The Integration of the NICT in the English Schools of Québec

Report — The Integration of the New Information and Communication Technologies in the English Schools of Québec

"We are preparing to take advantage of the opportunities created by a world in a constant state of flux. We have begun to redefine our classrooms of the future, in fundamental ways, because we believe our schools can no longer operate in isolation from the rest of the world. Our classrooms must embrace a global perspective and employ technology as a means to escape the limited "four-wall" mind-set. [...] As education funding continues to shrink, these new technologies will assist us in getting on with the task of equipping our students with the necessary skill sets needed to compete in a global market. It is imperative that all students and teachers begin to use and acquire an understanding of the new tools of information retrieval and manipulation. [...] Our students need help in finding new ways to reach out and learn from each other. Teachers must no longer see themselves as content providers when global networks are quickly taking over that task. Teachers must embrace their new role as context providers."
(Janet Baird-Jackson, p. 15-16.)

Introduction

"As we approach the 21st century, accessing, manipulating and communicating information are central functions of our society. Processing information from an ever-widening array of resources and applying that information to communicate and to make quality decisions is central to functional literacy. Modern information skills underpin collaboration for continuing to learn, accessing collective expertise, creating new

knowledge, solving problems, and overall productivity. To meet the needs of the upcoming citizenry, tech-nology is the prime enabling vehicle for carrying out these critical functions."
(Harriet Taylor and Lajeane Thomas)

At a time when the reform of education is under way and there is mounting pressure to integrate the new information and communication technologies in schools, the Advisory Board on English Education has tried to identify some of the opportunities for and barriers to an effective implementation of technological developments, in order to allow English schools to take full advantage of the new technologies for the enhancement of learning. To this end we have focused on the four key elements of the educational process most conducive to change: *the role of the teacher, student learning, school organization* and *the need to expand the present technological network* throughout the school system.

The subject of this report is the integration of the new information and communication technologies (NICT) in the classroom. By the NICT we mean, but do not always specify, all electronic information search, retrieval, storage, transmittal and networking systems, notably computers and their associated technologies: on-line communication, graphics processing, music processing, desktop publishing and multi-media, to name a few.

Transforming schools for the integration of the NICT will require coherent planning and action on the part of the school boards and schools themselves, with the ministère de l'Éducation taking the leadership role in the whole integration process. In an era of restructuring and diminishing financial resources, planning must include innovative and imaginative measures which respond to the following questions:

What impact will new technologies have on the English system as a whole?

What changes will have to be made to the way we organize our schools?

To what extent are the new technologies being used in our schools?

What has been accomplished to date and where do we go from here?

What impact do the new technologies have on student learning?

What impact does the use of new technologies have on the role of the teacher?

Technology: Not More and Faster but Differently and Better

The ability to use the NICT is becoming a more and more pressing requirement in the workplace and so there is a sense of urgency that education systems today provide students with the necessary skills and with access to the information superhighway. Concern is expressed that children who are not plugged into this huge and growing web of knowledge will be less well educated because they won't know how to apply this abundance of information to productive ends.

School is the common ground where all students can acquire the skills associated with the comfortable use of technology. The NICT in themselves are effective tools for teaching and provide incentives to learning and methods of communication. An American study, however, showed that most teachers who use technologies use them in traditional ways, to do what they have always done more efficiently. (cf. John O'Neil, p. 6-12) As Christopher Dede, Professor of Information Technology and Education at George Mason University, explains, "Our first instinct is to use technology to do the same thing faster."(cf. John O'Neil, p. 10-11) And indeed, all the empirical data shows that this instinct is universal.

The introduction of the NICT must be expanded well beyond the word processing level to incorporate the full range of their inherent possibilities. The new technologies break the isolation factor. They provide access to ideas and open the way to interactive pedagogical approaches.

Computers allow for the adaptation of the learning environment to students' needs. They focus interest and have the potential to diminish discipline problems. They facilitate teamwork and encourage concentration and calm. "It's not how many buttons students can push, but whether we can use technology to spark thoughtfulness and interaction." (cf. David Dockterman, pp. 58-59)

In-school access provides opportunities for students to work with good educational software, to use word processing, to engage in problem-solving and higher-order thinking skills, to create multi-media presentations.

Students who are denied full access to the educational advantages that accrue from a familiarity with the personal and pedagogical uses of computers are disadvantaged today and will be more so tomorrow. In schools, the syndrome of the *computer specialist* must be replaced with the *common touch*.

The English School Experience

The ministère de l'Éducation must ensure that the education provided in English schools is of equal quality to that of the French sector. To do so, the English school, particularly the small school, must be given the means to develop the capacity to build on its strengths. It must be able to compensate when direct services and resources are lacking.

The expansion of technologies in the classroom has particular relevance, therefore, for the English school system. The population it serves is geographically dispersed and structurally fragmented and more than fifty per cent of its schools have less than 200 students. Through technology, access can be provided to the best available learning opportunities, approaches to teaching and learning not possible in the traditional closed classroom with limited resources.

Classrooms without walls

In 1992, the Task Force on English Education was established to provide the Minister of Education with an evaluation of Québec's English school system. Since that time, the setting up of a Small Schools Network has helped to mitigate the isolation of small schools and their lack of adequate resources. Creating links among all schools was seen as one way of providing support for schools which traditionally have been "out of the loop." This network has proved successful, offering many small schools multiple opportunities to have access to new and exciting resources.

"Pedagogy is at the heart of the network, the core that brings teachers from unique and diverse situations together. Participating teachers are supported in developing projects that reflect the unique qualities of their school, students and individual teaching styles." (cf. Deborah Gross) SHARE (Share and Read Enthusiastically), for example, allows students six years old and up from across Québec to share their interest and enthusiasm for reading. Students learn to use a database application to prepare records and comments about their favourite books. The records are then compiled and sent out to participating classes at regular intervals.

