DOCUMENT RESUME

ED 371 724 IR 016 652

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TITLE Educational Technology and Educational Reform in Saskatchewan.
INSTITUTION Saskatchewan Univ., Saskatoon. Dept. of Curriculum Studies.
PUB DATE May 94
NOTE 108p.
PUB TYPE Collected Works - General (020) -- Information Analyses (070) -- Reports - Evaluative/Feasibility (142)

EDRS PRICE MF01/PC05 Plus Postage.
DESCRIPTORS Computer Mediated Communication; *Computer Uses in Education; Cooperation; *Distance Education; Economic Factors; *Educational Change; Educational Environment; Educational Media; Educational Objectives; *Educational Technology; Elementary Secondary Education; Foreign Countries; Innovation; Marketing; Partnerships in Education; Professional Development; School Business Relationship; Student Role; Teacher Improvement; Teacher Role; *Technological Advancement
IDENTIFIERS Canada; *Reform Efforts; *Saskatchewan

ABSTRACT

This document offers a view of educational change that has educational technology at the center of the process and underscores some of the contributions educational technology can make to reforming education in Saskatchewan (Canada). The province has an excellent teaching force and communities that value education highly, but there is a prevailing concern that they are "out-of-step" with society--approaches to teaching need to be drawn more into line with dramatic changes taking place in society. The following papers are included: (1) "Educational Technology and Educational Reform: Why Bother?" (Richard A. Schwier); (2) "Saskatchewan Educational Reform: The Roles of Teachers and Learners" (Peggy R. Proctor); (3) "School as Technology: Creating Environments to Teach All Students" (Patricia Cone); (4) "Educational Technology and Professional Development" (Todd W. Zazelenchuk); (5) "A Plan for Marketing Educational Technology" (Cole Kirby); (6) "The Economic Implications of Educational Change" (Victor Anton); (7) "Distance Education and Computer-Mediated Communication: Tools for Educational Reform" (Robert G. L. Longpre); and (8) "Industry/Education Collaboration: Opportunities and Approaches" (Robert O. Powell). Three figures illustrate the discussions. References follow each chapter. Includes five appendixes. (Author/SLD)

Educational Technology and Educational Reform in Saskatchewan

Educational Communications and Technology
Department of Curriculum Studies
University of Saskatchewan
May, 1994

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This document was prepared for the Minister of Education by graduate students in the Educational Technology program offered by the Department of Curriculum Studies at the University of Saskatchewan. The ideas, opinions and recommendations contained in this report are solely the authors' and do not necessarily reflect positions held by the Department of Curriculum Studies, College of Education or University of Saskatchewan.

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Chapter 1

Educational Technology and Educational Reform: Why Bother?

Richard A. Schwier

Abstract

This document offers a view of educational change which has educational technology at the centre of the process, and underscores some of the contributions educational technologies can make to reforming education in this province. This chapter sets out the context for the study, outlines some key definitions and extracts some key findings from research on educational technology and learning.

In this study, we look at educational technology, and the role it can play in reforming K-12 and post-secondary education, as well as other types of training in Saskatchewan. We are blessed in this province with an excellent professional teaching force, and further blessed with communities which value education. Still, something is wrong or lacking in our educational systems, most noticeably in our schools. There is a prevailing concern that we are somehow "out-of-step" with society—that we need to draw our approaches to teaching into line with the already dramatic changes we have witnessed in society.

Some symptoms of problems include common complaints heard from the public and from educators:

- inadequate content (the business community argues that we are teaching the wrong things to prepare students for the 21st century);
- approaches to teaching which haven't kept pace with technological change in society;
- leadership (no clear voice or consensus on how to address problems);
- inadequate response to the need for approaching learning as a life-long enterprise;
- falling national achievement scores;
- growing drop-out rates;
- a student population which is increasingly disenfranchised, losing interest in learning, and losing hope for the future;
- career paths are unstable, and a person will change jobs several times during a typical working lifetime;

- people with post-secondary and advanced degrees are increasingly found on the welfare roles; and
- training, and retraining are neither systematic nor equally accessible to those who need it.

Individuals may dispute some or all of these symptoms, but they are merely symptoms, not causes, of a larger problem with educational systems. The "structure" of the educational system is at the heart of these problems. Of what is the structure comprised?

One characteristic of our educational structure is grouped learning . Education happens in groups, and much of our time is devoted to deciding how groups of learners should be constructed. How many students can a teacher handle? Should students with challenging needs be integrated into the "regular" classroom? What is an appropriate teacher/student ratio? Will one group of students give a particular teacher too many classroom management problems? Should we "stream" classes?

A second prevailing characteristic is the component nature of the system. Our educational system, and indeed the way we have come to understand what education should be, is characterized by instructional components. Students are components to be moved through the system. Levels of schooling are broken into grade components. Subjects are divided into 10, 20 and 30 level components, with a selection of non-traditional versions between the regular classes. Movement from grade to grade is based on components of time for the most part, with minimum achievement criteria. Teachers also sometimes see themselves as components of a system rather than as professionals who *are* the system. At the secondary level, they are subject specialists. Students move from specialist to specialist, an assembly line metaphor in which components of education are attached to students at each station along the line. In Saskatchewan, the common essential learnings were introduced to address this very problem, and if fully embraced, they will be a move in the right direction. Integration of themes across the curriculum and a focus on critical thinking, the adaptive dimension and resource-based learning are all approaches which attack the component approach to education.

Another unfortunate perception of our educational system is its isolation from communities. Education is seen to happen in one place while life happens in another. Education is touted to "prepare students for life" and indeed it has made an honest attempt. But curricula are often criticized from several quarters for being irrelevant, and the criticism seems to be mounting as society undergoes change mc rapidly than schools. Community initiatives attempt to link the schools more closely with communities they serve, testament to the idea that there is an acknowledged gap to be br

There is a need to change the entire system; in fact, the entire system will change eventually and inevitably, even if nothing is done, to reflect a society which has moved from an industrial to an information base. As early as 1982, Naisbitt argued that an information society requires a different kind of person than an industrial society requires. To participate in an information society, an individual must be an analyzer, evaluator, problem solver, and a critical thinker. To be successful, the individual must also show initiative and take responsibility, demonstrate a life-long love of learning, and be able to adapt to change.

> *In the long run, would-be reformers may be doing more harm than good, if they transmit the message that state officials can legislate and regulate educational excellence without paying attention to the task of creating climates of excellence at the local level...I have concluded that our commitment to the lock-step, time-*

defined structures of education stands in the way of lasting progress. It is simply unrealistic to think that all students can learn from the same materials, to the same standards of performance, in the same amounts of time, taught by the same methods. (Cross, 1984, pp. 170-71 as cited in Reigeluth, 1988).

We propose the development of new environments for learning in the province. These environments require attention, investment and courage to create. While we are not suggesting that technology is an "answer" to the root causes of problems faced by our educational systems, we do suggest that any systematic and comprehensive approach to dealing with change in our educational systems will have educational technology at the heart of the approach.

What is educational technology? Educational technology "is a complex, integrated process involving people, procedures, ideas, devices and organization, for analyzing problems and devising, implementing, evaluating and managing solutions to those problems involved in all aspects of human learning" (Association for Educational Communications and Technology, 1977). This broad definition challenges the popular misconception that educational technology is machinery; we are labelled by our tools. In contrast, a process definition of educational technology emphasizes the integration of tools, strategies and people to solve educational problems. Information technologies form only one important part of how educational technologists address problems. The discussions which follow in this document speak to personal, community, organizational, administrative and "technological" concerns.

Guidelines Drawn from Research on Media and Resources

Many of the issues and recommendations addressed in this paper confront the need for resources and educational media to be used more effectively. A great deal is known and can be drawn from educational technology research about media and resources. One of the most important points to make is that the power of educational media exists in the quality, appropriate use and design of the material presented—not in the hardware. In and of themselves, computers or video are no more effective than printed media.

> *"The best current evidence is that media are mere vehicles that deliver instruction but do not influence student achievement any more than the truck that delivers our groceries causes changes in nutrition...Only the content of the vehicle can influence achievement."*
>
> Richard Clark (1983, p. 445)

The reasons for using media and resources for learning lie in the advantages they give learners and teachers when they are well designed, chosen for appropriate reasons and used skillfully. A few examples of principles selected from educational technology research follow to illustrate this point. These principles are by no means exhaustive, and the reader is directed to Thompson, Simonson and Hargrave (1992) for additional principles and elaboration of the points.

- Students can learn from all educational media; there is no best medium.

- Learners who are involved in the planning, production, or delivery of mediated instruction are likely to react favorably to the instructional activity and to the message delivered.
- Learners react favorably to mediated instruction that is realistic, relevant, and technically stimulating.
- Learners are persuaded, and react favorably, when mediated instruction includes the presentation of new information about a topic.
- Learners who participate in post-instructional discussions and critiques are likely to develop favorable attitudes toward delivery method and content.
- Persuasion is possible using mediated messages. Attitudinal outcomes can be produced as predictably as cognitive outcomes.
- Computers and technology can be used to help students learn new material in new ways.
- In general, teachers and schools are not yet integrating newer computer applications into the curriculum.
- Gender differences in computer use and attitude exist.
- Computers are increasingly being interfaced with other technologies to create learning environments for students; the computer should no longer stand alone as the technology for researchers.
- Hypermedia environments provide protential for creating meaningful, relevant learning environments for students.

The Scope of the Review

This document raises several questions and squarely addresses several important issues surrounding educational reform and the role of educational technology. It does not, of course, address every issue or attempt to provide absolute answers. We do, however, make several recommendations based on the literature and our own informed opinions. These are offered with the hope that they will stimulate discussion among those who can encourage and support actual change. Some of the recommendations overlap, and occasionally, writers disagree with each other and make conflicting recommendations. Rather than try to achieve consensus among the writers of the document, and in so doing compromise the richness of the debate, we decided to let the contradictions stand—as testament to important decisions which must be made.

In chapter two , Peggy Proctor describes recent provincial initiatives for educational reform, and discusses the changes educational technology makes on the role of the teacher. She also offers an alternative model for classroom education.

In chapter three, Patricia Cone discusses how schools *are* technologies, and also makes a plea for greater community and interagency involvement in the life of the school. Her vision of an adhocracy calls for the full and seamless integration of at-risk students, students with learning disabilities, regular students and community resources to create a new sense of community in schools.

Chapter four, by Todd Zazelenchuk, addresses one of the most pressing needs in successfully introducing educational technology in schools—the professional development of teachers. He describes approaches to be taken by pre-service teacher education programs and by in-service professional development programs to develop skilled, knowledgeable teachers who can use emerging technologies.

Cole Kirby, in chapter five, extends the argument to how schools can involve businesses in restructuring schools. Local collaborative projects are discussed, with an eye to how school systems can market their product effectively, promote public education and involve the business community. He also presents a model of how school administration can be restructured to include educational technologists.

So, how much will this cost? While there are no definitive answers, change is expensive, and Victor Anton addresses the actual and social costs of this type of educational reform in chapter six. He also presents recommendations concerning the reallignment of administration which stand in sharp contrast to Cole Kirby's recommendations.

In chapter seven, Robert Longpré addresses a more specific topic—distance education. He describes several approaches, including the advantages and shortcomings of each. Computer-mediated communication is then presented as a strategy to overcome the shortcomings of some of the other distance education technologies.

Finally, in chapter eight, Robert Powell takes the argument into the international arena. His chapter describes European models for collaborations between industry and education. With a particular focus on COMETT and its recommendations for educational technology, Powell presents a compelling argument for developing similar programs in Canada.

Throughout the document, the reader will find brief vignettes of educational technology in action which were uncovered by Wayne Udey. The reform we discuss in the various chapters is already underway around the globe, and these vignettes describe several fascinating applications of educational technology.

As a group, these chapters offer a unique perspective on educational reform. They present a vision of education which includes educational technology as part of the change process. We hope you find your reading of the document both thought provoking and challenging.

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Educational Technology In Action

Saturn School

Although there is a good deal of technology available at Saturn, it is not a technology driven school. It is a learner centered school that provides access to technology. There are five distinct ways that technology is used by Saturn students and teachers:

- tools for individualized learning
- tools for group interaction
- tools to manage and coordinate student learning
- tools for student expression
- tools for knowledge production

At Saturn we use technologies to create learning opportunities that meet the needs, abilities, and interests of each student. To achieve this, teachers must be prepared to embrace a wonderful variety of technologies as tools for individualized learning, group interaction, management of student learning, student expression, and knowledge production. Our teachers don't know everything there is to know about all of the technologies we have. They are willing to learn how to use these technologies with their students They aren't afraid of making mistakes, because they recognize that we are all learners in a unique learning environment.

"Technologies as Tools for Transforming Learning Environments"
Michael Hopkins

Computing Teacher, April, 1991

Chapter 2

Saskatchewan Educational Reform: The Roles of Teachers and Learners

Peggy R. Proctor

Abstract

This chapter presents a brief review of recent efforts to reform education in the province of Saskatchewan. Saskatchewan Education has taken an important first step in recognising the need for change. But actions taken by Saskatchewan Education to reform the content and delivery of instruction have had the effect of expanding the role of the teacher. Several other factors also conspire to force a change in the role of the teacher. Schools are systems, and as one part of a system changes so must other parts. As the role of the teacher changes so must the structure of schools. Technology has an important role to play in the process of restructuring schooling. The effects of educational technologies on both learners and teachers are examined and an alternative model for teaching is introduced.

The Path of Reform in Saskatchewan Education

In 1963, Saskatchewan Education published *A Plan for the Reorganization of Instruction in Saskatchewan Schools*. The concepts of individualized learning and continuous progress were highlighted in this policy (Saskatchewan Education, 1984). In 1978, *The Education Act* reaffirmed the policy and required teachers to plan instruction that accommodated individual differences. The thrust for educational reform in the province continued and in 1981 an advisory committee was formed, "for the purpose of assessing the adequacy of the K-12 programs in meeting the present and future needs of Saskatchewan students" (Saskatchewan Education, 1984, p.69). From this committee came *Directions: The Final Report* and a vision for education in Saskatchewan (Saskatchewan Education, 1984).

Directions: The Final Report charted a course for the future of education in the province which identified the changing needs of learners in the information age. The development and implementation of a core curriculum and the program of common essential learnings that followed it set in motion a process for reform in Saskatchewan schools. The report did not advocate radical change but rather elected to build educational reform on the foundation of

past successes (Saskatchewan Education, 1984). The report praised the work done by educators in the past but also pointed to gaps in the process.

