INFORMATION AND COMMUNICATION TECHNOLOGY IN SCHOOLS: AN INTERNATIONAL PERSPECTIVE

AN INVESTIGATION OF SCHOOL BASED TECHNOLOGY PROGRAMMES 2000

A report

By

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INTRODUCTION

As part of the Minolta/Don Le Prou study award for 2000 I was able to visit three International schools to observe, discuss and reflect on the development of Information and Communication Technology in those institutions.

The main reason for choosing International schools was that, generally speaking, these schools have advantages in this area that most schools in New Zealand can only dream about. They have large rolls and thus are able to employ an economy of scale. They have a relatively wealthy, select client base. Staff/pupil ratios are low, specialist staff are easily employed and teacher salaries very high by New Zealand standards. One might expect therefore to see a high calibre of teacher, both generalised and specialised, delivering quality programmes for students. A third factor is the generous allocation of resources evident in most, if not all, international schools.

Given that such schools could be expected to have the personnel, the financial support and a largely computer literate student population three focus questions seem appropriate to form the basis of the study:

1. How do these schools organise and deliver I. C. T. programmes to their students?
2. What issues, problems or dilemmas are they faced with?
3. What issues are relevant to the New Zealand situation and can we learn from them?

It was a conscious decision to limit the institutional visits to three albeit very different schools with the final choice revolving around personal contacts. Experience has shown that in-depth review of fewer schools is preferable to many superficial visits. Furthermore, if personal contacts are available access to key people is more simple and cutting through the "public face" to the key issues is faster. Certainly I found many professionals who gave willingly of their time and expertise, and were unanimously interested in debating issues as well as discussing the New Zealand situation with I.C.T. This assistance and collegiality is acknowledged and appreciated. Of the three schools chosen one is in Manila and two are situated in Singapore.

CASE STUDIES

SCHOOL ONE

The International School Manila (I.S.M.) founded in 1920 is a private, non-profit, co-educational facility. I.S.M. is organised into three distinct schools - the Elementary School with students aged 5 to 10 years, the Middle School with students aged 10 to 14 years and the High School with students aged 14 to 18 years. Each school has its own administration, teaching and support staff and its own principal directly responsible to a school superintendent who in turn is responsible to a ten member Board of Trustees. At the beginning of the 1999-2000 school year there were 205 full time equivalent staff members including 60 American citizens, 87 host country nationals (Filipinos) and 58 persons of 14 other nationalities.

At the time of the visit the enrolment number was just over 1800 students with 690 in the Elementary School and 590 in the Middle School. Of this total 24% were US citizens, 18% were host country nationals and the remaining were children of 55 nationalities.

The curriculum is American based and courses are primarily U.S. college preparatory. However, classroom environments, instructional programmes and teaching methods observed in the Elementary School were very similar to New Zealand schooling. This reflects what the school describes as "current best practice from around the world" but is probably as much a reflection of teacher selection. Certainly a large number of teachers are from Australia and New Zealand and the Elementary school principal is an ex Auckland primary principal. The language of instruction is English although seven foreign language programmes are offered at various parts of the school.

School facilities are extensive and impressive. In addition to classrooms, laboratories, teachers' rooms and administration offices there are 3 cafeterias, 3 gymnasiums, 2 swimming pools, a completely equipped 421 seat theatre, rehearsal rooms and teaching stations for music and art. Two media centres (libraries) have an impressive array of print and non-print material. Both

offer networked and stand-alone CD-Rom research stations and each is connected to the Internet via a dedicated line.

I. C. T. facilities

International School Manila has approximately 800 computers for students and staff use. In the Elementary School computer access is provided in three ways.

1. Each classroom has five computers to serve a class maximum roll of 22 students. All classrooms are networked.
2. Two computer rooms are available for Elementary students and staff each with two dozen computers.
3. One media centre (library) is dedicated to the Elementary School. An on-line catalogue and circulation system is well established. A generous number of computers is available in the library for integrated research and study.

