Reconstructing an Australian School

David Loader, Principal at MLC

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1. Preface

It is a rare moment in cultural history when we can self consciously witness a large scale social transformation... (Bell, 1979)

In 1989, parents of grade 4 students at MLC were informed that there was to be a dramatic change in the style of education to be offered to their daughters. As from the beginning of 1990, all grade 5 students would be required to have a personal laptop computer, together with pens, paper and books.

When this policy was announced, a group of Grade 4 parents decided to vigorously oppose this decision. Three parents meetings later, after many hours of one to one conversations between staff and parents, some media coverage and a Parents' Association Meeting where the decision was won by only one vote, the program proceeded.

Thus began a transformation of a school, its culture, curriculum and its teaching learning paradigm.

Historically, the role of technology in education has been peripheral, with new technologies being added to the traditional teacher centred model of instruction. Now here was a transforming technology in the form of computers, making the student centred model more accessible.

Today the transformation continues. Currently there are 1500 laptops in the school with staff and students. This is a computer to student ratio of 3 to 4. It is confidently expected that in 1994 this ratio will be closer to 1:1 with nearly all students Grade 5 and above using a personal laptop computer. Similarly the curriculum continues to be transformed. No longer is the emphasis on 'computerising' the old curriculum. Rather the emphasis is now on 'constructionism' and on developing a new curriculum that is relevant in a culture that is being transformed by technology.

2. The School.

The school is the Methodist Ladies' College (MLC), situated in the city of Melbourne, Australia

It is an independent (private) school established in 1882 by the Methodist Church. Today it has an enrolment of 226O girls from K-12 of whom 110 board on campus. MLC is administered as four relatively autonomous age related sub schools, Junior, Junior Secondary, Middle and Senior Schools. In addition there are another 4000 adults and young people enrolled in an after school (evenings and week ends) program of Community Education.

A unique feature of the school is the homes from which the students come. In these homes, it is the girl who has the computer and it is the brother who has to borrow the computer from his sister.

An unusual feature of MLC is its recognition that schools are not always good places for young people. Consequently there is an openness at MLC to, and an acceptance of, change when it can be shown that to make the change the school will be a more relevant place for young people. Consequently staff who want to work at MLC need to have some sympathy for the Tom Peters statement that people "must learn to love change as much as we have hated change in the past." (Peters,1988. p45)

The MLC philosophy is proactive. It accepts that a future must be chosen and then achieved. The school encourages and supports "bold imaginings" but is also mindful of the market situation that will determine enrolments.

A Pilot Program. Preceding the introduction of laptops by a year was the decision, taken in 1988, to introduce a pilot program, a 'Sunrise Class into' year 7. This class was one of eight at that level; the other seven followed traditional teaching approaches.

This pilot class had access to lots of computers. In such a setting, the computer provided ""the impetus for the new formulation of the classroom and the means by which it may be achieved." (Nevile, 1990. p5) Thus a "technology enabled" classroom was born where in addition to pens there were computers as student tools, where text was supplemented by graphics, music and even robotics as a medium of expression and where students were given more autonomy.

The experiment in 1989 of introducing one Year 7 Sunrise class at MLC was considered so successful that it was followed in 1990 by four Year 7 classes (one of which was a laptop class) and two Year 5 classrooms of laptops. In 1991 there were fifteen laptop classes in Grades 5, 6 and 7.

3. A New Focus.

The old industrial society supported the factory model of education with the focus on 'batchprocessing' of groups of students in classes and the measurement of a teacher's work load by the number of classes taught by that teacher. In the post industrial society of today, it is less acceptable for the curriculum to be transmitted in this way.

Classes and classrooms continue to exist at MLC but their future is not assured There is a search f or a better way of relating the teacher to the student in a setting that is more personal and more flexible.

The goal is that teaching will be subordinated to learning. Thus the educational focus is moving from teachers teaching and teacher styles towards student learning and student learning styles.

The curriculum is opening up with fewer class prescriptions and more opportunity for a student to write a personal curriculum. There is a greater emphasis on co-operative learning with joint projects encouraged. The timetable has been modified to allow for more sustained work that is not interrupted by some arbitrary bell to signify the end of a learning period. The result is that students will often work into their lunch time because their work interests and challenges them.

With so many students working on different tasks in the same room there is a remarkable concentration on task by students. The MLC experience is that personal laptops have decreased a student's dependence on a teacher's subject knowledge, delivery and control. Teachers and students interact more about curriculum and skills and are more joined in the educational task. Because assignments are more open ended, teachers are finding assessment more interesting and are often to be found in the staffroom excited by an original piece of student work. In such a setting, students are more motivated and teachers have fewer control problems.