The committee was told that students in the province lacked creative and critical thinking skills, independence, and the social skills and attitudes demanded by the work place. In short there was a perception in the province that our educational system was not providing learners with the skills necessary to function in modern society (Saskatchewan Education, 1984).

The report began with a statement of goals for education in this province. Inherent in these goal statements was an understanding of the need to prepare learners for life in a changing society. "There was consensus that basic skills in mathematics and language skills should continue to be essential components of education. However, the Committee saw the need to extend the concept of what is basic to include additional skills necessary for existence in a complex, pluralistic society" (Saskatchewan Education1984, p.25). These additional basics included preparation for life-long learning, career and consumer decision making and membership in society (Saskatchewan Education, 1984).

After having identified gaps in the educational process,the committee proposed a series of recommendations. The most significant recommendation from the perspective of the teacher was the adoption of a policy for the implementation of Core Curriculum. Concepts and skills were defined for each of the core subject areas which included language arts, mathematics, aesthetic education, physical education, science, and social studies. It was also recommended that policy guidelines be prepared for the development of alternative programs to serve the special and various needs of students in different parts of the province (Saskatchewan Education, 1984).

Following *Directions*, Saskatchewan Education published, *Toward the Year 2000: Future Directions in Curriculum and Instruction* (1985). In this report the need for curriculum reform was further stressed. "In the past, curriculum has been seen primarily as content (knowledge, facts, and information). In the future, what students learn in school must also include processes, skills, attitudes, and values" (p.14).

This change in curriculum, the report stated, will naturally lead to changes in instruction; "when the content of the curriculum changes, ways in which the curriculum is delivered must change correspondingly" (p.6). This in turn implied changes to the role teachers will play. "This means people in schools must also change - change their attitudes about the purpose of school and the role of the teacher, change the way they plan the school program, and change the way the school interacts with the home and the community."(p.26). A follow up report, *Instructional Approaches: A Framework for Professional Practice* suggested that instruction must change from being "teacher-directed and transmissional, to student-centred and transactional" (Saskatchewan Education,1991, p.iv).

The extent to which teachers should be involved in the change process was specified in, *School Improvement: Building a More Effective Learning Environment*. It suggested real change would occur when new teaching behaviours were used in classrooms. "Teachers are at the core of any improvement effort. They have the job of actually implementing the new program or practice and their actions determine whether improvements actually occur in working conditions and learner outcomes" (Saskatchewan Education, 1985, p.43). A large portion of the responsibility for the success of the *Directions* vision was placed squarely on the shoulders of the classroom teacher.

Problems with the implementation of Core Curriculum soon developed and were documented in the 1992 report, *Into the Classroom: A Review of Directions in Practice* . "As it is now unfolding, the implementation process is seen by many teachers as not only stressful, but also incoherent and fragmented" (Saskatchewan Education, 1992, p.1). This report delineated weaknesses in the system and a need to redefine the vision. "Teachers and schools reported that the process has been 'too much, too fast', without the time and resources needed to handle the changes. As a result, teachers feel overwhelmed by the expectations being placed on them and frustrated that the benefits of the new curricula for students are not being fully realised"(Saskatchewan Education, 1992, p.18). In some cases, teachers were asked to implement more than one new curriculum in a school year and often before the resources needed to support the implementation were in place.

Difficulties with the a..o tion of instructional technologies were also noted. "The use of technology to achieve ' ucational goals has not been well developed throughout Saskatchewan schools. Technological advances since *Directions*, and the need for all students tc acquire 't nological literacy', point to a greater emphasis on the use of technology as an instructional tool"(Saskatchewan Education, 1992, p.14).

Re-defining the Role of the Teacher

The teacher's role in Saskatchewan schools is defined in instructional terms in the document, *Instructional Approaches: A Framework for Professional Practice.*

Teachers begin the instructional cycle by assessing individual student's learning needs, interests, and strengths through observation and consultation with the student. They then determine the instructional approaches required, deliver instruction in a manner appropriate to the student's learning abilities and styles, and evaluate student growth and understanding. The cycle concludes with teacher self-reflection and further teacher-student consultation (Saskatchewan Education, 1991, p.3).

This definition encompasses a wide array of teacher behaviours both before and after actual classroom instruction. It requires that teachers provide both enrichment and remediation in order to individualize instruction and meet the diverse needs students.

However, there is more to teaching than instruction. A report published by the Saskatchewan Teachers' Federation (STF) suggests in fact that non-instructional behaviours are equally important to teaching success. "The study's emphasis on these non-instructional behaviours gives credence to teachers' claims that they suffer from an acute shortage of time. When would teachers find the time to attend to the wide range of activities outside the classroom that the study indicates are linked to successful teaching?" (Saskatchewan Teachers' Federation, 1989, p.133).

The STF's *Study of Teaching* proposes that the range of successful teaching behaviours identified is next to impossible for a single teacher to possess. The study identified a "remarkable variety" of successful teaching behaviours across the province. "Some show organizational skills, others communication skills, and still others conceptual and planning skills. It is highly unlikely, however, that an individual teacher will be equally skilled in all the many areas of teaching endeavour indicated by the study"(STF, 1989, p.132). These findings gave rise to some important questions:

- What happens to teachers whose skills and knowledge do not match the needs of particular students or situations?
- What are the chances of being able to match teachers to diverse needs, particularly in smaller schools?
- Are schools set up to recognise the likelihood of mismatches or are teachers and students in these situations simply left to experience unsuccessful teaching? (STF, 1989, p.132)

These statements by Saskatchewan Education and the STF indicate the complexity of the teacher's role. This role changes very little for the individual teacher from the day they enter the profession to the day they retire (Buching & Rowls, 1987). Teachers may become discouraged or jaded working in a job description that offers little room for advancement or stimulus for improvement. The result is the loss of many talented teachers to positions of administration or to other fields. What is needed is a new path to increased recognition and status so that talented teachers will no longer have to stop teaching and change jobs to attain it (Hodas, 1993).

In effect, the role of the teacher has been stretched to the breaking point. There are several factors which have contributed to this stress. As indicated in *Directions*, changes in the ways we live outside of our schools have increasingly put pressure on teachers to change the way they teach (Saskatchewan Education, 1984).

For example, schools are expected to keep up with technological advances. "Computer-based technology has been brought into schools during the past decade largely because the technology was seen as important in and of itself - because it was an increasingly central component of the world of adult work" (Campoy, 1992, p.18).

Teachers are told that what and how they teach must be responsive to changes in society. "The need for a new paradigm in education is based on massive changes in both the conditions and educational needs of the emerging information society" (Reigeluth & Garfinkle, 1992, p.17). Teachers are told to teach higher order thinking skills, and to provide challenging goals for learners. "Students must be able to understand what they read, not just recite rules and definitions: they must be able to locate, retrieve, and interpret information, not merely memorize a set of facts; they must be able to identify and solve problems, not simply fill out worksheets; and they must be able to work collaboratively, as well as alone (David, 1991, p.39).

At the same time schools are being asked to save our environmentally and socially distressed society. "We are bombarded by pressure groups. Whatever ills there are in society, it seems to be the school's job to cure them"(Brown, 1990, p.19). An increasingly divergent population means that students come to school with a wide array of needs and as Goodlad notes, "it is the teacher who is to be held accountable for remedying deficiencies" (1976, p.154). Johnson (cited in Saskatchewan Education, 1991) states, "Students entering the education system present may challenges to the teacher. Differences in language proficiency, family constructs, cultural backgrounds, economic circumstances, and experiential background are but a few of the diversities for which adaptations must be made. The reality is that diversity has become the norm among the students in the classrooms of today"(p.4). In response to this diversity teachers are being told to present content using a wide range of instructional methods and to provide a greater variety of learning experiences (Saskatchewan Education, 1984).

Teachers themselves are demanding change. The fulcrum of a dispute between Saskatoon public school teachers and their school board, which occurred during December of 1994, was the frustration felt by teachers who felt they had little say in how their roles were defined. The

teachers in Saskatoon were involved in a job action over issues directly related to the role of the teacher, the allocation of preparation time and the definition of extra-curricular duties. Teachers are reacting to the pressures of an expanding role. The pressures affecting collective bargaining issues are the same as those prompting school reform (Shedd, 1988).

Little has been done to significantly change the role of the teacher or to take advantage of technologies which could reduce the work load of the individual teacher. "Teachers work at a furious pace and spend an inordinate amount of time on technical matters, on clerking, on record keeping, on dispensing materials, leaving them precious little time for reflection" (Bullough & Goldstein, 1984, p.356).

Brown (1990) indicated that too many demands are being placed on classroom teachers, "to expect them to locate resources, acquire them, organize them, independently learn how to use them effectively as an integral part of their classroom work, to expect them to do all this in addition to meeting their classroom responsibilities is to expect too much" (p.27). Yet these are the expectations that are currently being placed on teachers in Saskatchewan as they strive to implement new core curriculum and to integrate the common essential learnings into daily lessons. As more and more is added to school curriculum the job of teaching is becoming increasingly difficult, and too much is expected of teachers (Brown, 1990).

Technology, Learners and Teachers

Educational technologies will revolutionize the learner's world and will change the student—teacher relationship. Communication technologies, such as computer networks and CD-ROM, will give learners access to an increasingly diverse and abundant amount of information. Learners will conduct real research. Electronic libraries will provide access to vast amounts of current information never before available (Solomon, 1992).

Technologies will also provide the tools; data base search programs, spreadsheets, and graphing software to help learners manage this information (Bruder, 1992). Learners will be more actively involved with content. "Computer-based simulations will be excellent tools for modelling the real-world, authentic tasks, and for maximizing active involvement and construction of learning"(Reigeluth & Garfinkle, 1992, p.21). Learners can then express their learning in their own electronic presentations. Students can also find real audiences for their writing through telecommunications (Solomon, 1992).

Technology will make true individualization possible as students are given more control over their own learning. Computer assisted learning could provide practice and feedback and the opportunity to make mistakes in a risk free environment (Butzin, 1992). It will allow learners to work at their own pace and address individual weaknesses (Bruder, 1992).

The use of computers will allow students to take more responsibility for their own learning. "Technology can transform instruction from a situation in which teachers deliver information to passive students to one in which students discover learning for themselves"(Solomon, 1992, p. 327). Technology will give learners increased freedom to explore individual interests. Computers allow different students to learn different things within a cooperative social structure (Collins, 1991).

One of the Common Essential Learnings identified by Saskatchewan Education is technological literacy. "A technologically literate person is someone who critically examines and questions technological progress and innovation"(Saskatchewan Education, 1988, p.36). Saskatchewan Education (1988) recognizes that technology is never neutral and that is it important for learners to understand "who makes decisions about particular technological innovations and from what bias these decisions are made" (p.37). Nichols (1991) advises that a truly technologically literate person is one who questions the ultimate purposes of the technology.

There has been a push in our society to place computer technologies in our schools to provide a quick fix to our problems (Campoy, 1992) and in reaction to "social imperatives" for the use of 'state of the art' technology (Nichols, 1991, p.127). This has been done with little consideration for the impact of computers on school culture or for the necessity of educating learners to the values implicit in computer use. This is an example of adopting technology for the wrong reasons and has often resulted in the misuse or underuse of computers in schools (Callister & Dunne, 1992).

It is the role of the teacher to help learners understand that the mediated reality presented by technologies emphasizes "the separation between mind and the rest of existence" (Nichols, 1991, p.130). They must come to understand that technology has the power to "create a world view" which is quite different from the world of direct experience (Nichols, 1991, p.123). Learners must be taught that technologies are tools, that their use should be critically examined and should not replace real life experiences. There is a real danger of creating an even more sedentary society lacking in face to face, personal contact (Nichols, 1991).

Learners must also be taught the importance of inquiry in interpreting information. Teachers must develop learners with questioning minds who are not satisfied with the mere "acquistion of fixed principles"(Murphy & Pardeck, 1991, p.395). At the same time they must be taught to recognize the importance of multiple world views. "That is, interpretation presupposes the existence of a variety of interpretations, a community of interpreters, the need to recognize all interpretations, since none by definition is absolute"(Murphy & Pardeck, 1991, p.393). By this standard, when considering telecommunications in education, for example, care must be taken to ensure that learners are involved interactively in discussion.

Technology will become an increasingly powerful force in the lives of learners. It has the power to place learners in control of their own learning and to promote active learning. As technology transforms the lives of learners so will it transform the roles of teachers.

Clark (as cited in Campoy, 1991) cautions that media are "mere vehicles that deliver instruction"(p.18). Crozier (1993) warns that we must not "confuse information with understanding"(p.17) while Surgenor (1992) suggests that "information needs to be converted to knowledge before it is useful"(p.101). These statements imply that simply placing a learner in front of a computer will not ensure that learning is taking place. Instructional planning, the thoughtful manipulation of objectives, materials and content, will continue to be a critical ingredient needed to promote learning. In other words, at some point in the instructional process the intervention of a teacher will continue to be necessary in order to ensure that knowledge is constructed from information. Teachers will decide "what is worth knowing, and why, what learning is appropriate and for whom" (Callister & Dunne, 1992, p.326).

What technology makes possible is a redefinition of the teacher's role. Two fundamental reasons why the teacher's role must change have already been mentioned: to relieve the stress

placed on teachers, and to promote the kinds of learning that will be necessary in the information age.

In one sense, teaching will not change. It will remain "intensely personal" and will continue to require near "continuous communication with others"(Reicken, 1990, p.58). In fact the importance of these skills will increase as teachers move from being dispensers of information to facilitators of learning. In education, the position of coach has most often been associated with athletics and brings to mind close, collaborative, personal relationships. The coach motivates and places the learner at the centre of the instruction. Teacher's should draw upon the skill sets of good coaches as they work more closely with learners to help them develop appropriate instructional goals and coordinate their efforts to achieve those goals (Reigeluth & Garfinkle, 1992).

Teachers will need to develop new skills appropriate to their new roles. Teachers will require the technical competence to access information, and the ability to manage an electronic learning environment (Surgenor, 1992). They should be able to personalize databases for instructional purposes (Surgenor, 1992) and able to develop instructional software which supports curricular goals (Kenny, 1992). Technology can provide the resources for students to use "as they construct their personal knowledge bases" while the teacher becomes an "organizer of problems for students to study, discuss, and solve"(Campoy, 1992, p.21).

In summary, the role of the teacher will be to actively involve learners in constructing a personally relevant and useful knowledge base while also guiding learners in the development of the higher order thinking skills essential for success in the new age. This is the promise that technology holds for teaching and learning in the future. The question remains what can be done to bring today's teaching into the future?