Every class has two scheduled library periods every eight days. Students are encouraged to use facilities at other times with their parents' support and assistance if possible. The library is open from 7.00 a.m. to 4.00 p.m. on school days.

I.C.T.Planning

> *"There's probably more computer power in this school than the whole Philippines government."*
>
> Elementary School principal

While this statement may have been made tongue in cheek there is no doubt that in terms of computers this school is very well served. There is more than one computer for every two students. Computer technology is supported with specialist managerial, teaching and technical personnel. There is also a comprehensive I.C.T. plan which aims to deliver the school's goal and objectives in this area. These include the following taken from the school's Strategic Plan (1999):

Goal: Curriculum is technologically current for students and all school personnel use information technology as a learning tool.

Objectives:

1. Students access and apply information technology in various learning situations.
2. Teachers manage information technology to model and assist students to apply it to different learning situations.
3. The school provides on-going information to parents about the use of technology in classroom programmes.
4. A technology vision group (staff members) is established to analyse and review strategic directions of modern technology.

To turn these objectives into reality the school has a comprehensive plan which details actions to be undertaken school wide. The major points include resourcing, curriculum integration, staff development, communication and review and assessment.

1. Technology resourcing

The school believes that if technology is to be fully integrated into the learning process it must be available at all times and in all locations. The application of information technology should not hinder other effective teaching strategies but rather be flexible enough to enhance them. Flexibility of provision and access is a key issue. To this end the plan details the following actions:

- Move to a laptop environment in which each student provides their own laptop to be used for the I.CT. needs both at school and at home. This would reduce the need for desktop computers at school and privately owned desktop computers at home, thus avoid doubling up.
- Move from a fixed location wired network which requires users to go to specific locations to access network resources to a roaming wireless network that permits users to access network resources regardless of the time or location.
- Acquire school-licensed software that has been identified as necessary for the delivery of the school's curriculum and install onto the students' laptops so each student can extend their ability to use the school's technology in their homes.

- Assess the availability of supporting technology in each area, it's impact on the stated goals, and adjust their availability to promote the desired outcomes. Supporting technology includes furniture, scanners, digital cameras, fax machines, printers etc.
- Increase network capabilities to handle expected increases in demand from an increased number of uses and the steady increase in the capabilities of these users.

2. Curriculum Integration

Information technology is not generally a separate curriculum but an essential part of every curriculum at every level of instruction. However, to use information technology across the curriculum requires an understanding of technology, a degree of skill in using technology and an ability to apply such knowledge and skill to all curriculum areas.

Curriculum integration is thus complex and relies not only on planned technology applications but also on the provision of hardware and software and the on-going training of staff.

I.S.M.'s action plans include:

- Existing curriculum will be placed on time lines. Time lines will indicate units of work and the I.C.T. resources currently used to achieve curriculum goals. Existing technology activities will be evaluated for appropriateness in terms of efficiently meeting learning outcomes.
- A minimal level of technology integration for each curriculum area will be clearly stated by school administration. This minimal level will be expected to be raised annually to reflect the growing importance of technology in curriculum delivery and increasing skill levels of staff.
- A system will be established whereby teaching staff can obtain identified technology resources needed to achieve curriculum goals. Co-ordination of requests and use of resources will be established.

3. Staff development

Staff development is acknowledged by I.S.M. as the most essential and the most difficult part of technology integration. The plan states that a school should expect to spend as much for training as it does for hardware or software. This expenditure primarily needs to come in the form of release time for the staff. All staff members must be released from some of their other non

instructional duties to concentrate on technology. Staff members identified as technology leaders must be given additional release time to help train others.

Staff also need to be part of the planning process for technology integration. Each subject area and grade level may have distinctive concerns and priorities that need to be expressed and considered in the prioritisation process for limited resources. A forum to share ideas and concerns must be created that permits these thoughts to flow throughout the school with a view to creating a positive cultural view toward technology use.