The Centres d'enrichissement informatique scolaire (CEMIS) have been instrumental in building and supporting the telecommunication network across Québec that makes these projects possible. At the present time there are five English service CEMIS. In certain regions these CEMIS have played a critical leadership role in both the pedagogical and technical domains, offering in-service training and support. Sometimes covering a vast territory, they have provided vital services to English schools, such as introducing new software, developing the use of multi-media presentations, troubleshooting and cajoling teachers into using the NICT. Now more and more CEMIS are giving pedagogical support and the boards are assuming greater responsibility for providing their schools with technical back-up.

It is apparent, however, that in serving the English sector the CEMIS animators are stretched to the limit in terms of time and resources. The reasons for this vary. Outside Montréal these resource people must cover very large territories and are often unable to visit a school more than once a year. The need for human contact is very important in building teachers' trust and commitment to the NICT. We would urge school boards, then, to take note of this valuable resource. Planning for the most rational use of this expertise, for example, in helping to train competent resource people at the level of the school, would be one way of making use of these limited resources. For its part, the ministère de l'Éducation must ensure that funding for the CEMIS is maintained.

Other technological initiatives have also been launched in our English schools. The Alabama Science Project, from the University of Alabama, was introduced by the English services at Radio Québec (Québec School Television). This integrated program of chemistry, ecology, physics, biology and other sciences is presented through electronic media and videos to students at Elementary 6 and Secondary 1 and 2 levels. The material is kept up-to-date and students follow lessons which involve in-class and interactive situations. It is already providing some 77 teachers with a different approach to teaching science.

Another activity, a collaborative project between the Services à la communauté anglophone of the ministère de l'Éducation and the school boards, addresses the problem of improving performance in mathematics. Technology is used to support the implementation of the new secondary schools mathematics programs, particularly in the remoter areas where schools do not have the services of a math consultant. This electronic network will help teachers establish and maintain links with colleagues, consultants and resource people for the sharing of expertise. It will also afford them electronic access to various resource materials.

Expanding the resource base

Our schools continue to experience difficulties over access to program-appropriate textbooks in some subject areas. In certain instances the cost factor, due to the small number of students, curtails the production of high quality materials that meet program requirements. Our report, *Textbooks and Teaching Materials* suggested that "a careful examination of the electronic teaching and learning resources" be made. (cf. ABEE, 1993) We would like at this time to reiterate the point. There is a vast wealth of complementary resource material now available electronically that teachers are more or less aware of: textbooks on-line, CD-ROMs and information on the Internet. There is a need to direct teachers to those sources where they can find appropriate materials of good quality, and to foster the development of supplementary resource material by teacher groups.

The Gestion du réseau informatique des commissions scolaires (GRICS), which has for a long time been a provider of administrative services and of a bank of examination items to the boards, is now expanding its mandate to offer pedagogical material to teachers. It is essential that the needs of English schools not be forgotten and that materials be developed for them.

Biliteracy imperative

The biliteracy imperative that faces English schools is a unique dimension of the English school experience. The myriad initiatives taken to meet the challenge of promoting biliteracy among its students have still received no recognition or support from the ministère de l'Éducation. The Advisory Board's last report, *Language Learning in the English Schools of Québec: A Biliteracy Imperative* (cf. ABEE, 1995) stressed the importance of having appropriate teaching materials, not only for the teaching of French as a second language but also for other subjects taught in French. Through the Internet, the NICT offer the means of supporting the quality of French language learning by providing sites where pedagogical resources can be made easily available. A modest start has been made through the Small Schools Network. It is important that the needs of the English schools in French second language teaching not be overlooked when French language learning material is being developed.

Partnerships

Partnerships provide English schools with valuable extra resources and expertise. One school board has formed a partnership with Northern Telecom and benefits from the expertise of an engineer, while another school board receives reconditioned computers from Bell. Whereas local partnering responds to the specific requirements of schools, there is an important role for the ministère de l'Éducation to play in promoting partnerships that respond to broader objectives and especially those that forge links within the English educational community.

Partnership initiatives in other educational jurisdictions have, for example, promoted professional dialogue among teachers through electronic bulletin boards. Teachers can 'chat' with their peers about pedagogy and curriculum issues in either English or French. With the capacity to provide email access to the Internet and to hook into professional databases, these bulletin boards also encourage teachers to learn about telecommunication use.

Recommendations – The English School Experience

1. That ministère de l'Éducation policies or initiatives for developing new resources for the new information and communication technologies (NICT) recognize and support the crucial role that the NICT must play in guaranteeing the viability of English schools in Québec.

2. That the ministère de l'Éducation encourage the development of teaching and learning materials and make them accessible on the Internet, particularly for French second language instruction.

3. That the ministère de l'Éducation guarantee continued funding for the CEMIS.

The Role of Teachers in the Technological Revolution

The challenge for teachers in adapting new technologies to how and what they teach and how and what students learn is enormous. The idea that teachers can involve students from many different disciplinary perspectives presupposes that they have already developed effective pedagogical approaches to integrating the NICT. In the new "take" on learning opened up by technologies, a fundamental shift in beliefs about teaching and learning has to occur. The role of the teacher undergoes a radical change to that of guide and facilitator, whose importance lies in knowing how to find the answer.

The concepts in learning that favour this approach-collaborative learning, constructive learning and apprenticeships-are not new, but they are difficult for teachers to sustain on their own. Technology can help provide practical support and intellectual stimulation as well as expand the repertoire of what works.