Changing the Structure of Schools

David (1991) notes that in schools today, "the presence of technology complicates teachers' jobs enormously. They are learning not only how to use the technology but also how to teach differently. how to relate in new ways to their students, and how to assume new roles as learners, researchers,and equipment technicians"(p.79). Increasing demands are being placed on teachers as they work within a structure reminiscent of the industrial age. Teachers are being told to change their teaching behaviours while functioning within a school system which constrains change with rigid time schedules, prescribed class sizes, graded classrooms and limited resources.

Clearly the role of the teacher must change but this can not occur without a concomitant change in schools themselves. "Changing schools means, then, not merely changing the teachers, principals, and superintendents who run them, difficult as this is. It means, also, changing the institutional arrangements which, in large measure, determine the 'school' behaviour of all these persons, individually and collectively" (Goodlad, 1976, p.168). Teachers can not be expected to significantly change their teaching practices without some form of support, training and freedom from restraint. But as Barth (1991) indicates, school personnel are stuck in the dilemma of maintaining an already overloaded system while trying to introduce a new one. (also see chapter by Zazelenchuk)

Goodlad (1976) describes two essential factors that foster change. "It would appear that, for change to occur, there must be some combination of internal responsiveness and external stimulation. For change to prevail as an ongoing characteristic condition, there must be some continuing productive state of tension between these two essential sets of forces"(p.174). Saskatchewan Education has provided the "external stimulation" for change through the development of educational goals to be administered in the province. Egnatoff (1992) states, "Whatever goals, policies, and directives may be set for teachers, what counts in the final analysis is what teachers actually do"(p.198). In Saskatchewan the "goals, policies and directives" have been written; what is needed now is a structure that can provide teachers with the time and freedom needed to acquire new skills. In order for teachers to maintain "internal responsiveness" the pressures described here must lead to a significant reduction of the expectations placed on them.

Avenues for Change

Goodlad (1976) has written that "change is not just a matter of tacking on something new. If a change is significant - and computers hold the potentiality for significant change - then it will affect the entire organism"(p.218). As we enter the information age it will become increasingly difficult for a single generalist teacher, working in an isolated classroom, to meet all the needs of a group of students (Butzin, 1992). Schools must come to be seen as communities of learners, a subset of the larger community and not as institutions separated from the community. We must recognize changes occurring in the information age community and design schools which are integrated with that community (Surgenor, 1992).

Teams of professionals working together with students in clusters, phases, or teams over a longer period of time, 3-5 years, should replace the teacher-per-class-per-grade concept (David, 1991; Goodlad, 1976; Reigeluth & Garfinkle, 1992). Within these teams educators should have diversified roles, "from counseling, to coordinating a team, to preparing materials, to preparing a televised lesson."(Goodlad, 1976, p.267). Entrants into the teaching profession should begin their training in schools. "And clearly, there will be a different kind of teaching staff; a core of highly prepared professionals and a whole array of others, some who do not plan on a teaching career, others moving up to fully professional status" (Goodlad, 1976, p.268). There will be a career ladder through which a developing teacher will move so that the "passage from the status of college student to school teacher is accompanied throughout by responsible involvement and financial recognition"(Goodlad, 1976, p.199). Extensive changes to the role of teacher will be needed to accomplish real school reform (Buching & Rowls, 1987).

A Model for Change

How then shall the increasing demands being placed on teachers and schools be resolved? If the skills needed by teachers are more than one person can command then the time has come for more than one person to do the job. A diversified model for teaching is offered here as one possible solution.

The model is built around a team of professional educators, consisting of a master teacher, specialist teachers, and associate teachers, which would form the nuclei for working groups in the school. Each working group would be comprised of a variety of individuals who would have

differing but reciprocal responsibilities for a specific group of students (See figure 1). The following discussion briefly describes the roles played by members of a working group.

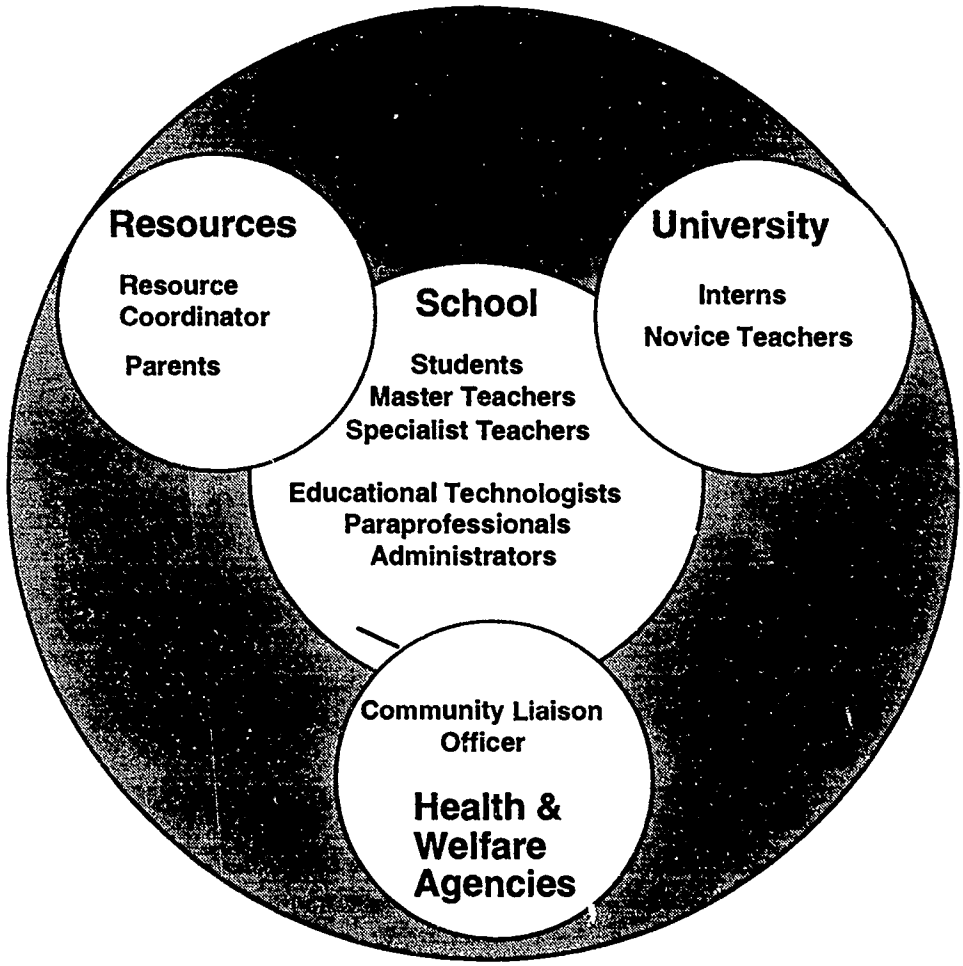

Figure 1. Diversified roles in teaching

The master teacher would be in a position of leadership. Selection of master teachers would be based on teaching success, post graduate professional education, and leadership qualities. Master teachers, well versed in theory and practice, would provide guidance for the working group as they set out to construct a learning environment. Master teachers would exhibit the kinds of expertise described by Surgenor (1992), "The teacher's unique expertise exists in applying professional knowledge about how learning takes place, in creating meaningful learning environments, and in modelling how to be a lifelong learner"(p.47). The master teacher would have input into matters of administration, but would remain closely tied to a selected group of teachers and students within the school. The primary function of the master teacher would be as a facilitator of learning for all members of the working group.

There may be several master teachers, each responsible to a different working group of students and teachers within a single school. Students within the group would not necessarily be divided according to age or grade but would be grouped according to their learning goals and developmental stage. Learners would remain in the group for three or four years.

Specialist teachers would be responsible for certain strands of the curriculum. They would teach in areas for which they held expertise. These would be the teachers who would work most directly with most students applying appropriate instructional strategies, providing access to appropriate resources, providing feedback and evaluation to students regarding their progress, and helping students to develop appropriate learning goals. These teachers would be equally engaged with the content and the context of learning.

An educational technologist would work in the school. Branch (cited in Kenny, 1992) defines instructional technology as, "a discipline concerned with the systematic design, development, evaluation and management of instruction and instructional materials"(p.97). While not primarily involved with teaching students, the technologist would work closely with teachers in planning instruction. It would be the responsibility of the technologist to ensure that effective use was made of communication technologies and resources in the school. The educational technologist would assist teachers to select hardware and resources which supported their curricular goals and would suggest strategies for the use of these technologies. It would be the responsibility of the educational technologist to assure the use of technologies based on contextual need rather than on the inclination to adopt technologies due to external pressures (Nichols, 1991).

Parents would be directly involved in the education and schooling of their children. The master teacher, with reference to curricular guidelines provided by the provincial department of education, would help parents set learning goals for their young children.

A community liaison officer would work in the school to ensure that all the social and physical needs of the learners were being met. The community liaison officer would be accountable to both the community and the school, and would work directly with parents and children who were experiencing learning difficulties. With the assistance of other members of the working group, students at risk would be identified and actions taken by the appropriate community agency to assist those students.

Pre-service teachers would immediately become members of a working group. In addition to university course requirements, first hand, practical experience under the guidance of all members of the working group, would enhance their preparation for teaching. They would be given the opportunity to learn the many practical skills required of teachers in a collaborative setting rather than then in an isolated classroom as a beginning teacher. The diversity of roles within the working group would provide these students with a choice of career paths. The amount of responsibility placed on the student teachers would be prescribed by the teacher education institutions with input from education professionals in the school. As they progressed in their studies they would spend an increasing proportion of their time in the school.

There would be several paraprofessionals in the working group whose role it would be to work with identified students or groups of students to ensure that their specified needs were met. Their duties would be prescribed by teachers. They would also be responsible for the supervision of learners during activities in the school not related to instruction.

A resource coordinator would identify resources in the community which would be useful to the school and facilitate their use.

The administrator for the school would be concerned with the operation and maintenance of the school facility. They would not be educational leaders but would most likely come from a business management background.

Conclusion

The contemporary role of the teacher continues to expand, and it has become too large for one teacher to deal with successfully. Diversifying teaching roles reduces the amount of stress on individual teachers allowing them to perform their duties more effectively.

The adoption of this model for teaching would alleviate several of the difficulties currently faced by teachers and learners in our province. The model is designed to deal with the diverse needs of learners. Saskatchewan Education (1991) describes the adaptive dimension of teaching as "those practices the teacher undertakes to make curriculum, instruction, and the learning environment meaningful and appropriate for each student"(p.31). The achievement of this goal would be more likely when close working relationships are developed between students and teachers in working groups. Technology would be a tool used to customise the environment to suit the needs of every learner.

With the elimination of graded classrooms, continual progress would become a the focus of achievement. Learning would occur more holistically without the limitation of having to complete a prescribed amount of work in a ten month period.

One of the recommendations in *Directions* calls for improved support services to students at the local level (Saskatchewan Education, 1984). "The school presently finds itself in the role of coordinator, and sometimes provider, of those services. Assuming this prohibitive task places undue pressure on classroom teachers"(p.40). This model draws the community into the school. Responsibility for the health and well-being of the child is given back to the community agencies designed for those purposes. (see also chapter 3 by Cone)

Under this model parents are directly involved in their child's education. As Surgenor (1992) suggests, "The responsibility for poor behaviour and negative attitudes must be given back to the parent"(p.24). Support would be available from the community when it was required. Discipline problems would not go untended and teachers would be respected for their role as knowledge builders.

And the teacher would become a facilitator of learning, a coach and a mentor. The many skills required of teachers could be practised in a supportive and collaborative atmosphere. Teachers would find satisfaction in a role which offered increased likelihood of success and opportunity for advancement. It is somewhat ironic that changes inspired by the application of technology, with its scientific roots, could ultimately lead to the refinement of teaching as a constructive craft.

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Educational Technology In Action

In Beverly (Massachusetts) High School, students are learning journalism, geography, and meteorology along with teamwork skills as they produce two television programs for their local cable system.

A cooperative program of the school's English, social studies, and media departments, the daily and weekly television shows feature school bulletins and a local weather segment.

Educational Technology in Action

One week before the start of the school year, a physics teacher at an Ohio high school quit. Faced with no on-site replacement teacher and no time or money to find one, the school turned to TH-IN Network Inc. a private satellite network, for physics instruction.

The services offered by TH-IN includes some elementary courses, non credit courses, and 20 high school credit courses in math, science, foreign languages, art history, sociology, psychology, literature, marine science, and more.

The certified teachers are located in TH-IN studio in San Antonio, instructing in front of a camera that beams their images via satellite into receiving classrooms around the country. Students in the class see the teacher on a television monitor at the front of the room. In that room is a facilitator, who helps the class run smoothly.

Once the students are seated the facilitator turns on the computer in the cabinet and selects the course on the screen. The course teacher, transmitted live from KET's (Kentucky Educational Television) studio in Lexington, then appears on the 25 inch screen in front of the students.

The facilitator distributes the wireless, interactive keypads ... to each of the students. The keypad has a small screen on it , and the students use the keypad to punch in their identity numbers, which go via modem directly to KET's home class in Lexington. During the class, the "beamed in" teacher on the screen asks multiple choice or yes-no questions, the students answer on the keypad, and their answers are immediately processed and sent to the teacher who sees a graph of all the answers. There may be up to 700 students interacting with this teacher, who conducts this course in front of a camera.

Chapter 3

School as Technology: Creating Environments to Teach All Students

Patricia Cone

Abstract

Schools are technologies. To better serve at-risk students, schools need to shift from bureaucratic structures creating standardized educational products to flexible organizations or adhocracies operating to solve educational problems for all students. Common threads in all programs for at-risk students include individualized instruction and small group interactions. Schools must work in unison with other community organizations. They must provide relevant education including life skills, vocational training, and apprenticeships. Educational technologists have a role in designing methods for interagency collaboration and media for instructional purposes.

There is nothing that makes educators call into question all the basic premises about schooling faster than asking them to accommodate "special needs" children. How do we make them fit in—or do we? What do or don't we teach them? Must they be labeled? If so, what shall we call them? What are the standards by which we evaluate their learning and our programming? During all of this dithering and deliberation, do we sometimes get the nagging feeling that it is the system, or societal expectations, that have made these students "exceptional" merely by identifying them?