A significant change observed is the increase in the learning that now occurs from peers. Of the three teaching modes- teacher exposition, self study and peer learning- peer learning implying a new and major role when students have personal laptops. It is noticeable that much of the informal dialogue in the classroom is now work focused compared with before when it had a social orientation. At the commencement of the program, there was some parental fear that students would end up setting in corners focusing on their computers like robots. In fact student interaction has both increased and changed. A group of students working with laptops is both people- focused and highly productive. Another interesting consequence, remarked upon by visitors to the classroom, is the increased articulation of the students. They are used to explaining, asking, commenting. A visitor to a classroom therefore finds student comfort with the questions and surprisingly clear answers. Consider what this is saying about a student's self confidence and feeling of self worth!

Another interesting phenomenon is the new role for students in the home. Students with their laptops are introducing their parents and their older siblings to technology. This has increased the self confidence of students. It has also has also led the school to offer introductory programs for parents. A program at the beginning of this year in LogoWriter had 150 parents arrive with their daughter's computer to have an introductory lesson so that they could "share their daughter's excitement!"

4. Constructionism.

While traditional curriculum dominates at MLC, every attempt is being made to move to a more constructionist approach which is learner centred This approach is based upon Piaget's 'constructivism' where knowledge is "built by the learner, not supplied by the teacher." This idea has been extended by Seymour Papert to 'constructionism' which includes "the further idea that this happens especially felicitously when the learner is engaged in the construction of something external or at least shareable . . . a sand castle, a machine, a computer program, a book." (Polin, l990. p6)

The idea of knowledge being constructed by the student shows appropriate respect for the intellect of the learner and reflects the subjective and evolutionary view taken of knowledge. The student, in such a view, is not a passive recipient of data but a constructionist trying to understand her world, having meaningful experiences, making personally significant connections, developing mental models, collaborating with others in an enriched teacher supported social setting. The student owns the task and sees the computer as an expressive and representative medium, a modifiable tool, a personal assistant. A student working on a traffic management problem using LogoWriter was heard to say in a moment of great excitement, "You beautiful little turtle. My God, I love this turtle."

Examples of constructionist thinking in a laptop environment can be provided in the humanities, maths and science areas. For example, in science a student discussion of the rotation of the Southern Cross (a constellation in the southern hemisphere) led to the challenge to represent this using LogoWriter. The goal was achieved by the Year 7 students and led one science teacher to say: "This is the first time that I have been able to visualise this phenomenon!"

Probably some of the educational outcomes were unplanned by the teachers. For example, the Year 8 French students were issued with a French version of LogoWriter. The teachers thought that these students would benefit from "talking to the laptop" in another language. However the surprise was that the students were "talking to each other in French" in maths and science classes. What is more, the maths and science teachers began trying out their French and now there is talk of a French 'immersion' class for next year!

Of particular interest is the unity of knowledge that emerges with laptops and constructionist emphases. History, Geography, English and Biblical Studies teachers no longer require separate

time for their classes allowing students to work on integrated themes. Year 7 students whose task was to describe the life of Moses, not only did so with prose and poetry, but also considered the geographic setting, noted what else was happening at that time in history, and used graphics, music and puzzles that required the reader's participation to present their knowledge.

Constructionism is a challenging idea and is not necessarily compatible with the Piaget 'stage theories' for cognitive development. Piaget's argument that children can learn things only when they have developed to a certain stage has been translated in schools into a fairly fixed sequenced curriculum. In contrast, constructionist thinking works with a less rigid curriculum, allows more student initiative in the development of the curriculum and gives students more control over their learning.

There is evidence now that a student with a computer in a medium such as LogoWriter has the potential to achieve learning that hitherto was thought impossible. (Dawson, 1991. p23) For example, students in Grade 5 are measuring the value of pi by using LogoWriter to graph circles and measure the radius and circumference. A study of a history topic such as the Olympic Games brought students into early contact with many mathematical concepts such as cartesian coordinate geometry, randomises, sequencing, decimals, percent, functions, visual representation of data, linear measurement and orientation. 3

"Personal Computer" Philosophy. MLC has found it difficult to conceive of tomorrow's classroom without computers. However, these are not school computers but the personal computers of students and staff. Students have the opportunity to use a personal computer for what they see as appropriate to their needs and interests. The student owner is responsible for determining the use of her machine. A personal computer needs to be compared to a student's notebook or to a student's textbook which has underlined sections and comments in the margins. On a personal computer students create their "knowledge space" with their ideas, data and software. It is ownership not just of a machine, but of knowledge and of power. The 'personal computer' policy was born out of educational philosophy, but there were good practical reasons for it too! There is the prohibitive cost for the school to buy computers, special desks and chairs, provide power outlets, et cetera. If the school had bought laptops, there would have been the problem of trying to keep track of them afterwards. A positive outcome of students owning their computer is that they value them more and therefore look after them better.