The use of the NICT involves more than video presentation, word processing and other generic programs for developing specific computer skills. These will remain the norm, however, until the MEQ requires that faculties of education and school administrations assist teachers in getting up to technological speed. If computers are to provide an empowering student-centred learning environment, the technology alone will not do it. Teachers are the key to making the NICT work for the students. They are the ones who must first embrace the technology and then anticipate classroom change that will allow its widespread use. To do this, the greatest barrier of all must be overcome-the time teachers need to learn and explore its uses. Teachers need time to learn.

Initial teacher education

Teachers are the key to the effective integration of technology. They shape the learning environment. The education of teachers in the use of technology is as important as introducing technology into the classroom. The successful use of the NICT to promote student learning depends in large part on the technological comfort and skill of teachers.

The problem of teacher education in this area is just beginning to be addressed. Increasingly, school boards ask that new teachers be computer-literate, yet technological literacy has not been an *exit* requirement for pre-service teachers. Most education faculties across Canada offer little more than an optional three-credit course in educational technology. Familiarity with new technologies and their integration into the curriculum should become a requirement of the new four-year teacher education program. In future, technological pedagogy should be integrated into all aspects of teacher education.

Recommendation – Initial Teacher Education

4. That the ministère de l'Éducation require all methods courses in teacher education to address the integration of the NICT into the process of learning.

Teacher Time, In-service Training and Support

Teachers need to be motivated and encouraged to realize the potential of the computer. It is no longer acceptable that only a few teachers in a school use computers on a regular basis. This raises issues of access and equity for the student. Teachers need to be convinced that the use of the new technologies, once mastered, is not an add-on to their workload, but a means of enriching the learning environment and stimulating students. If the goal is to bring computers into the classroom, the how and the for whom must be worked out. Teachers must find out how the use of the NICT affects the way students construct knowledge. They must create a sense of ownership among themselves and the students on integrating technology into teaching practice, since technology is changing the manner in which both teachers teach and students learn.

If the management of the technological project is to come from teachers, they will need time to think through as well as to study for the effective integration of computers into their teaching and the students' learning. They need time to become familiar with the software available and how to evaluate it. They need time to explore programs, learn to install software and demonstrate its use, develop lesson plans that include the use of the computer and troubleshoot minor problems with equipment.

Teachers must have the time to confer with each other and the opportunity to collaborate across subjects (crosscurricula projects) in new ways, e.g. multi-media projects. They must be encouraged to share information on teaching strategies and to build consensus on the goals of technology in the classroom. There is a cost to time. Providing the teachers with the opportunities needed to develop a new set of capacities must be supported by the ministère de l'Éducation.

All indications are that teaching will be transformed by the new technologies, from content to context. In-service training, therefore, should be readily available throughout the teacher's career. If the computer is to become an essential tool in the classroom, teachers need to keep themselves up-to-date to use it effectively, comfortably and with sustained enthusiasm. The ministère de l'Éducation should ensure that in-service training is provided at the school or board level.

In-service training should be voluntary. All planning needs to involve the teachers and address their needs. In-service sessions can be a useful vehicle to introduce teachers to new ideas and uses, to teach a few rudimentary technical troubleshooting skills and to allow teachers to explore new software.

Many of the skills required to make the best use of the NICT are not directly linked to technological expertise. In a teaching and learning setting, thinking skills, an understanding of the ethical questions associated with the retrieval of vast amounts of information, organizational and analytical abilities and a keen sense of communication are all human skills fundamental to the wise and effective integration of developing technologies. The school environment must become conducive to the development of these skills and attitudes.

School principals will play a key role in creating the right environment for the integration of the NICT. Without their active involvement and ongoing support as facilitators, it is unlikely that any meaningful change will take place. It is at the level of the school that the opportunities will be found to create time for teachers to share, be mentors, gain expertise, plan and innovate. Placing computers in staff rooms or workrooms, allowing teachers to take computers home and facilitating links throughout the school or with other schools are just some of the ways principals have supported teachers.

School boards that have been successful in integrating the NICT have developed policies in partnership with their schools, planned for the provision of special funding for the purchase of hardware and for in-service training and instituted a system of support for teachers. At one school board, for example, a technician is assigned to the computer lab and another to the administrative and secretarial services and a teacher expert is released to provide pedagogical support. Teachers need to have easy access to a resource person. Unless the right support people are in place, teachers will be reluctant to invest their time and effort on technology-based projects. Some boards have taken other initiatives to provide incentive and encouragement to teachers, such as negotiating special rates for teachers wishing to purchase computers for home use.

Recommendations – Teacher Time, In-service Training and Support

5. That the ministère de l'Éducation support the efforts of school boards to ensure that teachers have access to appropriate NICT.

6. That the ministère de l'Éducation support the efforts of school boards to ensure that teachers have access to appropriate pedagogical and technical expertise and support.

7. That the ministère de l'Éducation support local initiatives for professional improvement in relation to the integration of the NICT into the schools.

8. That the ministère de l'Éducation encourage local pedagogical initiatives that allow teachers the time to integrate the NICT into their teaching and student learning across the curriculum.

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Student Learning

The use of the NICT, as has previously been stated, is transforming the way students learn and teachers teach. It holds the promise of creating a better quality learning environment that empowers the learner. It provides opportunities for self-directed and independent learning while allowing teachers to accommodate individual learning needs, abilities and learning styles. Thus, students can work at their own pace with access to software or information sources that enhance their learning experience, whether they are seeking to increase their learning opportunities or to practise their skills.

The assimilation of the knowledge students are exposed to by the NICT is an ongoing process rather than an end in itself. The potential for the construction of knowledge is vastly enhanced by the multi-dimensional access to information.