This section will discuss interchangeably two groups of "special needs" that are not mutually exclusive, the "exceptional" and the "at-risk" learner. The exceptional learner is usually considered to have a label describing some kind of disability that affects his/her learning: intellectual, physical, behavioural, or emotional. Many of these terms come from a medical perspective focusing directly on a child's problems and behaviours. It is assumed that disabilities are something someone has (Maag & Howell, 1992). The term at-risk includes any factors that inhibit learning or schooling. The "at-risk" student is one who is in danger of dropping out of schooi or is in danger of failing to complete his/her education with an adequate level of skills. (Poirot & Canales, 1994). Duttweiler (1992) asserts that most definitions of "at-risk" ignore the relationship between the school and the student, and so give no suggestions of fundamental changes which could be made to the school system itself.

According to studies reviewed by Vacha and McLaughlin (1993), "social class is one of the most important correlates of school failure and dropping out" (p. 8). At present, schools are most effective at educating those with "cultural capital":

- parental understanding of the school system;
- parental involvement in school and learning;
- familial and student involvement in "high culture" such as art, music, drama and literature;
- little family mobility.

These authors suggest ways educators can help low socioeconomic class students get cultural capital, including a reexamination of curriculum and pedagogical practices. However, most teachers, as well as professional and business people, are recruited from that group of students who liked school and excelled academically. (Woodward, 1992a). They have little idea why students do poorly in school because they have difficulty imagining how instruction is perceived by these students (Floden, 1991). Hodas (1993) argues that schools themselves are a technology designed to transmit information and authority. Their purpose is to indoctrinate particular values and practices by acting like machines creating a standardized product If the inputs, students, "fit" the machine, they will be successful; otherwise it will spit them out as rejects or failures.

Unlike twenty to thirty years ago, when a student could leave school honourably and find employment without a grade twelve education, Canadians are now appalled at the high numbers of school dropouts. Yet, educational institutions and the communities they serve expect that a select small number of students will graduate with high averages. Competition for academic awards, scholarships, and entrance to post-secondary institutions is expected and lauded. According to Hodas (1993) there are two relevant conflicting goals of education:

- Teachers want to make sure that children learn;
- Schools must act as a medium to filter out and reward those whose abilities and talents are of most use in preserving the culture and promoting the progress of society.

Traditionally, schools have assumed that people are not equal in talents, and some talents are more valuable than others.

Before any progress can be made towards educational reform, communities must be clear about what they want from their school systems. The values and practices of communities influence educational institutions and so determine their effectiveness. If they want to retain a competitive system, where some get "A's", and so earn the right to higher education, prestigious employment and social power, then they must accept there will be some who get "F's" and fail out of the system. If, however, they want a system which adequately meets the needs of all children to become productive, functional citizens, then they must redefine their purposes for education. They also have to accept new methods of evaluating educational progress as standards and practices will vary depending on student needs. Whatever its decision, a community must accept responsibility for the education of all its children (Burello, 1992).

Educational technology is more than just technology, hardware and systems. Because schools are a technology in themselves, any school reform must consider all aspects of how a school functions:

- the structure of the building;
- time allocations;
- power structures;

- definitions of success and mastery;
- instructional techniques;
- student instructional groupings;
- school and community culture;
- interpersonal relationships among the staff, students, and administration;
- organizational rules and standards;
- expected educational "outputs." (Maag & Howell, 1992).

Reform must also include a clear idea of what is the "job description" of the school. If it includes increased use of technology such as computers, CD-ROMs, videodiscs, modems and networks, then the existing cultures of schools must also change (Woodward, 1992a). If reform includes making the school a more equitable place for all students, then the structure of the school must be overhauled and operate from a different frame of reference (Maag & Howell, 1992). According to Thomas Skrtic (Thousand. 1990), educational institutions are now bureaucracies whose purpose is to produce a standardized product. Educators educated in bureaucracies are trained to think deductively, and so resort to general theory developing curriculum and instruction to serve the needs of diverse clientele. As a result, neither educators nor their institutions can innovate to accommodate individualized instruction. Skrtic defines a "handicapped" student as one who cannot learn from the standardized practices of the school.

In order to allow for individualized instruction and true innovation, Skrtic advocates "adhocracy" as a method of organizing schools. An adhocracy is a collaborative, rather than hierarchical structure. In it, teachers on an ad hoc basis use inductive problem solving to create personalized instruction. An adhocracy coordinates the work of professionals working in multidisciplinary teams. (see also chapter 2, P. Proctor). Through a process of "mutual adjustment" of skills and knowledge, they create unique programs. In practice, this kind of instruction must be continually invented to meet the real needs of students.

Adhocracies have "no handicapped students, just students with needs to be met" (Thousand, 1990, p. 33). Excellence, defined in bureaucratic terms as increased st_ _lardization, becomes reinterpreted as less standardization using more teacher discretion in meeting student needs. In an adhocratic structure, curriculum developers, educators, educational technologists, and even students could work creatively and collaboratively to design instruction and instructional settings that work to the greatest good for the most learners.

Technology can help the at-risk student. It can be best used when the technology of school is changed from a bureaucracy to an adhocracy. The education of all students is made possible through this structure with the community taking an active role in educating and taking care of its young people. School and community services must be linked and work in unison to meet the social, emotional, health and educational needs of children. Education must be made more relevant for students by the inclusion of more vocational training at a younger age. Educators must create school cultures that meet the needs of both staff and students. Technology hardware and software has been and continues to be developed to create better educational and vocational opportunities. Used correctly and conscientiously, educational technology can help make education equitable for all students.

School Reform for "At Risk" Students Using Technology

As stakeholders in the education of its children and future citizens, all members of a community must accept responsibility for education. Yet, a recent editorial in the *Saskatchewan Bulletin*, ("40-percent factor", 1993) states that teachers do not receive enough public support. It quotes from *Globe and Mail* columnist Michael Valpy who estimates at least four out of every ten students have some kind of problem affecting their learning.

> *Schools, in every community and to an unprecedented degree are being expected to cope with physically and emotionally unhealthy children, neglected children, children whose parents lack the time and energy to be with them, substance-abusing children, children with minimal social skills, children from a vast range and variety of bruised, stressed and fragile families.* ("40-Percent Factor", 1993, p. 4).

This description covers many, but not all, at-risk students. *The Bulletin* states that teachers cannot continue to support these students without:

- more public understanding of the demands placed upon educators;
- more time to meet with parents and other professionals;
- adequate paraprofessional help.

Clearly, educational technology has a role to play in designing media such as television spots and documentaries, information videos for parent and community organizations, newspaper ads, and interactive software.

It is difficult to know where education begins and ends (Burello, 1992). There must be a social service component in schools which provides adequate support for all students (Banks, 1994; Burello,1992). In 1984, *Directions: The Final Report* proposed that there be interagency coordination, yet according to *Into the Classroom: A Review of Directions in Practice*,

> *"...little progress seems to have been made in this direction... Different approaches for delivering the array of services to children, approaches that reflect specific needs of individual communities need to be explored"* (Directions *Review Sub-committee, 1992, p. 13).*

This report questions whether schools can function both as educational institutions and as effective means of social support.

Technology can provide ways of coordinating the services provided by educational institutions with those of various agencies such as social services, mental health, public health, various employment services, and the justice system (Burello, 1992). For example, one innovative approach to using technology to facilitate interagency collaboration was recently developed at the University of Saskatchewan (Haines, Sanche & Robertson, 1993). Their system, called "AIMS Co-Planner," is Macintosh-based software which can be used by resource teachers to support collaborative instructional planning among teams of educators. Several key issues arise:

- interagency collaboration;

- interagency communication or "meta-communication;"
- policy development;
- common assessment and referral procedures;
- evaluation;
- means of easy communication and information dissemination.

How will all these services work together? The responsibilities of each must be determined, but all will give up some control of programs and services. A method of confidentiality and security procedures must be devised (B, Shad, personal communication, January 24, 1994)[1]. Also, a common "language" must be used among different professional services. Each profession has its own "jargon". Even if the technical words used are the same, they may have very different meanings (Solomon, 1988). For example, the term "individualization" may mean something quite different to a teacher whose frame of reference is group instruction than it would for a social worker accustomed to focusing on a single client at a time. Cloud (1993) also cautions that in order to develop real communication with families and involve them meaningfully in meeting the needs of their children, their cultural situations must be considered. Educational technologists could develop a "meta-communication system" by first determining the common ideas of all professionals and community members, and then devising common definitions and terms (Cunningham, 1984). They could then design instructional systems using text and multimedia in order to educate and train various groups so that they could communicate clearly with one another when functioning collaboratively.

All parties must agree on the services needed for each student. Collaboration includes deciding on consistent policies (Burello, 1990). A common assessment process must be used for all clients to become eligible for services. If there is a "meta-communication system" and collaborative policies, technologists can develop a referral system used by all agencies that would be cost-effective and efficient.

Around the world, computer networking is putting people in contact with one another. According to Hill and Anthony (1991), "wide-area, computer-based networking is one powerful and practical means for improving communications and information sharing" (p. 99) They elaborate:

> *"... a singular challenge for special educators and the educational community as a whole ... is ready, timely access to practical information: who's doing what, with what results; what works and what doesn't; current and emerging problems and issues; policy and program perspectives and practices; methods and techniques; in the home, the school, the school system, the general community" (p. 99).*

In Alberta, the Alberta Special Education Network or ASPEN, is intended to provide ready access to parents, teachers, administrators, as well as child and health services professionals. Its plans for the future include adding other organizations including regional health units, and family and social service agencies (Hill & Anthony, 1991). ASPEN's counterpart, the SEINeS network, part of Saskatchewan Education, Training, and Employment, is already in place in Saskatchewan. Like ASPEN, it is designed to be easy to use and inexpensive to access. It has incorporated the means for private correspondence between its users, and is organized

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[1] Robert Shad , Saskatchewan Education Training and Employment.

into conferences according to topics of interest. Eventually, its developers want curriculum documents and guides on line for easy access to educators. This already is potentially capable of linking up several agencies, including schools, but faces several obstacles. Most schools are not networked yet, and only six major centres have direct-access dialing. Few people are trained in its use. Long-term training, coaching and field support is necessary for successful implementation of this project (Bob Shad, personal communication, January 24, 1994).

At-risk students are often transient. It is important that educators have access to records and information about students who transfer into schools. This allows for a smoother transition because the school would have an immediate access to information for determining placement and instruction. It also reduces the need to test students to determine skill levels. Testing is time consuming, expensive, and stressful for the student.

Home and School organizations can and do hold workshops for parents on instructional strategies and parenting skills in order to increase positive parental involvement in schools. Last year, parents at Mount Royal Collegiate participated in workshops on mathematics and response to literature (Wilson, 1993, November). Recently, the Nutana Home and School in Saskatoon watched Dr. Joe Freedman's video, *Failing Grades* a critique of the Canadian education system (Carol Bassingthwaighte, personal communication, February 16, 1994)[2]. Getting parents involved in their children's education not only creates "cultural capital" for parents and students (Vacha & McLaughlin, 1993), but also networks community support for education and the welfare of children. Saskatchewan Education, Training and Employment, the Saskatchewan Teachers Federation and boards of education should be supporting these efforts. Again, educational technology has a critical role to play in designing instructional media to assist parent groups.

School Designs and Instructional Techniques Applicable to the Greatest Diversity of Students

In their review of the *Directions* report, the sub-committee stated,

> *"Successful schools are characterized by a shared vision which is reflected in a commitment to fundamental principles and clear school goals by teachers, students, and administrators alike. Accepted norms of behaviour are widely understood, and there is high involvement in joint planning."* (Directions Review Sub-Committee, 1992, p. 9)

Considering the school as technology, educational technologists collaborating with educators articulate and help construct a school culture, an "adhocracy" to meets the needs of staff and students (Skrtic, 1991). This concept sounds radical and unattainable, yet Skrtic cites the American National Aeronautics and Space Administration organizational structure during its Apollo phase during the 1960's as one successful example. In this kind of organization, the

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[2] Carol Bassingthwaighte, President, Nutana Home and School, 1993-94.

distance between teachers and administrators would be lessened as everyone is an equal partner in solving educational problems.

Manning (1993) lists seven essential components of effective programs for students with special needs:

- Comprehensive approaches that address more than one at-risk condition are used.
- There is a recognition of the relationship between self-concept and overall school achievement and so there is an emphasis on improving them.
- Educators have high expectations of all students, regardless of their condition.
- These schools teach social skills students will need for successful social interaction. Problem solving and not fault finding is the major focus.
- Teachers and learners are given opportunities to agree on expectations, methods, and materials.
- The school consults parents and families when determining educational goals and the means for attaining them.
- There is a focus on the link between motivation and success. Considerable responsibility is placed upon students for their own learning.

The National Dropout Prevention Centre at Clemson University in South Carolina, U.S.A. claims the most successful programs start as early as possible, preferably during early childhood. (Duttweiler, 1992). "Remediating learning deficits after they are already well-established is extremely difficult" (Madden, Slavin, Karweit, Dolan, &Wasik, 1991, p. 594). In addition to early intervention, good programs include parental assistance and involvement. Effective learning environment characteristics include:

- participatory decision making;
- school-based management;
- alternative forms of schooling;
- flexible scheduling;
- year-round schooling;
- non-graded clusters instead of age-graded classes;
- adjustment of instruction by attention to developmental levels and learning styles;
- appropriate use of technology;
- increased professional development for educators;
- collaboration with businesses and the community.

Alternative instructional measures include: early concentrated assistance with reading, individualized instruction, academic summer programs, mentoring, tutoring, and career counseling (Duttweiler, 1992). Again, quoting the *Directions* Sub-Committee (1992),

> *"Curriculum in (successful) schools is planned to meet school goals as well as the needs of individual students, and there is a school-wide commitment to instructional improvement. Instruction has a student focus and student learning is facilitated*

through adjustments to curriculum, instruction, and the learning environment. There are clear instructional goals and high expectations." (p. 9).

Two common threads in all successful programs for students with special needs are individualized instruction and small group interactions (Poirot & Canales, 1994). Italy has the most complete integration of special needs students; 90 per cent of disabled children are in regular classrooms with 80 to 95 per cent of moderately to severely disabled integrated. The key to this seems to be that class sizes are reduced to twenty students when a child with special needs is added. Teachers are also assigned paraprofessional support (Murray-Seegert, 1992). The idea of varying class sizes in order to create the most optimal learning environment for all students is one that should be considered in redesigning the technology of the school.