I.S.M.'s action plans include:

- All teachers to be provided with laptops so they commit themselves to using technology in all appropriate ways. Laptops should be viewed as a staff development component of the employment package.
- At least 50% of the available staff development release time shall be devoted to technology.
- All staff members be required to attend some technology workshops based upon their current skills and the technology requirements of their subject area.
- Technology skills assessments will be developed to revaluate teachers' technology abilities and to target training. Staff members will be expected to train others in the areas they have mastered.
- Shift emphasis for technical support staff from hardware maintenance to software acquisition and use.
- Set up technology teams in each school (Elementary, Middle and High school) with representatives from each year level to direct progress in key technology areas.

4. Communication

I.S.M. is considering the use of electronic communication as a replacement for the majority of school/home communication that usually takes place by written form. This includes teacher information on individual students, school newsletters, school policies, calendars of events etc.

Action plans to introduce comprehensive electronic communication include:

- Every family to provide the school with a private e-mail address that students cannot access. This address to be checked regularly – preferably daily.
- Teachers to start each year by initiating e-mail contact with parents.
- Minimal frequencies of communication should be established by each school. Guidelines for teachers to be established because although the professional judgement of the teacher is crucial the school must establish overall policy procedures by which teachers work.
- The school must create policies regarding the access to, the storage of and the manipulation of information.
- Each part of the school must examine what it wants and needs to communicate and to what audience. Electronic resources can then be provided to enable what is identified.

International School Manila - a summary

While this school has vast, almost extravagant resources when judged from a New Zealand perspective an understanding of issues confronting this school is helpful.

The school's plan for further resourcing illustrates that regardless of resourcing levels there is never enough. There is always a further level to attain. In the case of I.S.M. the provision of personal laptops for all pupils and teaching staff is the next level. However, this move has not yet found universal acceptance from all school decision makers and I believe is some way off. It is unlikely that Elementary and Middle School students will work with laptops in the foreseeable future. Staff members I spoke to thought laptops would be convenient but some doubted the necessity for them given the ready computer access staff have at school and in their homes. The same is also true of students. On the other hand, one thing we do know about technology is that future needs are impossible to predict.

Curriculum integration of information technology is also universally complex. Progress in this area is helped by generous resourcing but also depends on staff skill and even more importantly the match between curriculum requirements and software applicability. If information technology is to result in improved learning outcomes for students then software needs to be developed with this goal in mind. Students can readily be taught how to use technology, given appropriate resourcing. The important question is then how is this skill to be harnessed to bring

about improved success in mastering the learning outcome described in the curriculum statements for the seven essential learning areas mandated in New Zealand.

Staff development is recognised by I.S.M. as a major issue – as it is in all schools. However, one wonders if the stated aim of spending at least fifty percent of their staff development budget on technology is feasible. The key question is how many 'priorities' can a school address at once.

The use of technology to improve communication throughout the school and with parents is exciting. However, much is to be done to make this work efficiently and effectively. For example, the e-mails received by the principal I worked with were enormous in number and largely unnecessary. There is much work to be done in defining what information goes where and for what purpose. Each recipient also needs to be ruthless in deleting non essential mail. However, there continues to be a danger that, because it is easy to send copies of messages in all directions, people do so and then expect everything to be read, understood and acted upon by everyone else.

The use of e-mail to communicate with parents is excellent if one sets aside the issue of access. The opportunity for fast, comprehensive parent communication is present and this is used by teachers to send home class newsletters and follow up issues such as homework or student behaviour with particular parents. This appears to be working well.

Overall International School Manila illustrates two major points. It is exciting what excellent resources and enthusiastic staff can accomplish. On the other hand it is also clear that major issues - resources, staff support and development, communication pitfalls for example remain.

SCHOOL TWO

In 1975 the United World College of South East Asia (UWCSEA) became the new title of Singapore International School. The United World College movement has a network of nine schools around the world. The movement aims to promote international understanding and to make education relevant to the global needs of the modern world. There is a stated emphasis on

developing student responsibility for the welfare of humankind and the global environment. During my relatively short visit I could see this emphasis was seriously accepted by staff and did form a major part of learning programmes.