"Recent advances in technology mean that almost all students can now access and use computers in personally meaningful ways that help them communicate and learn. The computer provides a student-centred learning environment that is truly empowering. It allows the student to exercise control and act purposefully to achieve a desired goal. Perhaps most important, learning with computers can be fun for students who have experienced excessive amounts of failure in conventional teaching situations. And computers provide a good context for celebrating students' learning achievements."
(cf. Ken Ryba, pp. 8285)

Learners in small schools and remote areas will have access to a wider menu of options and will be able to "beam in" the best teacher specialists and other experts who are available to share their expertise. The Small Schools Network has developed a telescience project that is designed to provide students in remote areas with access to a teacher specialist in Montréal. The project offers students an optional physics course at the Secondary V level with its accompanying resource material. It also gives them a chance to interact and collaborate with a peer group who share their academic interests.

The NICT, particularly multi-media computers, are increasingly being used to support the teaching of students with special needs. For each child, educational software can be selected to complement and reinforce the classroom objectives. These highly interactive software packages provide a stimulating, entertaining and engaging environment in which to learn. These talking machines have infinite patience. They are well suited to teaching and reinforcing simple cognitive and motor skills as well as more complex conceptual and social skills. For the English sector this technology is especially important. The integration of children with special needs into the regular stream, the scattered professional and material resources in the currently fragmented English sector, and the large number of small schools make the use and adaptation of this technology essential. The new technologies provide vital learning opportunities for these children through the expertise inherent in the educational software itself.

The NICT provide us with the opportunity to enrich the scope of human interaction. The use of the new technologies does not negate the importance of good communication between teacher and students. Students will have access to enormous quantities of information of good, bad and indifferent quality. They will be required not only to understand how the different technological tools work and how to use them productively in searching, collecting, organizing, processing and presenting information but also to develop a set of attitudes towards their use. Under the guidance of the teacher, students will need to learn to become critical users of information. They will need to learn when to discard what is irrelevant, inappropriate or false. They will need to develop an understanding of ethical issues, such as right to privacy, copying, licensing and intellectual property, in order to make informed and responsible decisions about the information to which they have access.

Many secondary and some elementary school students spend little time at the computer. There are no specific ministère de l'Éducation requirements at each level of schooling regarding computer use, though we know of at least one school board that is attempting to put these in place. In order to promote the use of new technologies schools must know what is expected of them. What skills and attitudes should be developed? When should they be acquired and how?

Then there is the problem of access. Parents have certainly expressed their concern in this area. Access to computers is not simply a question of computer-to-student ratios. All students should have access to flexible learning time and opportunities for cooperative learning based on a curriculum that promotes the computer as a significant tool for learning. Students who do not have access to computers at home are at a disadvantage, so efforts must be made to familiarize students with the new technologies in school time and by providing access to computers outside the classroom experience. English students in rural areas, however, may be further penalized, as busing schedules prevent after-school activities. Innovative solutions must be found to increase access to computers for students in this situation.

Boards have told us that obsolescence is not a problem: older model computers still have a valuable role to play and a range of computers with different "abilities" can equally well serve the different needs of the students. It is important that access be geared to the acquisition of computing "abilities" or "powers." The ministère de l'Éducation must bear more responsibility for keeping the technological capabilities of our schools up-to-date.

Recommendations — Student Learning

9. That the ministère de l'Éducation provide support to school boards to encourage ready access for students to appropriate NICT at every level of schooling.

10. That the ministère de l'Éducation adapt the curriculum requirements to integrate the use of the NICT into the process of learning, with particular emphasis on the development of the critical faculty for the appropriate selection and ethical use of information.

School Organization

As our schools move forward into the next millennium, they are discovering that the forces of change around them will no longer allow them to do business in the old way. Thus, the educational community is in the throes of generating a new set of core assumptions about how schools ought to be organized.

Obvious barriers such as the top-down, rigid, compartmentalized curriculum, low teacher autonomy, externally prescribed working conditions and reliance on quantitative measures of student progress are being questioned. If the integration of the NICT is seen as being instrumental in preparing our students for the future, then one of the responses of the ministère de l'Éducation must be to provide an appropriate environment in which students will learn to handle the complexities of the information age.

The school needs to have the latitude to take charge of its own change process. Minor changes, importing successful models from elsewhere, and top-down changes without meaningful bottom-up collegiality will not accomplish the required transformation. The wide disparity among the schools makes the imposition of a set model unworkable. There must, therefore, be room for schools to plan and organize according to their size, student body and resources. Each school needs to reconceptualize the ways in which it uses people, time, facilities and other resources. The goals of this reorganization must be student-centred: to provide students with equal and extended access to the NICT and to foster independent and collaborative work in an environment that accommodates a wide range of talents and abilities.

This cannot be done on a rigid timetable of set periods, as the current régime pédagogique appears to prescribe. Blocks of time must be available for the exploration of the integration of subject matter and for the encouragement of cooperative learning through collaboration on projects in which students demonstrate what they have learned by producing a text, a table, a multi-media presentation, a drawing or a piece of music. The possibilities for the enhancement of teaching and learning through the NICT are wide and growing. Using them to advantage requires that time be seen, not so much as a prescribed allocation to each subject matter, but as a space in which the learning of subject matter in all its forms takes place. Flexible timetabling, in other words, an innovative use of time, makes team teaching possible and encourages teachers to work together with students.

Structure is maintained by the teacher who acts as a guide to learning rather than simply as its transmittor. From the grouping of the desks in a classroom to the organization of patterns of learning, the teacher's role is pivotal in organizing a student-centred, learning-oriented environment.