Co-teaching is a collaborative instructional approach used to effectively teach at-risk learners (Friend, Reising, & Cook, 1993). A regular class teacher works with a special education teacher or other professional, sharing responsibility for planning, delivering, and evaluating learning experiences. Instruction usually takes place in a classroom setting. Rationale for using co-teaching is:

- to provide students with more diverse yet individualized learning experiences;
- to allow teachers to not only complement each others' expertise, but also to provide a professional support system.

This teaching strategy is most often used when there is a cluster of special needs students in one class.

Educators and educational technologists who develop and design instruction for them must be aware that many learners do not have the proficiency in the English language expected of all students. Instruction must accommodate language characteristics including language use patterns, language preferences, language proficiency and the primary language used by significant others (Cloud, 1993). Reading and writing performance is linked to language development. Instruction must take into account the language proficiency of the learner and also consider his/her exposure to literacy (Cloud, 1993). Some concepts, such as precise quantitative measures used in mathematics and science, are culturally specific and may not exist in some languages and dialects (Crawford, 1990). Crawford (1990) states that some teachers erroneously confuse language competence with conceptual development. A way to avoid this is to structure the social context of the classroom so that various groups of students are encouraged to talk about how their cultures or social groups perceive qualitative aspects of concepts and contexts. Through such dialogue, teachers become aware of, and students gain access to different cultural information. (Cloud, 1993; Crawford, 1990). Oral language and cognitive development is enhanced for all.

Cooperative learning is an instructional strategy that works well with all students. Structured groups collaboratively research and solve relevant problems (Duttweiler, 1992; O'Neil, 1993; Ward, 1992). Computer-assisted instruction, judiciously employed, has been a successful technique for teaching all students (Crawford, 1990; Duttweiler, 1992; Gross, 1990; O'Neil, 1993). Cooperative learning using computer-assisted instruction is a method that will include the most students of varying abilities. They can investigate information data bases on CD-ROMs and computer networks in order to research relevant, real-world problems. They can organize and report their findings using word processing, desk top publishing and database programs. They can use computers to learn and practice skills at their own ability levels. Feedback is immediate and non-judgemental. Integrated software programs using video and

sound are motivating and promote greater student learning. Students are more likely to understand and retain information if images, sounds, and symbols are attached to words (Poirot & Canales, 1994). Well-designed software in science and mathematics "provides students with a common experience of dynamic visual representations of abstract concepts and the relationship between them" (Crawford, K., 1990, p. 4). Students from diverse cultures and social situations may view the computer as socially neutral where they may be intimidated by the culture and class of the teacher (Crawford, 1990). In-school computer networks allow computers to be placed in classrooms rather than centralized labs (Duttweiler, 1992). Computer assisted instruction also allows for flexible secondary and post-secondary study (Gross, 1990). Using a flexible classroom structure with group learning and individualized instruction is a way to allow for the most diverse student population to be educated in one classroom. According to Duttweiler (1992), "Instructional technologies allow students to learn without being publicly labeled slow or stupid."(p. 8).

Because multimedia knowledge is a restructuring of knowledge, new literacy skills will be needed (D'Ignazio, 1991). Visual knowledge, visual communication, image, auditory communication, music, dramatic speech, and body language must be part of the curriculum. D'Ignazio argues that technology planning cannot just be left to computer teachers and technologists; fine arts, dance, drama, library and physical education professionals must be involved in cross-disciplinary curriculum teams. Students also need to be trained in creative classroom presentation, design techniques, knowledge architecture, and effective non-verbal communication.

Vocational Training

Education is meaningful to many students only to the extent that it prepares them for life outside and beyond the school (Whitworth, 1993). Habitually, most educators consider vocational education something to occupy at-risk and low-ability students so that schools may get on with the important business of academics. According to Spectrum Vocational Testing Limited (1993),

> *"Separation of academic and practical learning has removed the relevance and interest of schooling for many students, and contributes to Canada's 30 per cent drop out rate"* (p 14).

Much of the employment being created is in the service industry . Many of these jobs pay low wages and frequently lay off their employees (Cloud, 1993, Woodward, 1992c). Those with better pay demand higher skills and more education. School reform for special needs students must include restructuring the curriculum using technology to provide instruction for preparing students for more demanding occupations, or their economic future will be bleak. (Woodward, 1992c) Successful integration of special needs students into the world of work creates a pressure and a need for community supports of work and living contexts (Murray-Seegert, 1992). Instruction must include functional life skills and apprenticeships (Howell, 1992).

One of the most important roles the community can play in the education of students is facilitating the transition from school life to independence and paid employment. Yet, disabled, culturally different and low socioeconomic status students are most likely to be

under- or never- employed (Crawford, 1992, Woodward, 1992c). The degree of disability is not necessarily related to the likelihood of being employed (Cloud, 1993); for example, people in wheelchairs are employed while able-bodied people with intellectual disabilities are not. Crawford (1992) claims:

> *"Because the duty to accommodate has not been framed as a broad, social responsibility, employers are often successful in their claims of 'undue hardship' to avoid having to make workplace accommodations for people with disabilities"* (p.3).

When faced with hiring a person with special needs, employers are concerned about accommodation costs, safety issues, sick time, personal interaction problems, and objections from employees and customers (Johnson, 1992). Johnson (1992) suggests that it is time to get business and agencies involved with people with special needs in a non-confrontational setting and in a joint attempt to solve problems. Social service agencies may have different agendas than do employers; therefore, it may be necessary to create new organizations to bridge the gap between social service and the work place. The techniques developed to facilitate interagency collaboration with the school may be utilized to establish such an organization.

In schools, educators have to determine what knowledge students need and what skills they must acquire to be successful in the adult world and then incorporate this into school programs (Whitworth, 1993). The use of technology is creating greater employment opportunities for some people with special needs. Instruction in its use should begin in school. Banks (1994) has described a career cluster vocational model that could be used with the greatest number of students. A career cluster is defined as "a broad base of related knowledge that is separated into occupational majors" (p. 18), and provides a wide knowledge base about many types of work. Occupations are classified as professional, technical, and apprenticeship. Students of varying abilities and talents are accommodated within the same cluster. As preparation for a labour market constantly in flux, they learn the skills applicable to a multiplicity of jobs . They also learn a variety of academic skills directly related to the cluster and this often provides motivation to learn advanced academic content. Schools offering career clusters offer joint secondary/post-secondary programs. To operate successfully, they need:

- adequate numbers of guidance and vocational counselors
- a curriculum to teach applied academics and applied technology
- open door policies for older students
- libraries connected with universities, industries, and government data banks to provide current research and information about new technologies.

Prior (1993) quotes survey results showing that eighty per cent of employers felt that a shortage of skilled workers is a limitation to their success. However only 4.3 per cent of parents want their children to pursue apprenticeships and trades while over eighty per cent want college or university. Not only must the school system change, parents must also readjust their expectations to create support for vocational and career education.

Some people could argue that the job of the K-12 school system is not to prepare students for direct employment. However, in Sweden, which has an economy with nearly full employment, and a comprehensive vocational education program starting in the third grade, there is nearly

full literacy, a low school dropout rate, little drug abuse, and low youth unemployment (Campbell & Richardson, 1990).

> *"In the absence of linkages to the working world, education becomes abstract and flirts with irrelevance. Unable to make a connection between what they are being taught, and the world around them, many students 'tune out' at an early age"* (Campbell & Richardson, 1990, p. 14).

Educational Technology and People with Special Needs

Technology has been used for many years to help people who are disadvantaged and/or who have disabilities. It continues to do so. However, technology in and of itself is not useful unless it is used well. A computer can be used creatively as a focal point for cooperative instruction, or it can become an electronic baby-sitter playing endless drill and practice games with a student positioned at the back of the room. The structure and functioning of schools and the attitudes of parents, educators and community members, collectively determine the utility of technology as a means of instruction.

The computer is the most ubiquitous piece of technology used in business and education. In schools, it can be used as an instructional tool for both group and individual activities, and can help adapt instruction for a variety of students. Computers can remain in classrooms through a network system in the school connected to a central file server (Hill, 1993) or to a more wide area network such as Internet. .

Some students have difficulty perceiving written text correctly. Word processors and desk top publishing programs allow the user or the educator to vary the font, size, style, and spacing of text. Individual formats can be saved as templates and style sheets. Printed text can be entered into the computer using a good quality scanner and appropriate software, for example, Omni Page by Career Corporation (Stuebent & Vockell, 1993). Publishers who are notified in writing why student need scanned text are most often amenable to granting permission. Stuebent and Vockwell (1993) assert that it is reasonable to expect publishers to provide a computerized version of almost anything a student can read.

For students with reading difficulties, computerized audiotext and voice synthesizers can help. With computerized audiotext, a cursor blinks and highlights words as a computerized voice reads it. This is also a useful tool to develop language skills for students with language processing difficulties (Stuebent & Vockell, 1993). A voice synthesizer can "read back" what a student has written with a word processor (Stuebent & Vockell, 1993). DECtalk manufactured by Digital Equipment Corporation .s an example of a speech synthesizer which converts text to speech (O'Neal, 1992).

Technology exists for a teacher or student to be connected to a computer by a microphone. His/her speech is converted to text which can be printed. The Touch Talker (Prentke Romich Company) is a communication device which attaches directly into a computer (O'Neal, 1992).

Devices continue to be developed which make it easier for people with physical disabilities to use computers. The Touch Window (Edmark Corporation) is a transparent screen which fits

over a computer screen allowing a student to bypass the keyboard by touching the screen. The Unicorn Expanded Keyboard and Intellikeys (Unicorn Engineering Inc.) are examples of alternative keyboards, and the Kensington Turbo Mouse (Kensington Microware) helps students compensate for fine motor difficulties (O'Neal, 1992).

Instructional materials that can be used by special needs students can be difficult to find, expensive to buy, and incredibly time consuming to make. Woodward (1992b) asserts that much print material used with mildly handicapped students uses difficult vocabulary and is of questionable quality.

> *"In texts where there are many complex ideas, or where scores of concepts are explained in a cursory manner, naive or mildly handicapped students have a difficult time comprehending the material."* (Woodward, 1992b, p. 6)

More publishers are creating data bases from which educators and educational institutions can create their own custom texts and learning materials. Adobe Acrobat is an example of software that will allow users to sent and receive electronic documents. It can also read, annotate, and print documents allowing schools and other organizations to create custom texts. Permission and royalties are handled by the custom publisher (Bruder, 1993).

Saskatchewan Education, Training and Employment needs to explore the idea of creating data bases and computerized texts of information not available from large publishing houses for general availability to Saskatchewan schools. More prepared curriculum and instructional materials need to be made available for teachers trying to adapt instruction within their classrooms. As well, the Saskatchewan Government Correspondence School, if it is to meet its mandate of serving the needs of all students, needs to provide alternate education courses (e.g., high school courses numbered 11, 21, 31, or 18, 28, 38). This would not only provide education for at-risk students in settings where distance education is needed. It would also provide teachers with instructional assistance in course preparation the way that regular correspondence courses do now (Minister's Advisory Committee on K-12 Distance Education, 1992).

This discussion is but a brief overview of the kinds of technological options available to help special needs students. It is important to know that these tools exist. However, they are useless if educators are unaware of how to operate them and how to integrate them into the day-to-day operations of their classrooms. According to Burello (1992) "staff training in the use of evolving technologies is more important than the investment made in the technology itself" (p. 10).

Conclusions

Presently, communities have given the education system a conflicting mandate. On the one hand, schools are expected to create a "standard student product" with a basic minimum level of skills, and to "sort" and "classify" students for prospective employers and entrance into post-secondary educational institutions. On the other hand, schools are asked to provide education for all. The public expects every student to graduate by adjusting programs to suit individual needs. These are contradictory purposes. The community for which the school exists needs to come to grips with what it wants from its educational system. It needs also to accept

responsibility for its role in educating its young people and making a place for them when they leave the school system.

Educational technology extends beyond technology, hardware, and systems. Schools are a technology in and of themselves. If this technology is redesigned with the cooperation of educators, administrators, parents and community members to try to meet the most needs of the most students, hardware and software can be valuable tools in accomplishing this task.

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Educational Technology In Action

The Los Angeles Unified School District uses instructional television to offer "Homework Hotline" which runs on a local public broadcasting station for students who need tutoring at home. In Massachusetts, a cooperative international project called KITES uses satellites to connect three local schools with a fourth in West Germany; the curriculum focus is environmental science.

Educational Technology In Action

The First "Hyperschool"

Cincinnati Day School (K-12; enrollment 750)

Students at Cincinnati Day School now use hypermedia in history, English and music classes in all grade levels. Why?

A history teacher who was looking for a way to teach geography along with history. She had never used a computer, but within 30 days, she was using HyperCard in her classes – not only to serve up information to the students, but to challenge them to create their own hypermedia documents.

"We saw HyperCard as a way to get kids more involved, interested and responsible for what they are learning. But what we didn't know, what we discovered, is that HyperCard is a way of making connections between things. That's really what history is all about."

Now Hoffmiester says, an English teacher is using hypermedia to teach works that are difficult for some students, such as Joseph Conrad's *Heart of Darkness*. Teams of students create hypertext versions of the work, with explanations of literary and historical allusions "buttoned out" in connected documents.

Chapter 4

Educational Technology and Professional Development

Todd W. Zazelenchuk

Abstract

Successful reform of the educational system depends on many things, but two of the most important are the effective application of educational technology and the corresponding need for the improved professional development of teachers. Currently, both university teacher education and school inservice programs are failing to provide teachers with adequate training in educational technology. Research has provided us with several recommendations for improving the situation, yet they remain implemented sporadically, at best. Until a clear direction is established and consistently followed, effective change will remain elusive.

Educational reform requires two things, a vehicle and a direction. If one accepts that educational technology is a promising vehicle for the task, then a bottom-up approach through more effective teacher training represents the direction we should follow. For educational technology to succeed, a genuine shift from the teacher as provider of information to the teacher as guide or manager of learning is necessary. There is also the need for teachers to be trained in the basic strategies that accompany a technological approach. We can hardly expect teachers to serve as change agents in the reform process unless they are equipped with the skills and understanding to do so. Unfortunately for reformers, the road toward effective teacher training is anything but smooth. In this chapter, the various roadblocks will be examined and suggestions will be presented for overcoming them.

Professional Development Versus Staff Development

"Almost a decade since the introduction of the microcomputer into the school, teacher training continues to be one of the most critical components of the success of any educational technology program" (Sturdivant, 1989, p. 31). Teacher training, also referred to as professional or staff development are terms often used interchangeably in educational circles.