The College is made up of three schools, the Elementary School (270 students), the Lower Schools (600students) and the High School (1300 students) each with its own classrooms and principal. The Head of the college oversees the whole College. Approximately 15% of the pupils from Year 6 to 12 are boarding pupils. Interestingly all students are children of ex patriots. Children of Singapore parents are expected, indeed required by law to attend local schools. UWCSEA occupies a campus of nearly 20 hectares with very impressive modern and well equipped facilities. The outstanding sports facilities include a large sports hall, gymnasium, fitness centre, floodlit tennis courts and large grassed areas. Cultural activities are supported by a large main hall, two theatre halls plus fully equipped suites of rooms for art, music and home economics. All students have full access to all facilities.

The curriculum is similar to New Zealand and, as in Manila, the learning environments and teaching methods were seen to be similar to New Zealand. Again a large number of Australian and New Zealand trained teachers are employed.

I.C.T. facilities

The Elementary School and Lower School (ages 4 to 12) share two well-equipped computer rooms. More computers are located in classrooms and in study areas adjacent to classrooms. The library is large and equipped with banks of computers for personal study and research. While it is difficult to determine numbers it is safe to say that computers are freely available.

UWCSEA has a computer / I.T. policy which is currently being debated. Key points are listed below:

1. I.C.T. skills

A planned progression of skill building is outlined for classroom teachers and specialist staff to follow. Specialist support is available on a regular basis. Fundamental to the school's

philosophy is the principle that students should develop a range of general skills and develop the confidence to access any piece of software they might want to use.

The policy also recognises that, although the student population is relatively computer literate, students do bring a wide range of skills. It is expected that I.C.T. will be used for individuals to learn at their own pace.

At most levels the school expects I.C.T. skills to be taught within the context of an exercise in a curriculum area. For example software for teaching mathematics must be designed to assist students develop I.C.T. skills at a range of levels including extension work in both I.C.T. and the subject concerned. This expectation is supported by specialist technology staff who acquire relevant software, assist classroom teachers with planning and help with class lessons. It is expected that by High School (age 13) the majority of students will have basic knowledge and confidence in a full range of I.C.T. skills.

2. Staff development

The school's priority is to train teachers who teach students who are in their first six years of schools. This is where I.C.T. skills are new and directly taught. The College finances visits from specialists who teach staff on courses run at the weekend, in holidays and after school. All teachers are expected to develop their skills, not only through school based programmes but also through further private study. There is a strong belief that I.C.T. has developed to the stage where teachers must take responsibility for competence on an area which is particularly relevant to their work.

3. Resourcing

Computers are freely available for pupils and staff. If programme requirements demand an expansion of resources this will be considered. The policy is to ideally replace machines after four years. The school is currently working on a network which links all teaching rooms. E-mail communication amongst teachers will soon be possible. The school sees great potential in e-mail amongst staff as well as outside the school. The school has investigated the provision of a lap top for every student. The school believes the experience of schools that have adopted this

approach indicates great difficulties with lost or malfunctioning computers. As long as every student has a computer at home, which they do, it is believed that the majority of curriculum objectives will be achieved. However, this part of the policy will be reviewed annually.

The overall I.C.T. policy is seen as a target for the next two to three years. Longer term planning is seen as meaningless in the area of computer technology.

The school's policy is supported by planning and assessment material which is available for all teachers. This material also contains form letters regarding internet use, lists of software resources and information technology proficiency awards.

The United World College of South East Asia - a summary

Once again by New Zealand standards this school is extremely well resourced. The emphasis now appears to be on developing effective programmes using the resources available while expansion is under way with e-mail facilities, the development of a website and classroom networking. The I.C.T. programme in this school appears to focus almost exclusively on computer technology.

Curriculum integration is seen as very important. The approach is to teach basic I.C.T. skills in lower year levels and secondly to obtain software that enhances curriculum outcomes while reinforcing and expanding on information technology skills. This seems an excellent approach provided specialist staff and software programmes are available to support classroom teachers.