Understandably, teachers have a desire to hold onto what works and many fear change. They are constrained by the present expectations of the curriculum, especially at the secondary level where the emphasis is often laid on getting students through examinations. Teacher initiatives to work with others across the curriculum or to explore the potential of the new technologies are inhibited by workload assignments. Teachers must be allowed to take ownership of the changes required by schools if the implementation of the NICT as teaching tools is to take place. They cannot do this without the time and space to participate in the planning of the school day. Their input is essential to any useful rethinking of school organization to incorporate the technological dimension of teaching and learning. Teachers' unions have a major role to play in the reorganization of English schools. The allocation of resources, the use of time by teachers to confer, innovate and integrate, the organization of student timetables and the use of facilities have to respond to the requirements of teaching and learning.

Schools that have successfully managed the introduction and development of teaching methods incorporating the NICT have all begun the process by familiarizing teachers and students with the technology. Only when computers have become part of the culture of the school are their multiple uses introduced into the curriculum of the school. By then, teachers are equipped with the skills, hardware and software to put technology to work.

If teachers are the key to the effective implementation of the NICT in classrooms, school principals are the key to opening up the schools to the technological revolution. Without their motivation and commitment, the conventional school will continue to be inhospitable to the new ways of teaching and learning.

Recommendations — School Organization

11. That ministère de l'Éducation policy promote the interdisciplinary and collaborative approaches that are emerging with the expanding use of the NICT.

12. That the ministère de l'Éducation, school boards and teachers' unions establish conditions for a more innovative and flexible use of teachers' time to better respond to the integration of the NICT.

13. That the ministère de l'Éducation encourage schools to develop the organizational structures that support the integration of the NICT.

Expanding the Network

An important part of the mandate of the Task Force on English Education was to examine the situation of the school with fewer than 200 students, as many English schools fall into this category. As the task force report stated at the time, "Many cannot offer a complete range of programs and services. [They] can therefore be seen as a problem or, conversely, as an opportunity to offer learning on a human scale and to use informal approaches." (cf. Task Force on English Education) It was recommended that an "English Small School Service" be established "to set up links among small schools across Québec and between small schools and larger schools with specialized expertise."

As already mentioned, its aim was to address the isolation factor and so the Small Schools Network was designed within the ministère de l'Éducation to promote exchanges among classes and teachers. Today, the network links 140 schools and 250 users, who can select from 25 projects which have been developed to date. Two CEMIS animators and a group of teachers and other professionals have played a key role in expanding this network through their particular expertise and support.

Out of these efforts to plug small schools into a wider teaching environment have come valuable learning experiences: both pedagogical and technical "how-to." The Small Schools Network's collaborative project, "The Newspaper Across the Province," for Elementary 6 students has provided a point of comparison for both teachers and students. Standards are raised as much by peer pressure as by practice. Teachers and students alike have learned a lot about what the technology can do for them. It has provided them with a reason to write, a new and wider audience and a different means of communication and publication.

A relatively new aspect of the technological revolution as it affects schools is the proliferation of world wide Web sites or Web pages. Hundreds of schools around the world are constructing individual sites to describe their schools and their achievements. As these sites multiply, they offer unlimited possibilities for electronic communication to thousands of users. Soon everyone will be able to build a Web site, as simplified construction programs become increasingly available. It is therefore an ideal time for the ministère de l'Éducation to provide the basic infrastructure for such sites making possible links to dozens of separate educational topics or specialities.

The potential of such a ministère de l'Éducation site is enormous. Small schools would be able to link up and access all sorts of curriculum materials. Examinations could be made available to students and teachers to download for practice. Special interest groups, such as outdoor educators, subject associations and so on, would be able to leave information and find answers to particular problems.

Recently, the Small Schools Network established a site on the World Wide Web known as the Small Schools Network Project Centre, which is dedicated to giving teachers information about and access to ongoing projects in the English schools in Québec and around the world. It will break the isolation of some schools and contribute to an ever-expanding virtual community. Not only will the development of the Web site be instrumental in shaping the way that teachers use Internet resources, it has the potential to expand into a much wider-based English Schools Network.

The development of this site is extremely important to the English sector as it could include all schools in a comprehensive network. It would be able to bring together various initiatives, to be used by the participants for a multitude of purposes: linking schools, accessing expertise, increasing availability of pedagogical material in both languages, widening access to information and so on. An eventual English Schools Network will be a dynamic system and a number of factors will be important to its growth. Coordinating this expanding network will be essential. It will require constant updating and management to keep up with new content and new developments. The suitability of the pedagogical material placed on the site will depend on critical judgment and professional expertise, and the CEMIS could play an important role in promoting and helping teachers to use and adapt the material. The availability of useful pedagogical material of good quality will be instrumental in bringing the schools on-line.

> ### Recommendation — Expanding the Network
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> 14. That an English Schools Network be supported by the ministère de l'Éducation with the necessary resources to ensure that it can offer and maintain on-line a wide menu of pedagogical, administrative and professional growth options for the English school system.

Appendices

Appendix A — Individuals consulted in the preparation of this report

Mr. Alain Breuleux (McGill University)

Mr. Sam Bruzzese (Elementary 6 Teacher, St. Veronica's School, and part-time computer consultant, Commission scolaire Baldwin-Cartier)

Mrs. Louise Dallaire-Klink (CEMIS Coordinator, GRICS)

Mr. Ken France (CEMIS Animator, Commission scolaire District of Bedford)

Ms. Deborah Gross (Small Schools Network Coordinator, Services à la communauté anglophone, MEQ)

Ms. Alice Jackman Renaud (Principal, MacLean Memorial School, Commission scolaire régionale Eastern Québec)

Ms. Ellie Klaus (Parent, St. Thomas More Elementary School, Commission des écoles catholiques de Verdun)

Mr. Stephen Lessard (Principal, École secondaire Royal George, Commission scolaire South Shore)

Mr. Dominic Martini (Director General, Commission scolaire Laurentian)

Ms. Rosemary Murphy (Parent, Pierrefonds Comprehensive High School, Commission scolaire Baldwin-Cartier)