When proposing educational reform through educational technology, however, one finds that staff development lacks the range and character of its *professional* counterpart. "Staff development has come to connote training, education, and consultation provided to practicing teachers in the interest of improving their teaching and/or career development" (Shrock & Byrd, 1987, p. 45). Professional development, on the other hand, represents the umbrella that encompasses staff development along with the preservice training that teachers undergo during their university experience. The significance of this difference toward the implementation of educational technology cannot be overstressed. "Teacher education programs, unlike inservice programs, have the ability to reach future educators" (Bitter & Yohe, 1989, p. 22). Gooler (1989) further emphasizes this point by stating that "continuing professional education is key to the long term development of a teachers' ability to use technologies, but the initial mindsets and *comfort level* of the new teacher are formed during the undergraduate experience" (p. 20). This is not to say that teacher inservice programs are not important. On the contrary, given that the majority of teachers who will occupy positions over the next few decades are already employed, staff training holds a great deal of importance. With respect to implementing educational technology, the key is striking a balance between the training emphasis devoted to practicing teachers and that devoted to their future colleagues.

Professional Development and Educational Technology... So What's the Problem?

The problems which currently exist with professional development are widespread, traditional in nature, and for the most part, well-recognized by administration, teachers, and university students. For the purpose of this article, these problems have been examined with respect to the two main components of professional development: university teacher education programs and school inservice efforts. In some cases, the problems are being addressed and improvement is gradually following; in most cases, they are simply being ignored in favor of tradition and a reluctance to change. One thing is certain: for educational technology to be implemented and reach its full potential, the nature of professional development must change significantly (Valdez, 1989).

University Teacher Education Programs

Upon examining teacher training programs, one finds a variety of conditions that make educational reform through educational technology a difficult process. University education programs have an opportunity to equip teachers with the necessary training in educational technology prior to initiating their careers. Unfortunately, this opportunity is being neglected, and teachers who are unprepared in the planning and delivery processes associated with educational technology quickly regress to teaching the way they were taught (Steffin & Sleep, 1988).

There are numerous reasons for the lack of educational technology training in university environments, but a few stand out above the rest. The first is the lack of modeling by faculty instructors (Kerr, 1989; La Follette, 1992). For preservice teachers to make a genuine transfer of

the knowledge they receive throughout their university experience, they need to observe the theories and methods in practice. Nowhere does this apply more than in the area of educational technology. Opportunities to model educational technology include such things as a systematic approach to planning instruction, the effective use of different media and materials, and the implementation of a variety of mediated learning strategies. Unfortunately, education faculty often feel uncomfortable in implementing such measures because they themselves lack formal training in these areas. The result is that the training in educational technology is typically left for a select few instructors to dealwith when common sense suggests that such skills and methods should be part of the natural teaching repertoire of all instructors in an educational faculty.

A related problem seems to be the lack of awareness on the part of many faculties that such modeling is not occurring. In one study, the readiness cited by student teachers to teach with computers was only half that of the perceived readiness by their instructors on faculty (Marker & Ehman, 1989). This discrepancy suggests that faculty instructors might do well to reexamine their efforts at implementing and modeling educational technology.

A second reason for the lack of development of educational technology skills is the indecision surrounding the question of whether technology should be presented as content or as instructional tools (Gooler, 1989). While some instructors feel the priority should be on learning *about* the various technologies, others believe that learning *how* to use technologies in one's instruction should be the key. This indecision has resulted in the lack of a clear focus for many educational technology programs. Courses which should be mandatory for teachers are being offered instead as electives. Meanwhile, courses which emphasize much less practical and applied knowledge remain as required credits. The negative impact that this scenario holds for educational reform is monumental. "Minimal exposure to technologies in their preparation programs makes it highly unlikely that most graduates of teacher education programs will develop interests in and facility with technologies once they are teaching in their own classroom" (La Follette, 1992, p.113). The most logical place for teachers to start making a difference is with the new and energetic teachers entering the field. However, unless they have the necessary exposure to educational technology during their training, their enormous potential for contributing to change is inhibited.

School Inservice Programs

Additional training through inservices and workshops has long been recognized as a necessity for teachers to remain current with the latest techniques and materials throughout their careers. The continued training of working teachers takes on even more importance when the goal is systemic change. "Effective change in schooling requires the participation of teachers in defining goals, in designing curricula, in planning instructional procedures and in developing the necessary understanding, skills and attitudes to perform the roles they have thus helped to define" (Tyler, 1983, p. 463). Unfortunately, the roles which inservices typically play have been criticized by both teachers and the general public. Characterized by the *quick-fix* workshop, "most staff development programs are irrelevant and ineffective, a waste of time and money. Disjointed workshops and courses focus on information dissemination rather than stressing the use of information or appropriate practice in the classroom" (Wood & Thompson, 1980, p. 374).

The problems with staff development have been well documented (Boe, 1989; Robinson, 1992; Shrock & Byrd, 1987; Steffin & Sleep, 1988) and, for the most part, apply regardless of the nature of the training emphasis. However, when inservice training is focused on the implementation of educational technology, some key problems once again emerge. The first and perhaps most influential is administration.

Traditionally, staff development has been a process intended for teachers, but determined by administrators. It has been characterized by short term planning and decision making without staff input or sense of ownership (Robinson, 1992). In keeping with tradition, "staff development continues to be conceptualized and operationalized within very narrow limits. The relationship between the planned activity and the school or classroom is often unarticulated, resulting in teacher frustration when expectations are not met" (Steffin & Sleep, 1988, p. 11). By having the power to clarify such relationships and ensure staff involvement, administration holds an important key to improving the quality of inservice training for teachers.

Another problem is the traditional design of staff inservice programs:

- one day, four times-per-year, prescribed by central administration;
- students stay at home;
- teachers gather in a single room;
- an expert arrives in the morning, delivers the message, and bids farewell at the end of the day.

The time-honored approach to inservice is simply not effective. It never was and it never will be. Just a few of the limitations inherent in this design are:

- lack of input from teachers as to the focus and content of inservice efforts;
- little opportunity for immediate implementation of ideas due to the absence of students from inservice;
- lack of collaboration time;
- no follow-up to encourage and support the implementation and adoption of techniques/skills by teachers.

These limitations have made the transfer of inservice knowledge to the classroom most difficult, with research suggesting that the transfer rarely takes place as intended. "Once skill development was documented, most researchers assumed that implementation would follow. Those few who observed the participants in their schools and classrooms were usually in for a rude shock. Rarely did teachers transfer their new knowledge and skills to general classroom use" (Showers, 1990, p. 35). Nevertheless, Showers (1990) concluded that teachers are generally excellent learners given adequate conditions, and that training is most successful when it includes theory, demonstration and practice. Her findings suggest that, like any learners, teachers simply require the chance to understand, practice and develop their skills.

Teacher attitudes toward change and their acceptance of new technologies represent another area of interest to staff development programs. Recently, this issue has been the topic of an interesting debate. There are those who believe teachers, like the systems they operate in, are resistant to change. They identify the lack of motivation situationally reinforced in the educational system as a major inhibition to change. When it comes to instructional

technologies, they also point out an intimidation factor that exists. "Teachers lack confidence in their ability to master new tools and play a significant role in their use. The teachers opt for minimal involvement and a largely redundant curriculum of tutorial and drill programs. By backing away from technology, teachers miss an opportunity for their own professional development" (Robinson, 1992, p. 41).

Gentry and Csete (1991) concur with the observation of teacher resistance, but suggest that different forces are at work. They propose that most resistance to technology is not because of fear, but because of:

1) a limited technical aptitude;

2) not wanting to contribute the time necessary to learn how to use the technology;

3) past hardware or software breakdowns, and accompanying embarrassment.

Regardless, one finds much that is common in their response to staff development. Snelbecker (1989) cites some of the most prevalent responses below:

- "I'm already doing that" (teachers fail to see how new ideas differ from their old ones).
- "OK in theory, but it's not relevant to my area."
- "I know my subject matter and I don't need any help in teaching it."
- "I already know that theory"
- "I can't afford the time to plan new instruction."

On the other side of the debate are those who regard teachers as professionals, genuinely concerned with performance and instruction, and cognizant of the need to implement change (Showers, 1990; Solomon, 1992). These people argue that teachers are no longer *technophobes*. Rather, they claim that the majority of teachers use technology daily in their personal and professional lives and, in actuality, would appreciate a greater opportunity to embrace technology (Gooler, 1989). Evidence of this can be found in a recent American survey conducted by *Instructor* magazine (April, 1991) revealing that 4 out of 5 teachers use computers for various tasks, yet over half of them still approve of more and better training. The importance of distinguishing those who are predisposed toward training from those who are not is obviously crucial to determining appropriate inservice activities.

The final problem related to staff inservice training is the failure of most inservice programs to use the talents of their own school personnel. As was mentioned earlier, the accepted practice is to bring in *outside experts* to deliver training. For the teacher audience, this increases the distance between the information being presented and what they perceive *real teaching* to be. Overlooked opportunities to recognize and implement the talents of local innovators often results in a less effective transfer of information, and even more unfortunately, the frequent loss of these individuals to more rewarding industry and training sectors (La Follette, 1992; Sturdivant, 1989).

Looking for Solutions

"If you don't know where you're going, any road will take you there."

I believe we, in education, have been wandering without a clear destination for some time now. This has resulted in a trip which, despite its urgency, never seems to end. If we are truly serious about effecting change in our system, we must agree on some destinations and to start plotting the courses for reaching them. The remainder of this section presents a road map to one such destination, the successful implementation of educational technology through effective professional development.

University Teacher Training Programs

It's not surprising to find that some of the greatest opportunities for promoting educational technology lie at the place where teacher training begins. "Continuing professional education is key to the long-term development of a teacher's ability to use technologies, but once again the initial mindsets and *comfort level* of the new teacher are formed during the undergraduate experience, and may be carried over to the professional life of the teacher" (Gooler, 1989, p. 20). Only when emerging teachers begin entering their field with an adequate training in educational technology, can we expect to see the widespread changes in our system which will allow for a true resource-based, independent, and life-long learning environment for students.

So where do we begin? Simply agreeing that preservice teachers need to be better trained in using educational technology is a nice start, but more specific guidelines are required. Bitter and Yohe (1989) identified three overriding goals for teacher training programs which begin to meet this need:

1) Develop proficient, critical users of current educational technologies (aware of both the possibilities and limitations).

2) Promote the importance of viewing changes and innovations from more than one perspective.

3) Produce competent designers of instructional systems that promote students to think critically. (p. 22)

While these goals require more time than school inservices can provide, universities have the time and resources to reinforce each goal at different levels throughout a student's program. Unfortunately, the prevailing tendency among many universities is to view the communication and technology components of an preservice education as electives. The result has seen the vast majority of emerging teachers embark on their careers having minimal, if any experience with educational technology.

To achieve the goals identified by Bitter and Yohe (1989), universities must be prepared to make a commitment to certain issues. Gooler (1989) identifies four in particular:

1) identify a body of content regarding technology development and application;

2) commit resources to provide improved development and application;

3) provide training opportunities for faculty; and

4) undertake the instructional design and development of courses that will allow pre-service teachers to learn with use of technologies. (p. 21)

With respect to the first point, Gooler (1989) recognizes the importance of determining where such content will fit in the curriculum, who will be responsible for teaching it, and how it will be taught. Will the course be offered by departments of curriculum or psychology? Will it be a course which instructs *about* educational technology or one which examines *how to implement* its approach in one's own teaching? Indeed, can it be accomplished in a single course or will it need to involve multiple courses? In response to these questions, I believe we need a curriculum-based program that teaches students *how* to teach with technology. This instruction must then be reinforced by the assignments, acitivities, and presentations required in other courses. Enrollment must be mandatory regardless of a one's specialization, and course instructors must have a background in educational technology. This latter point is reaffirmed by Shrock and Byrd (1987)..."it's extremely important for instructional designers to be involved in preservice education. Teachers will not emerge as accomplished designers. However, they might acquire a structure that would allow them to add to their expertise as they amass experience and additional training" (p. 52).

Gooler's (1989) second point, regarding a commitment to providing resources, boils down to devoting money and priorities to the delivery of educational technology programs. With budgets being continually slashed, further demands may well seem unreasonable. However, while money will always be a factor, the key is to make educational technology a *priority* within colleges of education. This requires that faculty and administrators recognize the potential of educational technology for delivering instruction in ways that are more effective, far-reaching, and efficient. This recognition ties into Gooler's third point regarding training opportunities for university instructors. "For most faculty in teacher education, technology is a bother, a mystery, a blur, a largely incomprehensible phenomenon" (Gooler, 1989, p. 20). There is little sense in attempting to train teachers as future educators when those doing the training continue to model the skills of the past (Gooler, 1989; La Follette, 1992). Opportunities are required for faculty members to work with instructional technologists as they learn the methods and receive practice in teaching with technology. Ironic as it may sound, for educational technology to become successfully adopted by preservice teachers will first require that educational faculty become better educated.

Gooler's (1989) final point identifies the need for courses which require students to gain experience with educational technology as a part of their learning process. La Follette (1992) notes two programs which are presently accomplishing this goal. The first is an interactive video project undertaken at the University of Michigan which enables prospective teachers "to examine and interact with lessons taught by experienced teachers in authentic mathematical activity in school settings" (La Follette, 1992, p. 116). The second program consists of a series of videodiscs produced by the Faculty of Education at the University of Alberta which allows preservice teachers to hypothesize and experiment with classroom management techniques in a non-threatening environment (La Follette, 1992).

In addition to such on-campus offerings for preservice teachers, there remains a need for experiences with educational technology in the field. Just as we can't expect university graduates to walk into their first teaching job without a practical internship, we should not expect them to feel competent and enthused about teaching with educational technology without practical exposure to it in real school settings. Preservice teachers must be able to observe effective teachers who make exemplary use of technology in their instruction so that new teachers may adapt technologies and strategies for themselves.

School Inservice Training

The second major stop along the way to our destination of implementing educational technology is represented by the standard inservice programs offered to working teachers. Assuming that the recommendations outlined for the training of preservice teachers can be implemented, there remains a large population of teachers, presently employed and working in the field, who need to receive and practice the skills for effectively implementing educational technology. To accomplish this task, professional development inservice training is the best available tool. What must be improved for staff development to become truly effective, is the haphazard approach typically applied to the selection, design, delivery, and evaluation of inservice content and skills.