Staff development is largely seen as a personal responsibility support by school organization funding. The approach to staff in-service was summed up in the following quote from a principal:

"Teachers don't have to come (to I.T. training sessions) but they do have to know".

In other words to be a teacher in an International school one must have a reasonable level of computer literacy. This seems reasonable. To be a teacher in the current times requires personal ownership of a computer and a reasonable understanding of I.C.T.

An issue not addressed in the policy on I.C.T. but one that came through strongly in staff debate was to do with ethical and moral implications. The issue of privacy is an important example in International Schools. In some parts of the world schools' policies exclude the publication of any information, in any form, that may identify a student outside school. Concerns range from misuse of information through to serious risks of kidnapping. As I.C.T. makes all sorts of information more freely available in the public arena all schools will need to develop policy positions.

SCHOOL THREE

The Singapore American School (SAS) was established to provide an "American" education for children of United States citizens residing in Singapore. The curriculum and teaching systems are American. All administrators (principals and deputy principals) are American and the majority of teachers are also from the U.S.A. although some Australian and New Zealand teachers are currently employed. SAS has a total roll of 2,700 students. The school is run as four separate schools each with it's own facilities, administration and staffing structure. A number of facilities are shared across schools, if and when required.

The school facilities are extremely impressive. Singapore American School has a reputation among other international schools as being very well appointed. Sports facilities, cultural centres, recreation areas and cafeterias are modern, well equipped and among the best I can remember seeing anywhere.

My visit focussed on the Intermediate School which caters for 600 students in Grades 3, 4 and 5 (ages 8,9,10). Students I met were particularly articulate and out-going. Each of the three grade levels had ten classes giving a class size average of around twenty. Class teachers were supported by an extensive team of specialists in art, music, physical education, technology, Mandarin plus two counsellors, a psychologist, an enrichment advisor and a teacher librarian. Clearly the impressive plant resource is matched by people resources.

I.C.T. facilities

Information technology is largely linked to computers and computer education. Computer education in the Singapore American School Intermediate school is extremely well resourced. Each classroom has four computers (class size around 20 students) and there are three computer laboratories (as they are known) for classroom use. This works out at one computer suite for each ten classes. There is also a further laboratory staffed with a computer specialist to assist teachers and students with new programmes.

At present the Intermediate Division was both Macintosh and P C computers. P Cs are gradually being phased in. Throughout the year students work on word processing assignments using ClarisWorks, multimedia projects using Hyperstudio and Powerpoint, and leant how to use the Internet.

The Intermediate School also has a library media centre with an extensive collection of children's literature and audiovisual materials including CD-ROMS, videotapes and laser discs. As well as teacher conducted classes students are encouraged to make independent visits for both research and recreational purposes. Parents and guardians are welcome to use the library facilities with their children. The centre is open each school day from 7.30 a.m. to 4.00 p.m.

I.C.T. Policy

Computer education is closely integrated with each year level's instruction programme. The students learn a progression of skills that will enable them to use computer applications in day to day assignments. An emphasis is placed on word processing and graphics skills. There is a very detailed computer technology curriculum guide set out in year levels beginning with five year olds.

To ensure that appropriate use is made of the technology resources available at the school all users must have proper authorisation and adhere to the school's code of conduct. The school takes this issue very seriously. A one page code of conduct is widely publicised. To access technology at SAS an acceptable user policy statement must be signed by each student, and his/her parent. This is kept on file by the school. This policy ensures the code of conduct is

recognised and authorised. If necessary the school will withdraw access to resources if the policy requirements are breached.

Staff development in technology is recognised as important. It was reported that teaching staff are "well up" with computer technology although there remains some "teacher anxiety". Staff training appears to be largely "in house" with use being made of specialist staff. E-mail is used throughout the classrooms.

Personal teacher skill building is also seen as a personal responsibility of each staff member. A reasonable degree of computer literacy is expected as part of a teacher's basic skills. Progress in improving skills is expected and is built into appraisal for salary increases.