Ms. Johanne Smith (Vice-President, English Affairs, FCPPQ)

Ms. Beverly Weber (CEMIS Animator, Commission scolaire régionale Eastern Québec)

Appendix B — List of people interviewed for a survey on the implementation of the NICT in the English schools of Québec

Mr. William Allen (Commission scolaire Western Quebec)

Mr. Pierre Bernier (Commission scolaire Jérôme-Le Royer)

Mr. Denis Boulanger (Commission scolaire Ste-Croix)

Mr. Sam Bruzzese (Commission scolaire Baldwin-Cartier)

Ms. Cheryl Douglas (Commission scolaire Laurenval)

Mr. Jerry Dunn (Montreal Catholic School Commission)

Mr. Maurice Galley (Commission scolaire Chomedey de Laval)

Mr. Laiq Hanafi (Commission scolaire Laurenval)

Mr. R. Johannsen (Commission scolaire de Lakeshore)

Mr. Rick Laverty (Commission scolaire protestante Châteauguay Valley)

Mr. Charley Levy (Commission des écoles protestantes du Grand Montréal)

Mr. David Maloney (Commission scolaire du Sault-Saint-Louis)

Mr. Dominic Martini (Commission scolaire Laurentian)

Mr. Thomas Matthews (Commission scolaire Eastern Townships)

Mr. Dennis McCollough (Commission scolaire District of Bedford)

Mr. Renzo Orsi (Commission scolaire Jérôme-Le Royer)

Mr. Stuart Richard (Commission scolaire Gaspésia-des Iles)

Mr. Tom Stenzel (Commission scolaire South Shore)

Ms. Beverly Weber (Commission scolaire régionale Eastern Québec)

Appendix C — Overcoming the Barriers

A sample of initiatives taken by school boards and schools

Teacher In-service Training and Support

A board arranged for teachers to buy computers at special discounted prices for educational institutions.

Computers have been put in teachers' workrooms to allow teachers to explore new pedagogical methodologies.

A board has a designated teachers' networking lab with eight outlets. The lab is also used for in-service training.

A board and the teachers' union have released one teacher resource person to assist with software and pedagogical support.

A board-wide training program was established for elementary school teachers in the use of the NICT. Secondary school teachers training focuses on an integrated approach to learning through computer technology. Courses in software applications, the Internet, etc., are also provided after school hours.

Teacher in-service training is determined annually and courses posted.

Each school provides for its in-service training needs and the board retains a portion of Professional Improvement Committee (PIC) funds to supplement special training initiatives.

Consultants assist teachers with subject-related issues connected to the use of information technology and provide in-service training as required.

Key people are identified in each school to promote the use of information technologies and assist colleagues, giving pedagogical support and software advice. A technician is available to address technical problems.

Teacher "champions" in each school help colleagues to become computer literate.

An information technology class was introduced in each school with two well-trained teachers providing in-school in-service training for colleagues.

A board evaluates pedagogical software and advises schools on its potential uses.

A board is involved with the McGill distance education program and some teachers are taking a certificate in educational technology at the Faculty of Education.

Partnerships

Partnerships have been established with local community groups and businesses to improve student access to computers (e.g. partnership with a regional paper company). Québec City's Citadel Charity provided $30 000 to help equip a computer lab in a Québec City high school.

A board is working in partnership with McGill, OISE and Apple to develop an integrated cooperative learning environment using computer technology.

In collaboration with Northern Telecom, a group of students is in regular contact with a group of students in a school in Britain. An engineer from Northern Telecom organizes the telecommunications link and once a month the two groups of students have a teleconference.

Through parent committees, Statistics Canada uses a board's schools in a pilot project to disseminate statistics and data to schools.

Computers have been received through the Bell project for schools: Bell revitalizes old computers and passes them on to schools.

Student Learning

All elementary school students acquire word processing skills.

Computer-literate students are paired with those who need assistance. Students also help teachers!

A board's policy is to provide equal educational opportunity for all students. Computer labs are made available to students outside of regular school hours.

A board is exploring the purchase of small word processors for student use at home.

In one school, all students follow a morning timetable which includes English, French, Math and Computers. Using the NICT to promote self-esteem for 45 at-risk students, the school produces its own newspapers and yearbook, and this year has introduced an Internet Web site which highlights the school's program.

A board requires parents and students to sign a permission slip outlining what the students may access on the Internet.

Providing the Means

A board-wide standardization of software purchasing has been established: Microsoft Word and Claris are used to complement the teaching of higher-order skills.

A technologies strategy committee (with board, school and external community representation) has been established to review hardware and software needs and teacher in-service training requirements with a planning sub-Committee (administrators and teachers) to develop a long-range plan for the acquisition of hardware and software and for future directions regarding the use of the NICT.

A telecommunications committee has been established to examine the question of access to electronic information. The committee will outline the implementation of an information technology system.

A board is exploring the leasing of computers to address the issue of obsolescence.

As a general rule, a board places computers in elementary classrooms and has computer labs in secondary schools.

A board is implementing a microwave system that will link up all schools.

A board has set up a system of matching grants; schools fundraise and the board matches the amount raised.

A board has implemented an automated library system.

A board has initiated a bulletin board service linking all schools.

Expanding the Network

Technical Vocational/Adult Education Services are networked with local agencies. Thus, the school board is up-to-date with work study and job placement opportunities.

Most schools in a board have e-mail.

All schools in a board are linked to the Internet.

A board has networked schools internally and one secondary school has an Internet lab through a local provider.

All elementary schools in a board are linked into the Small Schools Network.

A board will be used as a centre for access to the Internet.

Appendix D — New Technology at Maclean Memorial School

[Adapted from a presentation to the Advisory Board on English Education by Alice Jackman Renaud, Principal, MacLean Memorial School, Chibougamau, Tutor, physics class via distance education, 1995-96.]