Neighbouring schools to MLC laughed at the idea of personal computing in a school setting, but they did come in large numbers to visit this "experiment". Three years later neighbouring schools are beginning to venture forth encouraged by the success of the program, its high acceptance in the community and the growing enrolment at MLC.

5. School Computing.

One of the most difficult problems that MLC confronted was the myth that schools should provide everything including computers. The uniqueness of the MLC setting is best described by the 'no' to the idea that the school should provide computers for students and staff to use at school and home. This does not free the school from providing hardware, software and technical support staff. The hardware that the school provides includes the network, battery chargers, ancillary equipment such as overhead pro projection panels and more powerful PCs to undertake special tasks such as administration, desktop publishing and multimedia.

6. Staff Computing.

From the time when computers were introduced at MLC it was clear that a limiting factor would be staff skill and comfort with computers.

What proved to be an even more limiting factor was staff access to computers at home as well as at school. The MLC response to this staff deficit was to offer some incentive to staff to purchase a laptop. In 19924 MLC offered $700 towards the cost of purchasing, maintaining, upgrading a laptop or towards the purchase of new software. There was a time when staff felt that the school should make 'school' laptops available for them to borrow at will. Now staff acknowledge that they need a personal computer too and are pleased to have had financial support to purchase and maintain one. Indeed, could they now do without their laptop?

Some measure of the success of this personal laptop policy is the fact that more than 90% of staff now own and enjoy a laptop.

At no time was there an attempt to design a common training program which would be imposed on all staff. From the beginning, it was assumed that staff had individual needs. Staff would be starting from different points, would learn at different rates and would have different destinations. Similarly it was assumed that staff needed to be in control of their own learning. It was seen as important that teachers came ready to learn, could choose how and when they might learn.

Thus MLC offered free professional training in any computer area, even if the training was not of relevance to the teaching. It was found that this offer of free access made it possible for staff to learn new skills which translated into greater confidence with, and interest in, computers. Financial support was also provided for staff to visit conferences and attend external courses.

The advent of laptops has meant that teachers have to rethink the curriculum. For example what happens to the traditional maths curriculum now that students have access to

spreadsheets, data bases and sophisticated software packages in areas such as statistics? Thus teachers have appreciated the practical support that consultants such as Liddy Nevile, Gary Stager, Paul Goldenberg, Steve Ocko, Brian Harvey and Dave Baker have been able to provide.

The introduction of laptops has meant that staff need to be supported in ways that enable them to cope with their changing professional environment. With the increased use of laptops, staff find many dimensions of their occupational roles changing, including the cultural setting, career opportunities, work standards, required skills, hierarchy and salary to mention a few.

The view is taken by MLC that the school needs to be redesigned to make it into a learning place for teachers as well as students . Time for professional development, for planning and for curriculum development needs to be provided. only then will teachers be able to re-examine their practices and to consider fresh approaches to teaching which will take advantage of the expanding medium in which their students are working.

The above is rather clinical and does not do justice to what is happening. There is lots of excitement, feelings of achievement and professional pride amongst teachers at MLC. In fact, visitors often comment upon what they see as a shared feeling of pride amongst both the staff and students of "this is the only way to go and we are getting there first".

7. What Do The Students Think?

Survey results from 215 Year 7 students in 1991 showed strong personal commitment to their laptop computers and to learning with them.

95% liked using them. "They described learning with these tools as being 'fun' (86%) and 92% denied that working on a computer was boring. Although learning was not seen as easier, they felt that they had attained 'new skills' with the computer (98%) and that laptops had allowed them to do things that could not be done in other ways (88%). 89% were confident that programming had taught them a lot.

Appreciative of its portability (89%), 93% used the computer in their spare time, for recreation purposes. 86% of respondents noted that work was easier to find when they used a computer, and overall 81% felt more organised.

Most students preferred the appearance of work completed on a laptop and 85% preferred using it to paper and pen, although some students stressed that this depended on the task.

85% of students described their learning as more independent, ...82% felt more able to learn at their own pace, ...95% of students noted that teachers trusted them to work alone on projects... 86% of respondents felt that students had helped each other more in class this year...

Student acceptance of this innovation was strongly favourable..."(McDonald, 1992.p6)

8. Additional Costs.

The MLC entry into computers has involved significant additional expenditure both of a capital and recurrent nature.