Interestingly the issue causing consternation among a number of staff at the time of the visit was the introduction of class web pages on the school's website. It seemed that the difficulty arose from the manner of the introduction of the concept however. However, this is a management issue rather than a problem stemming from the wider use of technology.

Singapore American School - a summary

The resources at this school are extraordinary. With regard to technology there is clearly enough equipment, software, skilled personnel and available space to do whatever is seen as necessary.

The school has a seemingly "laid back approach". Information technology is simply part of the overall educational environment. This is not to assume that I.C.T. is not very important but rather the important place of I.C.T. is established, resourced and organised. In many ways this is an ideal arrangement.

The recognition of I.C.T. in this school, as in others I visited, revolves very much around computers. No one would preclude other forms of technology as useful in learning but computer education, and the use of computers for education, are paramount in information technology programmes in all three schools visited.

NEW ZEALAND ISSUES

This section lists aspects of information and communication technology that, I believe, need further consideration and debate. Obviously no definitive answers are given nor during the course of this study, were any seen. Rather this is an attempt to add to the debate by raising questions that could be seen as difficult, even controversial, by some.

1. Resourcing

"To err is human but to really foul things up requires a computer." Anonymous

It is acknowledged that the International Schools visited during the course of this investigation are relatively large, wealthy and have a highly computer literate student group. However it is clear that if schools in New Zealand are to seriously address information technology then the issue of resourcing needs examination. Private schools have made major progress and it is acknowledged that state primary schools are working hard to address I.C.T. However, I believe the following questions are important to consider:

- Do schools have enough hardware to give students regular access to computers?
- Do schools have appropriate software that builds I.C.T. skills while enhancing learning outcomes in our seven essential learning areas?
- Have schools got co-ordinators to oversee the introduction of I.C.T. policies?
- Do classroom teachers have access to specialist teachers with responsibility for software selection and use, classroom teacher upskilling and classroom programme integration?
- Do schools have technical staff who ensure appropriate purchasing is done, the best use is made of equipment and technical difficulties are resolved?
- Do school facilities have designated teaching spaces provided for I.C.T. rather than cribbing classroom or storage space?
- Are schools able to budget sums of money for equipment replacement programmes (3 – 5 year basis)?

At the end of the day the progress that is made in I.C.T. depends on the allocation of funding which in turn will depend on the priority given to I.C.T. by Government as well as school based leaders. The cost is extensive and it is interesting that some people are already questioning the value of computers in primary schools, given the money, time and expertise they require.

It could be argued that much of this concern stems from a clash between what one might call the old priorities and the new priority. Schools have traditionally invested large sums of money in areas such as physical education and the arts. The building of halls, auditoriums, swimming pools and other sports facilities is to be applauded. Perhaps now we have a new area to recognise. And I believe this needs to develop on a national basis rather than relying on, what one might call, piecemeal local initiatives, laudable as they may well be.

2. Professional Development

"We have the hardware, we have the software, what we now need is the peopleware"

I.T. Co-ordinator, Manila.

The professional development of staff is a crucial area and this is recognised in all the schools I visited as well as in New Zealand. The questions that need addressing, I believe, are as follows:

- What is the balance between personal teacher responsibility for upskilling and school provision of training programmes? This needs to be a partnership with schools providing opportunity for learning and teachers accepting the responsibility for knowing. As another I.C.T. co-ordinator in Singapore told me:

"No one told me how is not acceptable in this school. Teachers have a responsibility to know."

- When can professional development be undertaken? One international school runs courses after school, in the weekends and during holidays. In New Zealand professional development release from class teaching is common. A further question that arises is how much time should be devoted to professional development during class time and how often can a primary teacher be absent from class before the class programme suffers?