Background information

Our school is in its third year of distance education with the assistance of the MEQ. We have gone from a unit of a few weeks to a year-long course. For the 1995-96 school year two students-girls, I might add-are taking Physics 534, using audio communications (a Polycom telephone), Smart 2000 software, cc:Mail and a fax machine. Their teacher is Jan Farrell, who teaches them from Beaconsfield High School.

We accepted to do the physics course by distance education this year as we know that our declining enrolment will mean that this way of offering senior sciences may *not* merely be an option in a few years. We would prefer to try it now when we do have a senior science teacher to help rather than wait until no one in our school knows where anything is or what anything is in the science lab! The girls do not turn to the science teacher for help in any way. We realize that in order for this year's course to be valid, we must "follow the guidelines."

The two girls, typical MacLean Memorial students, want to keep their options open for CEGEP. The new technologies certainly are opening up the world, especially to those of us who live way up north.

I accepted to fulfil the role of facilitator, and as principal, I welcomed the opportunity to live this experience along with the students.

The school had to accommodate this course by scheduling physics at the same time every day. We had decided to try some 75-minute periods this year. Our first and third periods are 75s and the rest are 50s. Physics is taught every day. Secondary V computer science and Secondary V home economics are scheduled opposite physics, so the two girls do not take these courses. They do sit in on some computer classes scheduled at other times but do not get credit for it.

Our routine

I try to check my cc:Mail at 8:30 each day as Jan often sends me lab set-up instructions and other information. At the beginning I told the girls that I was the facilitator for the class, and that the term implied that I had an easy job!!! Since then I have reclassified myself as a tutor and am relearning physics along with the girls. A person who is not a teacher could do this job; however, he or she would certainly have to have an interest in the class and be prepared to pay attention to what is going on.

The class meets every day from 10:52 until 12:07 - a 75-minute class. The students have recess before this class and usually go into the science lab early and check their cc:Mail. They are in audio contact with Jan from 10:52 until 11:27, and then she is off to teach her physics class in Beaconsfield.

During the time that they are in audio contact, Jan sends slides via Smart 2000. The girls work on these slides with her and sometimes send slides back to her. She and the students interact, doing what an on-site class would do, only they are doing it using technology, i.e. they review homework, look at labs done the previous day, ask and respond to questions, and prepare for what is to be done when Jan disconnects.

After Jan disconnects, the girls usually have a lab to do which I have organized for them. Most schools would have this class for 50 minutes every day. The extra time that the girls have allows them to print the slides they have worked on and send their homework and/or lab reports via cc:Mail or fax.

The students' reflections

One girl enjoys the independence of working through technology. The other girl still prefers having a teacher in the classroom. I think this is to be expected, especially since she is still learning the intricacies of the English language. We who are teachers know that facial expressions often reveal more than words. An encouraging pat on the head or a promise of after-school help keeps a student interested in a class. Jan has much enthusiasm and this comes through loud and clear over the phone. The girls have a good rapport with her and often joke with her. They have even requested that they be given a colour printer by the MEQ for this project! They say that their slides would be so much nicer! Just as students in class sometimes tune teachers out, these two girls have jokingly told Jan that they would "lock her out," which means that she wouldn't be able to access them through Smart 2000!

The girls are understanding what they are being taught. Jan has told them that their marks are comparable to her students' marks in Beaconsfield. Jan has sent slides that she has gotten off the Internet to us. As each day goes by, they are building bonds with her. She often asks, "What's up for the weekend?"

Where are we going?

Our school board, Eastern Québec Regional School Board, is looking into distance education. We have several small English schools with declining enrolments. We have talked about a Secondary IV or V level course being taught at Québec High and beamed out to the hinterlands.

We at MacLean like to say that we are risk takers! I tell the girls that this experience that they are living this year will help them to become more independent and better prepared for post-secondary education. They will have blazed a trail for students in the near future who want to take courses which are not offered at MacLean. I already know that I will have difficulty finding a teacher for Math 536 for the 1996-97 school year. Distance education may be the answer.

Appendix E — Extract from a speech given by Yves Archambault at the English Sector Back-To-School 1995-96 Welcome Meeting

The school of the 21st Century

Let's drop in on a few classes of this imaginary school of the future ...

We'll begin with a Grade 6 class. As we enter, the students are in the process of excavating a simulated archeological site. They are grouped in teams of three or four and their task is to examine the site, analyse the artefacts that they find, and then formulate and defend a thesis on the sociological characteristics of the people who lived in that society. Even though the experience is computer-generated, you can feel the anticipation and excitement of the students as they discover pieces of ivory or arrowheads. Their teacher circulates among the groups to provide assistance as needed.

Now, let's go on to a Secondary III class. The students are beginning the study of a classic literary work. They've read the text; now they're pursuing a more in-depth exploration with the help of a computer which is hooked up to important data bases. They are accessing illustrations and scenes

from films; they are also consulting bibliographical references. The teacher, who has been giving this course for a number of years, hesitated at first to introduce the computer into the classroom. Now she is astounded to see the ease with which her students use it to enhance their knowledge. She realizes that her role has changed; she feels that she is more like a guide, whose function is to help her students formulate questions and organize their ideas. Note that the form of student presentations varies-some may choose a written text, others may choose a multi-media format and still others a video. All of these techniques are good, provided they're well-adapted to the subject of the presentation.

Now, let's drop in on the school library. Its collection is computerized and it's hooked up to the public library. It also has a dozen micro-computers, videodisk players, a CD-ROM, video cameras and several printers. A few workstations are linked to the Internet.

In the music class, new technologies are used extensively: synthesizers, electronic keyboards, CD-ROMs, etc. Emphasis is placed on composition and execution.