Regardless of the topic being dealt with by an inservice program, there are general goals inherent to every staff training effort. Unless these goals are kept in mind by the organizers and developers of the inservice, the program's value can be easily lost along the way. Valdez (1989) identifies three such goals toward which inservice training should strive:

- identify life-long value for individual and society;
- make us more human, creative, and better problem solvers;
- stimulate curiosity and increase enthusiasm. (p. 37)

While these goals are intended to apply to any inservice training, they are particularly suited to the implemention of educational technology. By themselves, however, such broad goals provide little in the way of real guidance, leaving the need once again for a more detailed road map. The seven points which follow provide some detail.

1) A need for administrative support .

More than any other single factor, administration has the potential to ensure a successful professional development program that will promote the use of educational technology in schools. "Much has been made in the professional literature of the necessity to restructure the role of the teacher because of technological developments. However, much more critical is the restructuring of the administrative staff. They are the key to the success of any technological system. But administrators are still under the impression that these new developments are of concern primarily to teachers and not to them. (Heinich, 1991, p. 242). Thus goes the old saying, "with power comes responsibility". For inservices to effectively train teachers in the strategies and applications of educational technology, administrators must first effectively use the power made available to them.

The first priority for administrators must be the establishment of a common vision among staff members. "Vision articulates why we are here, where we are going, and what we are all about" (Steffin & Sleep, 1988, p. 11). While most staffs generally have some sort of mission statement by which they operate, it is often not clearly articulated or universally shared. The result is that staff development efforts are often undermined as expectations vary and individuals develop and pursue their own visions. Administrators play a key role in the development of their school's vision and in its promotion among staff members. For staffs whose vision includes the importance of implementing new strategies and technologies, the potential for realizing change is significantly increased.

A second point for administration to consider is the importance of obtaining teacher input when planning inservice activities. One of the greatest problems associated with ineffective inservices is the perception by teachers that the training being provided is not relevant to them (Snelbecker, 1989). When this perception is true, the problem can generally be found in the failure to consult the teachers themselves as to the training they believe is important. With technology having advanced so rapidly over the past two decades and a typical staff being comprised of several generations, the abilities and experiences with educational technology can be quite varied. To suggest that everyone on staff participate in the training of basic operating procedures for various equipment would be as inappropriate as delivering high end design strategies for teachers developing their own materials. While both sets of skills would undoubtedly be appreciated by select portions of the staff population, the remaining members would soon be resenting the intrusion on their time. The underlying lesson for administration is to remember that the successful adoption of any program demands the informed consent and participation of those involved (Robinson, 1992). To achieve this, administrators must be prepared to conduct continuous needs assessments to ensure that the proposed training is truly that which is desired by teachers (Sturdivant, 1989).

2) A need for teachers to understand the nature of the innovation and how it applies to them.

Ever since the development of objective-based learning theories in the 1920's, educators have recognized and promoted the values in identifying the intended outcomes of instruction (Shrock, 1991). Yet, while we believe objectives are important for determining what is to be learned and for what purpose, rarely do we apply them effectively to staff inservice training. The common lament of "This doesn't apply to me" serves as evidence of the neglect often shown toward defining inservice objectives and negotiating them with teachers. When it applies to the implementation of educational technology, this feeling towards training can be even more pronounced. To increase the likelihood that teachers will benefit from inservice training on educational technology, one has two choices: (1) to have teachers identify for themselves that they desire training in the area, or (2) to make sure teachers can identify how the innovation being presented applies to them (Boe, 1989; Showers, 1990). In the first case, effective inservices are easily developed. In the second, certain guidelines need to be followed.

Without question, the priority for promoting the adoption of educational technology among teachers is to demonstrate its application to them as individuals. At the same time, one must be careful not to oversell the idea. "Teachers are great hype detectors, rightfully suspicious and critical of new instructional ideas. Most have been overblown fads and unfulfilled promises come and go, while they persevere in the classroom, helping their students learn and grow with whatever works" (Marker & Ehman, 1989, p. 29). Dalton (1989) suggests that the key to striking a balanced approach is to employ educational technologists to work directly with classroom teachers. Developing cooperative technology-based learning environments, training teachers in the use of the particular innovation, and assisting in redefining the teacher's role as counselor, developer, and manager of instruction, are just some of the benefits that would come from such a relationship (Dalton, 1989).

Another key to remember is that technology must help solve old problems (Marker & Ehman, 1989). Teachers find little value in solving problems of the future, those which they don't yet have, when what they really need are solutions to immediate problems. For example, the traditional paperwork associated with evaluation, attendance, and parent-teacher communications has long represented an inefficient means of dealing with such tasks. The

need for individualized instruction suitable to various learning styles has posed an equally old problem for teachers. Through computer applications, telecommunications, and interactive multimedia, such problems are readily addressed. The key for inservice training is to focus on these areas and foster an incremental improvement of teachers' work, rather than attempt to fundamentally change education through technology (Marker & Ehman, 1989).

3) A revision of learning methods and the roles of both teachers and students.

For teachers to successfully implement such measures as the Common Essential Learnings (CELs) and Resource-Based Learning, there must be a fundamental shift in the roles of both teachers and students (Boe, 1989; see also Chapter 2). No longer can teachers take the position that it is their job to teach students everything they need to know. Given the daunting expansion of information and knowledge, no individual or group of individuals can hope to know enough to accomplish such a task. A teacher's role, therefore, must be to teach students how to learn more than what they themselves know—to learn strategies and gain skills for finding answers to their own questions. Similarly, students can no longer expect to be the passive receivers of information they once were. With the level of competition that presently awaits students upon graduation, the need for them to be creative, independent, and active learners is increasingly important.

For teachers, the emphasis on CELs and Resource-Based Learning involves many shifts that technology can make possible "...a change from being the source of knowledge to being a guide or coach to students; a change from frontal instruction to diversified classroom activities; and an expanded variety of instructional models and practices recognized as legitimate" (Kerr, 1989, p. 11). For students, technology holds similar potential as it places current, accurate information at their fingertips and permits them to take an active role in discovering and critically examining new knowledge. Once these roles come to be accepted, teachers and students will not only welcome the implementation and adoption of educational technology, they will demand it.

4) Strategies for the development and transfer of skills.

Surprisingly enough, the most overlooked aspect of any inservice training is the *training* part of the process. Information is typically presented, discussed, and promptly dismissed, as teachers fail to receive the necessary assistance for incorporating the new information or skill. Unfortunately for teachers, this is often viewed by the public as resistance to change. While this conclusion no doubt holds true for a percentage of the teaching population, resistance is not always the problem. "We do teachers a disservice when we say they can't or won't change, when in fact, they simply don't know how" (Solomon, 1992, p. 328).

If teachers are expected to adopt and develop the strategies and skills provided by inservice training, they must also be given the opportunity to experiment with, practice, and refine those skills over time. One of the best strategies for accomplishing this task is to promote collegial interaction (Seller, 1988; Showers, 1990). "Teachers, including beginners, learn to teach through experience, and in schools learning from experience is learning alone. Teachers are isolated from other teachers; they learn their craft through trial and error, with little help to guide their trial and error learning" (Riffel, 1991, p. 28). Through techniques such as peer coaching and mentorship programs, the opportunity for teachers to observe and practice their

new skills makes their incorporation into the classroom more likely (Seller, 1988; Showers, 1990).

Another strategy worthy of mention is that of providing differentiated inservice activities based on the age, experience, and expertise of the teachers involved (Steffin & Sleep, 1988). This practice reduces the tendency to put an entire staff through training when their needs and interests are likely very different. By providing differentiated activities, inservice training becomes more effective because the audience consists only of those who are motivated for training. Outside experts are utilized more productively and the transfer rate of skills learned is increased. In addition, there is the development of in-house experts who are able to return to their staffs and serve as peer coaches to their colleagues.

5) Time for strategies to be implemented by teachers.

In order for skill practice, peer coaching, and mentorship programs to be implemented, appropriate time must be provided following inservice training (Boe, 1989; Showers, 1990). Marker and Ehman (1989) go so far as to recommend doubling the amount of time one initially thinks necessary for implementation and training—implementation will always take longer than anticipated. Unfortunately, if there is anything in greater demand than money these days, it is time. More with respect to this issue than any other, we need to consider a change in our system of education. The traditional school day, summer holidays, and present professional development activities all need to be reviewed in our effort to create a more effective operation. By doing so, perhaps we can arrange a schedule which allows teachers to devote time to developing new skills.

6) Support for experimentation and innovation by teachers .

To avoid the problems cited earlier surrounding the loss of innovative teachers, the educational system must find ways to recognize and reward teachers who undergo additional training (La Follette, 1991; Sturdivant, 1989). Individuals who take the initiative to become leaders by example in their use of educational technology presently do so on their own time and at their own expense. Monetary rewards are not the primary issue however. What is more important to teachers involved with educational technology is the opportunity to experiment with, develop, and apply their ideas beyond their own classrooms (Boe, 1989). To foster this, administration must acknowledge the leadership of such teachers with mentorship and peer coaching programs, having them conduct regional inservices for interested staffs, and providing them with opportunities and time to further develop their own skills and interests.

7) Improved evaluation of training efforts to measure the effectiveness of skill transfer .

"Many attend, some learn, and a few transfer what they have learned to their classrooms" (Riffel, 1990, p. 28). Unfortunately, this seems to be the fate of most inservice programs. Sturdivant (1989), believes that for skill transfer to be improved, there must first be an improvement in the *evaluation* of inservice training. Too often, training is deemed necessary, time and expenses go into its development, and when all is said and done, the transfer of skills into the classroom is left to chance. If we expect objectives to be reached, we must be prepared to follow initial training with assessment. A preferred strategy would have teachers identify and implement the appropriate evaluation measures following inservice. Greater emphasis placed on the evaluation process may even assist in regulating the number and nature of inservice

sessions provided throughout the year. Requiring the training to be implemented makes it more likely that only those programs with merit would be considered for inservice. From the teachers' perspective, the expectation that strategies are to be used would also encourage the transfer of new skills.

Conclusion

The recommendations for preservice and inservice training outlined in this chapter are not new. Rather, they distill the viewpoints of numerous authorities in the field over the past fifteen years. Unfortunately, with the exception of a few isolated cases, the advice from research has not been followed in practice. On the occasions when it has, it has been this author's experience that promising results have followed. A deliberate and consistent application of the guidelines presented in this chapter can result in effective professional development, which will in turn contribute to educational reform in our province.

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Educational Technology in Action

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Chapter 5

A Plan for Marketing Educational Technology

Cole Kirby

Abstract

This chapter proposes an action plan for educational technologists to assist them in introducing a technological perspective into the current restructuring movement in the K-12 school system. Based on an analysis of how school systems are changing, recommendations on the role of the educational technologist in the implementation of solutions to educational problems are offered.

> *" School restructuring is the current hot item in education, but any efforts in that direction that try to work within the current framework will have little, if any, permanent effect.... If you want to make any fundamental change in a system, you must do it from outside that system." (Heinich, 1991, p.237).*

Traditional thought on change emphasizes that those within a system must contribute to the process for change to be lasting. Change must come from within to be lasting and meaningful but it can be initiated, accelerated, and guided by those in positions of authority or by outside interest groups. This chapter examines some of the current pressures for change, how school systems are responding to these pressures, and how we as educational technologists can play an active role in the renewal that is emerging in education. More specifically, it addresses a process by which educators and educational technologists might effectively "market their product" to the public they serve.

Pressures for Change

The first national poll of public opinion on education was conducted by the Canadian Education Association (CEA) in 1984. According to Macleod, (1985) the greatest finding was that the schools were ineffective in communicating with their publics. The Ontario Institute of Studies in Education (OISE) has been polling Ontario citizens regarding their opinions of education on a regular basis since 1978. From that time, the public's satisfaction with the

school system has steadily declined. Results from 1979 reveal a satisfaction level of 50%, while 1988 results reflect a satisfaction level of 36% (General Evaluations of Schools, 1989). The 1992 OISE survey replicated the results from 1988 suggesting that the downward trend has stabilized; however, the problem of two-thirds of the population being dissatisfied still remains (Livingstone, Hart & Davie, 1993). These findings have sparked a flurry of media coverage which has contributed to an increased awareness about opinions on education. Public scrutiny has intensified criticisms of educational systems which in turn have intensified arguments for restructuring.

Business and industry have been openly critical of the education system across Canada and are becoming a major influence in the restructuring movement. Typical statements revolve around the theme that high-school graduates are entering the work force with poor skills and are generally not ready for the world of work. According to these critics the term "skills" refers to more than simply the three R's, it also encompasses interpersonal skills, social skills, and technological skills. The private sector has been soliciting schools to allow them to become more involved in the education process, either financially or more directly through partnerships. These offers can be very attractive to financially starved school systems and becomes another pressure to change the way school systems do business.

News of the information "super highway," the increased power of micro-computers, the advent of two-way interactive video, and other networking technologies are also exerting tremendous pressure for change in education. There is growing sentiment, from within and outside of education, that school systems are not keeping pace with technology. "Canadians want refocused, reinvigorated learning systems with stronger ties to the community and working world. These systems must apply new ways of teaching, and make full use of innovation and available technologies, as well as new modes of delivery ..." (Steering group on prosperity, 1992, p. 35). Educators are becoming comfortable with the technology of the 80's as the technology of the 90's unfolds, increasing the pressure on school systems to adopt innovations in technology to assist in the delivery of instruction and to act as a resource for students.

One change that has occurred in education over the past twenty years is the relationship between students and teachers. There is much more interaction between these two groups. The line between teaching and learning is not as clear as it once was as both groups work more collaboratively in the teaching-learning process. This approach to teaching is more personalized but also requires a great deal more energy from the teacher. Teachers no longer simply disseminate information . Gone are the days when teachers spewed out information and students obediently recorded every word and then went home and learned it. The teacher's role is changing.

> *In traditional classrooms the teacher performs many functions. Teachers plan the course of study; evaluate and locate appropriate instructional materials as necessary; handle administrative details such as attendance and daily announcements; evaluate student progress; inform students, parents, administrators, and other teachers of student progress; and, oh yes, teach. In addition to teaching, teachers also adopt the course of study for individual students for whom the standard course is inappropriate, evaluate the final performance of students and of the course itself, provide necessary discipline, serve as models of adult behavior and values, and provide a safe environment for students.*
>
> (Hannafin & Peck , 1988 , p. 30)

This is an adequate depiction of the role of the teacher, but even this description falls short. The changing face of today's learner is creating still more for teachers to do. The two parent, single income family, which our system is designed to serve is not commonplace today. More likely we find dynamics of double income, no income, single parent, and blended families. These changes have placed an increased burden on school systems to provide more eclectic and dynamic programming which was previously handled by the family (e.g., sex-education, driver education, conflict management and other areas of socialization). In addition, increased use of drugs and alcohol, violence in the schools, and teen suicide have placed further demands upon teachers. This rapidly expanding role is resulting in an anxiety ridden teaching force that is searching for innovative methods to make their jobs easier.