At the recurrent level, there are the staff salaries, professional development expenses and the cost of the computer subsidy for staff purchases of laptops. MLC started with one technical support person and now there are four, together with a very important secretary/social worker/technical person as the interface between teachers and technical staff. MLC started with and retains one staff adviser. However now when a technology decision is to be made, 25 people expect to be consulted! This is not all bad because with a number of directors of independent computing programs all competing for scarce resources, there is more energy, diversity and personal commitment.

At the capital level, there are substantial costs for networks, for batteries and rechargers, for support equipment such as printers and data shows and software. Last year MLC spent more than S300,000. As well, parents and staff spent a further $500,000 on laptops!

9. Future Curriculum Directions.

At MLC the focus question is: "What kind of learning can take place in a school where students have personal computers?"

Initially the response was to integrate the computer into the existing curriculum. This was effective as judged by the satisfaction, enthusiasm, independence and achievements of the students and the delight of parents about their daughters' progress. (Baker 1989 p6) Now there is a need for new curriculum that acknowledges that some of the present curriculum has been outmoded by the advent of the computer. Philip East goes so far as to suggest that cursive writing "can be assigned the same fate as calligraphy" as it will serve no useful purpose. Similarly he argues that "we no longer have to think of mathematics as a calculation skill" because in the future mathematics will not include paper and pencil calculations. (East, l990.p6)The implications of these observations are yet to be appreciated. For example, in Australia there is a problem looming with existing external exams. Will students be permitted to take their laptops into the exam rooms?

The search has begun for a new curriculum that takes advantage of the existence of a medium that is richer than linear text. For the MLC purposes in Grades 5, 6 and 7, LogoWriter has been found to be excellent, being used in the core subjects of Maths, Science, English, Geography,

History and Biblical Studies. It provides "facilities for the writing of procedures, the manipulation of a micro-world, the production of graphics, animation, music, the provision for word processing and a data base."(Baker, 1989. p4) It requires analysis, logic and perseverance; students constantly hypothesise and test; problem solving and creativity are linked.

For the higher grades, some form of 'hypertext' is needed but is yet to be provided at MLC. At this level students and teachers will want to 'hierarchically organise' and 'cross connect' their text. In this way "overviews can graphically become part of the documents." Then students "can scan at a high level and only zoom into details" when needed. But this hyper text will only be the beginning as moving pictures are added to this text. These pictures will be interactive in that they can be "poked and manipulated." (diSessa, 1989. p3) "The possibility of a computational medium and a new, extended literacy involving it are exciting prospects."(diSessa, 1989. p29) This medium will allow the expansion of knowledge beyond a "narrow stream of text and talk to a rich flood of multimedia knowledge that feeds the senses, stirs the imagination... Learners are not just little linear text computers." (D'Ignazio, l990. p23)

10. Conclusion.

There is a group at the school who call themselves the 'wishing committee'. They talk a lot about possible tomorrows. Heads of sub schools meet together regularly and the agenda always includes the future. The College Council, which governs the College, encourages forward thinking and enjoys participating in this process.

There is also a two year study being undertaken at MLC looking at how the school can be refocussed away from teaching to learning, restructured away from fixed size classes to learning groups of variable sizes, reorganised so that the school day does not have to begin at 8.30 am and finish at 3.30 pm and includes learning that occurs away from the school.

Attempting to create a new future for MLC will involve making mistakes. It is important that any mistakes are not equated with failure, as this would discourage further experimentation. Tom Peters makes the point that there is "an almost irreducible number of failures associated with launching something new. For heaven's sake, hurry up and get them over with!" (Peters, 1988. p260)

MLC seeks to create a safe environment "within which people can struggle with the constant and chaotic world of change." The goal is not only to empower students, but also to allow "educators to emerge from their safe environments and take flight into new worlds. " (Farley, 1992. pl0.) Teachers and students are increasingly being viewed as learners together, in the same place simultaneously. The principal of such a school is not the instructional leader but the "head learner, engaging in the most important enterprise of the schoolhouse - experiencing, displaying, modelling, and celebrating what it is hoped that teachers and pupils will do." (Barth, 1991, p46)

11. Footnotes

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1. Australian schools are either dependent (fee paying) Schools enrolling about 30% of all students or State Government (Public) Schools enrolling the remaining 70%.

2. Sunrise is the registered name of a 'school of the future project' which is now associated with the Sunrise Laboratory of RMIT (Royal Melbourne Institute of Technology). Sunrise was created by Liddy Nevile.

3. From an observation by Gary Stager while at MLC in an unpublished paper, 1992.

4. This figure varies each year. In 1991, it was $400. The 1993 figure is $500.

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