In the art class, the students are creating a virtual reality museum. The project involves visiting a real exhibition, digitizing postcards and photos, writing texts and creating a hypercard stack. The "virtual" museum is then presented to students in another country through the Internet.

There are no computer labs in the school of the 21st Century. The computers are in the classroom. The number of computers varies: the older or more advanced students have more than the younger or less advanced students. Each classroom is also equipped with a CDROM player, a few printers, perhaps a videodisk player and an electronic projection panel.

In addition, every teacher has on his or her desk a small portable computer which is connected by e-Mail to the computers of other teachers in the school and also in her sector. Each teacher is also connected to the Internet. Students have access to the Internet through their teacher, who guides them in their research. Finally, every teacher has a telephone on the desk which permits them to communicate with parents on a regular basis by voice mail.

Let's conclude our visit. In the room next door, a teacher is using her free period to prepare her class. She turns on her computer and modem. She consults a variety of databases which provide information that she can download as she sees fit for her upcoming classes. She also consults the electronic bulletin board of her school commission and responds to a colleague's request for test items. Her answers are deposited instantaneously in her colleague's mail box.

Appendix F — Québec School Television

Last year teachers in some Québec schools tuned in to Québec School Television on Radio-Québec at one o'clock, and their classes:

- watched a first-ever live broadcast from the Antarctic;
- dialogued face-to-face with their American peers on live interactive television, discussing multiculturalism, youth issues, and Québec politics;
- called a toll-free 800 number to ask a marine biologist in California questions about sharks after watching a program on the subject;
- asked panelists questions (again via a toll-free 800 number) during a live television program exploring career possibilities for women in science fields;
- explored marine life on Barkley Sound on the west coast of Vancouver Island "live."

Appendix G — An Overview of River Oaks Public School

River Oaks is a Kindergarten to Grade 8 elementary school with 760 students located in Oakville, Ontario. The school, which opened in September 1990, is currently in its sixth year of operation. The vision for the school centers around the restructuring of curriculum to prepare students for the workplace of the 21st century. The restructured curriculum has as part of its focus the concept of information, with particular reference to acquiring knowledge, skills and behaviours related to accessing, managing, processing, and communicating information. Within this context, technology has become a natural, almost transparent tool in the student's day to help manage the large amounts of information available. Students in the school are considered "knowledge workers" or "information architects." More than 7000 visitors from around the world have toured the school to observe the restructured curriculum, students and teachers in action.

To help facilitate the preparation of students for the global workplace of tomorrow, River Oaks Public School created partnerships with several major corporations. The three major partnerships include the Halton Board of Education, Apple Canada Inc. and the Ontario Ministry of Education. As a major partner, Apple Canada agreed to help provide some technology to support the vision. River Oaks Public School is totally networked. The school has 250 Macintosh computer systems providing a ratio of one computer to approximately every four students. Forty of the computers reside on the desks of teachers to facilitate communication within and outside River Oaks. There is also a variety of related technology such as scanners, CD-ROM players, video-disk players, electronic keyboards, computerized sewing machines, telecommunications equipment, robotics equipment and other specialized tools. This was made possible by further partnerships with Northern Telecom, Sony of Canada, The River Oaks Group, Husqvarna, Roland Music Canada, and Claris.

The Ontario Ministry of Education's involvement at River Oaks has been to support ongoing research by the University of Toronto and York University. The research being conducted by the two universities is focused on observing, monitoring, and reporting the results and work of both students and staff within the school. This research should provide helpful data and further understanding of change and the best practices that may be used by other educational jurisdictions as they undertake significant change.

The restructured curriculum at River Oaks has focused on four key areas: Literacy, Life Skills, Arts and Creative Applications. This constitutes a shift to an integrated approach that reflects work in the real world. The four areas are taught to all students through three major strands of content. The three strands are Human Relationships, Science/Technology and Global Awareness. At least one third of the curriculum has a focus on science and technology. Each strand has a series of themes that have been developed from Kindergarten to grade 8. Each theme has an associated set of math and language skills. The integrated thematic approach allows students to learn within real-life contexts. In the Literacy component of the curriculum, students acquire basic skills in language and math, as well as media, technical, scientific, economic literacy and a host of others. Within the language and math component of Literacy, formal grammar, spelling, writing, basic operations, logic and probability, numerical analysis and other communication skills are taught. In the Life Skills component, students acquire acknowledge and skills related to conflict resolution, collaborative work teams, time management, project management, cooperative groups, goal setting, leadership and other areas.

The Arts component of the curriculum focuses on the development of various vehicles for communication such as music, visual arts, drama, physical education, family studies, design and technology and multi-media applications. The most unique component of the River Oaks curriculum is Creative Applications, which attempts to foster creativity, innovation, collaborative work and other skills by encouraging students to apply basic skills and knowledge acquired through Literacy, Life Skills and the Arts to self-directed inquiry. This approach is intended to promote practical application of learnings to real-life situations and helps develop the student as a lifelong learner. The self-directed inquiry (creative application) of a student or group is analogous to working on a project in the work world. Students learn such skills as time management, resource allocation, and development

of project evaluation checkpoints (quality control), while working cooperatively in a group, completing tasks, and using other personal management and teamwork skills. Throughout the learning process, technology is used as a tool to help access, manage, process and communicate information and to enable, engage and empower the students in their learning.

Restructuring education at River Oaks is a major initiative. In my opinion, we at River Oaks Public School have just scratched the surface of what we are capable of achieving in the coming years to prepare our students to be competitive in a global work force. We are indeed very fortunate to have the support of several corporations to help us move toward our vision. It is also very gratifying to see other schools throughout Ontario and abroad adopting some of our learnings and successes.

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