- How many professional development "priorities" can teachers cope with at any one time? Teaching is obviously complex, time intensive and personally demanding. Last year in New Zealand I.C.T. was a major national priority. In 2000 literacy and numeracy are national priorities along with a renewed emphasis on school underachievement. In the meantime the new Arts curriculum is due to be introduced. Ideally national priorities should be set and achieved before others are introduced. Otherwise schools could be in danger of doing all things superficially

3. Communication

The developments in communication using computers are tremendously exciting. Internet use in schools is established and growing. Intranets are being established as classroom networking is put in place. As schools increase electronic communication policies will be required regarding the access to, storage of, and the manipulation of information. Privacy issues will certainly need to be addressed.

The sheer volume of material being exchanged is also likely to escalate. How this is dealt with needs to be examined. In one school that was visited the use of e-mail, for example, was clearly excessive. People were communicating, one suspects, simply because they could rather than because they needed to. Once again school policies will need to outline what information is required, by whom and for what purpose.

4. Curriculum Integration

All three schools visited are addressing this issue. The basic skills of computer use are taught early. Students are also taught the advantages of computers as a tool to achieve their goals, i.e. ability of a computer to store, retrieve and manipulate information. Students are then helped to use computers to enhance curriculum learning outcomes. However, to do this requires access to hardware, appropriate curriculum software plus a planned and co-ordinated approach organised over years. All of this requires resources as pointed out in number 1 above.

The three schools visited had a common approach to what is a fundamental issue. In all schools I.C.T. was well resourced including the use of specialist teachers to oversee programmes and ensure the best of software was available. Computers were provided in classrooms, computer rooms, libraries and study pods. Whenever students wanted, or were required to use a computer they were thus able to do so. However the issue of access to appropriate software is one that needs addressing. I believe this probably limits the successful use of computers in New Zealand more than any other factor. Perhaps it is time that an organization such as Learning Media source, and distribute, curriculum specific software to schools in the same manner they provide print material for language programmes.

5. Information and communication technology and equity

"Machines are worshipped because they are beautiful and valued because they confer power; they are hated because they are hideous and loathed because they impose slavery."

Bertrand Russell

This issue has become a crucial one when I reflect on my visits. It was however not an issue in the schools concerned. As mentioned they are very well resourced and probably 100% of their students have computer access in their homes.

In New Zealand schools, however, I believe access to computers and computer-enhanced learning is a major issue. If access to information technology is not equitably distributed there is potential for a learning gap that could exceed the literacy and numeracy gap that is currently causing concern. Given that access to knowledge is a major source of influence in society, and given the major role of computers in knowledge acquisition, it seems crucial that students in our schools have the opportunity to be computer confident at an early age. Limited access to I.C.T. has the potential to lead to an increasing "power gap" in society.

The initial action is probably for schools to clarify who has access to computers. What percentage of a school's student group have computer access at home and what are those computers used for? Is computer access at school related to school decile, or gender or

ethnicity? Even if computers are available is the software appropriate in terms of improving learning outcomes in key curriculum areas?

There is an argument that computers are only part of an information and communication technology programme. This may be correct but computers are certainly the major part. Another argument is that computers are 'only a tool' to aid learning. I venture to suggest computers are not only a tool, rather they are 'the tool' to aid learning.

Of course computers cannot teach everything, neither will they ever replace a skilled teacher. However, information technology is, I believe, only beginning to impact on our school programmes. Information technology is about computers in the same way reading is about books. It is accepted that access to books is necessary for learning success. In a similar light I predict access to I.C.T. equipment will become necessary for learning success in the future. If we are not careful, access to I.C.T. resources will be the equity issue of the future - if it is not already.

Conclusion

During the course of this investigation I spent time with the staff and students in three amazing schools. To everyone involved, teachers or learners, I extend my appreciation and thanks. I was fortunate to be reminded that as educators we live and work in the exciting global business of education.

What I am also reminded of is the exceptional schooling system we have in our own country. Leaving aside idealistic resourcing, and accepting the varied student population in our schools, I have renewed pride in the work of our teachers and support staff. We have as good a teaching force as I saw anywhere, even better when cost effectiveness is taken into account. I continue to believe we run an excellent education system on a relative shoe string.

Educationally we certainly have much to be proud of. In many ways, in an imperfect technological world, New Zealand schooling is still about as good as it gets.