Discontent is mounting, and people are beginning to act upon their discontent by taking advantage of alternatives to traditional educational settings. The Saskatoon Star Phoenix (January 21, 1994) reported a dramatic enrollment increase in British Columbia's private schools. Despite tuition costs of between $2000 and $8000 per year, attendance has more than doubled since 1980. A similar trend is evident in Saskatchewan even though the overall population is lower now than it was in 1984. Independent school enrollment has actually increased 11% over this same period of time. This is a significant statistic considering the declining population, the economy of the province during the past decade, and the fact that the province already offers a publicly funded dual stream educational system. (Department of education annual reports, 1984- 85 & 1993-94).

In addition to private and independent schools there is general consensus among educators that the numbers of "home schoolers" is also on the rise in the province. For the first time, the Saskatchewan government is providing funding of up to 50% of the costs per child to home based educators. This development suggests that a demand has been created and is indicative of an increased population of home schoolers. Now that statistics are being kept, analysis of trends in this area will be possible which will allow for corroboration of this "feeling" that educators have about increases in these numbers. The bottom line is that home schooling is now an affordable option for the public of Saskatchewan and has created a formidable challenge to the status-quo in education.

Responses by School Systems

Education is becoming an increasingly competitive business. Public schools no longer hold a monopoly on education. In order to deal with competition from alternative forms of education and to improve communication with the public, school systems are increasing their use of marketing strategies. Public school marketing committees have become more commonplace over the past decade. The philosophy of these committees in effect is to sense, serve, and satisfy needs of its clients and publics within the constraints of budget (Kottler,1975). Richard Dodds , Director of Education for East York stated:

> *Our marketing plan is designed to monitor what people like and don't like in their schools - to find out what they do and don't want in their classrooms - to analyze changes in the educational marketplace - to bring schools into synch with the communities they serve. This is marketing in action.* (Dodds, 1986, p. 2)

The Saskatoon Public School System created a Marketing Committee in 1989. It has four goals:

1. To enhance the quality and value of educational programs as received by parents, students, and the community.
2. To enhance caring in responding to the priorities and interests of parents, students and the community.
3. To enhance the commitment and support taxpayers have for education.
4. To ensure that the children and youth of public rate payers want to attend public schools.

(System Marketing Committee, 1992)

Clearly, the goal of marketing public school education is to meet the expressed needs of the people the school system serves and ultimately direct change to provide more effective education. Some new initiatives include: before- and after-school care programs, pre-schools, optional classes to allow for more student choice, work education, special needs programs, inservice of staff on marketing concepts, and a greater emphasis on student services.

Industry pressure for involvement in education is being addressed by an increasing number of school/business partnerships. An important player in this initiative has been Northern Telecom. Their corporate policy states, "Northern Telecom will contribute to the development of effective, high quality educational systems in every region in which it operates" (Northern Telecom Corporate Video, 1993). In 1987, Northern Telecom initiated an annual teacher-industry conference (The National Institute) which is dedicated to improving teaching and learning through the use of technology. Large corporations like Northern Telecom have dedicated resources to support strong educational programs, and school systems are beginning to take advantage of this. Although opportunistic, effective partnerships are more than a cash grab; they promote direct involvement and interaction between business and education. Successful initiatives include partnerships with Rathcoote High School in Belfast, Ireland which won awards for their industry sponsored communications project. In New York, an interactive video network links three city high schools and a community college. River Oaks public school in Oakville now has one third of its curriculum devoted to science and technology. Birds Hill Elementary School in Winnipeg won the Conference Board of Canada Award for excellence in business and education partnerships. The Conference Board also recognized a partnership with Earl of March Secondary School in Ottawa involving increased post secondary enrollments in science and engineering.

In 1991 the Saskatoon Public School System conducted a survey of public opinion on attitudes toward education (Ochitwa & Fleishhacker, 1991). The survey, contracted through the College of Commerce at the University of Saskatchewan, isolated two main issues.

1. Business and industry wanted more involvement in education.
2. A general lack of communication between the school system and its clients.

In response to this survey, the school system initiated it's first school-business partnership with the Saskatoon Star Phoenix. The Executive Assistant to the Director of Education, Brian Hartsook, stated that the school system's two main goals are to educate business about what schools are doing and to show students the relevance of what they are learning and how it

applies to the world of work. Both of these goals support the overall objective of improving the quality of education for Saskatoon students (Personal communication , Feb. 2, 1994).

The Saskatoon system is currently involved in partnerships with fifteen businesses including Northern Telecom, Sask-Tel, The Star Phoenix Husky Oil, K-Mart, The Canadian Imperial Bank of Commerce, and Ford of Canada. Partnership activities include tutoring, job shadowing, mock interviewing, resume writing, providing resources for science projects, mentorships, direct instruction and guest speaking, joint staff development, awards for development and achievement, environmental awareness, sharing library resources and joint social functions. Mr. Hartsook envisions a day when staff exchanges will be viable for both partners, where teachers will spend extended education leaves with a business and vice versa.

This partnership program is one example of how a school system is responding to criticism from business by involving them in the process of education and ultimately changing the way in which learners learn. Other more established programs, such as Ontario's Waterloo Region Catholic School System, have progressed to the point where teachers spend up to four weeks working in businesses that compliment their teaching area (Steering Group on Prosperity, 1992). In addition to involving business in education, partnerships have assisted in closing the gap in the implementation of emerging technologies in education. Through partnerships, students and teachers are given opportunities to gain experience in the use of telecommunications and networking technologies. Continued collaborative efforts between education and industry will lead to further advancements within school systems.

Other technological initiatives are coming from teachers themselves. All school systems have teachers who are, in effect, educational technologists. They use the skills of educational technology but lack formal training. These educational entrepreneurs initiate innovative programs that make learning more exiting, make teaching more rewarding and make their jobs easier. Few, if any, of these people began their careers with technology as part of their teaching repertoire, but later developed a strong personal interest in the area. As technology advances so does the number of entrepreneurial teachers. The work they do cannot be underestimated. They directly influence the students they work with and also influence colleagues. This grass-root movement toward technological effectiveness is an important aspect of the emerging renewal of education.

Role of Educational Technologists

"We cannot change the past-it is history. We can only make the best of the present - it is already happening. But we can begin now to become masters of our future."
(Steering Group on Prosperity, 1992, p. 61).

Education in Canada is changing and educational technologists have an important role to play. Pressures for change have spawned school marketing committees and business partnerships. A grass roots movement led by teachers with a strong interest in technologies is firmly in place. The stage is set.

The direction educational change is taking will require active participation from technologists and the energy provided by entrepreneurial teachers should be harnessed. This bottom-up pressure for change must be organized to be effective. Much like popping popcorn

with the lid off, the job is getting done but it could be done better. Creating administrative systems to oversee technological development within the schools would provide leadership and direction to the grass roots movement.

Initially, I propose the appointment of a consultant with formal educational technology training who would first organize and coordinate existing technological expertise, and second, use this expertise to promote technological solutions to educational problems. This individual would establish a process to review existing and emerging technologies. Teachers in the field should be involved in any review of technological systems designed for use in the classroom. Bohn (1992), describes this as sociotechnical analysis, where equal emphasis is placed on both technical and social systems in establishing compatibility between technology and its users. According to Bohn, this type of analysis has been successful in business training systems when dealing with employees who are reluctant to change.[1] A final responsibility of the central office administration and consultant configuration would be to initiate, organize and implement teacher inservice.

In addition to central office representation, schools themselves require educational technologists, but not in the traditional sense of service personnel to supplement instruction. This strategy does not work. Instead schools need a new type of instructional leadership that can best be provided by what I will call, a technology systems administrator.

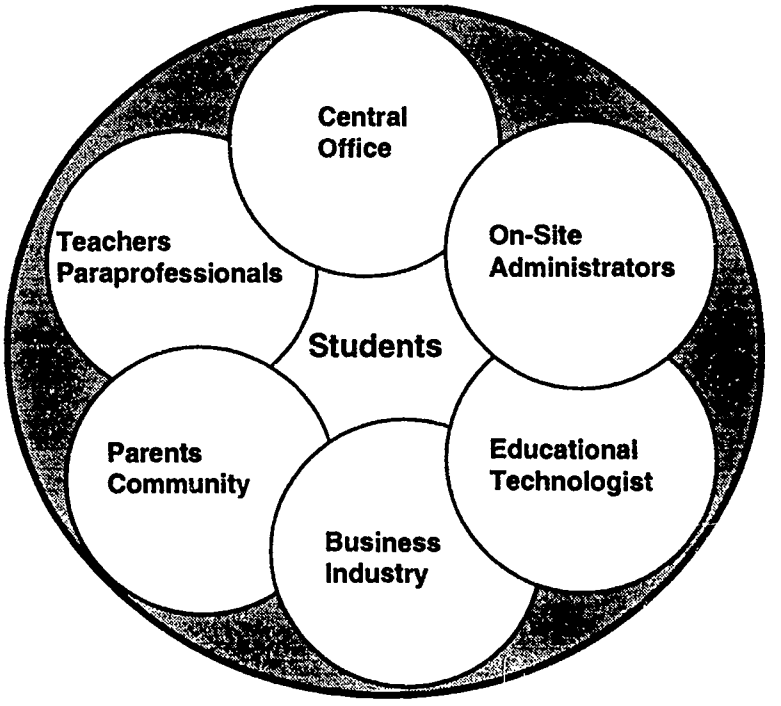

Figure 1. Collaborative Model of Educational Technology: Administration. The outer circle symbolizes the interdependence required by all groups within the model.

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[1] Solutions to successful inservice of teachers in areas of technology can be found in the *Journal of Education Technology* (vol. 29, No. 3, 1989), a special issue dedicated the topic of inservice training in educational technology.

This hybrid role would take the form of an on-site administrator with a majority of responsibility for administering instruction and technology. Figure 1 illustrates the working relationship of this proposed administrative configuration.

Marketing committees have been created in response to public opinion and the growing availability of educational alternatives. Education technologists need to be involved with these committees to ensure that the technological perspective has an effective voice. The progressive philosophies of technologists would be an asset to school system marketing committees as well as provide an important forum for technologists to pose their opinions on the role that technology should play in education renewal. Marketing committees have a great responsibility to appropriately represent their school systems, and as a result membership on these committees often consists of high level central office administrators. For educational technologists to participate in change they need to be in a position to inform and educate these administrators about the potential educational technology holds for schools.

A more specific role of the technologist on marketing committees would be to address the concerns of an increasingly vocal business community. Business and industry are concerned with finding technology-based solutions to problems. Educational technologists could lead new initiatives and provide a technological perspective on solutions to educational problems. Consider the technological tools available to companies such as Northern Telecom, Sask-Tel, Husky Oil, Ford, and even CIBC. Business is more technologically advanced than education and will remain that way for the foreseeable future. The very nature of business requires that it be on the leading edge to be successful. As soon as one company has the ability to do something better, faster or more efficiently they have a competitive edge which, in turn, prompts others to follow suit. As a result, technology quickly becomes obsolete in the business world. However, the rapidity of this technological turnover means that the obsolete technology of business is often superior to the current technology of the schools.

The economic condition of the educational system is stifling the system's ability to address its technological inadequacy. One need not look outside Saskatchewan to see that budget cuts and decreased provincial grants are the norm rather than the exception. These economic handcuffs are preventing school systems from making any significant changes or improvements to the technological gap that exists between business and education. Partnerships between business and education could help close this gap. This is already happening in an informal way in many areas across the country. In Saskatoon, Ford of Canada recently donated more than twenty fuel injected engines to the school system for use in instruction. These engines were going to be discarded by Ford, but for the schools who didn't own even one fuel injected engine, this was an unexpected windfall. In another case, businesses donated computers to the school system. These computers were once again obsolete in business settings, but still useful in educational settings.

The business world is not only rich in technology but also rich in expertise. I recently attended a school- business partnership orientation meeting at the Atomic Energy of Canada Limited offices and was astounded by the quality and number of highly talented employees. Twenty-seven staff responded to a skills-interests inventory survey (see appendix A). Results indicated that the respondents held 21 different degrees in higher education, most of which were engineering and technology based. These employees spoke ten languages other than English and had other interests ranged from scuba-diving to dog training to photography. These individuals voluntarily responded to this inventory knowing that it would be shared with school representatives, and knowing that they could be asked to donate their expertise to schools.

The question then becomes how do we effectively use this vast pool of expertise? Educational technology would provide a logical educational link to business because it is one of the few prevailing needs in both worlds. Educational technologists should be involved in all business-education partnerships from the orientation phase to the implementation phase and then in a consulting role as needed. The technologist could ensure that resources (human and technological) available through the partnership be used well. The technologist could be a resource person for both education and industry, working and consulting in areas of design, evaluation, and technological networking. The creation of a symbiotic relationship is important for partnerships to be successful.

Conclusions

The school system itself is a technological system. As educational technologists it is not sufficient to state that schools are obsolete, need restructuring, and naively believe that schools will change because we say they should. To effectively create change in the schools we cannot rely on governments, courts, or businesses. By participating from within the school structure as members of marketing committees and as partnership consultants we can encourage renewal toward effective education for the future.

Recommendations

1. The creation of an administrative arm responsible for promoting the expansion of technology based systems.
2. The appointment of a consultant to serve as a technology adviser and staff developer at the division level, with a major responsibility for coordinating the energy of untrained technologists employed within the school system.
3. The creation of an on-site administration/technologist position in all schools to assist in integrating curriculum and technology.
4. The involvement of educational technologists with marketing committees to promote a technological perspective in marketing initiatives.
5. The involvement of educational technologists in all school-business partnerships from the orientation phase to the implementation phase.

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Educational Technology in Action

Birmingham Historical Society and Scholastic Publishing to produce a Mullet-Media history of Birmingham. To create this product, children visited historical areas of the city took photographs to be scanned and digitized, researched the sites, and wrote text to accompany the photographs. Where appropriate, they added sound to the multimedia product.

Appendix A

Skills/Interests Inventory, Atomic Energy of Canada Limited - Saskatoon

Children - 27 of various ages ... includes attendance at minimum twelve different schools- Dr. John Eggnatoff, River Heights, Aden Boman, Queen Elizabeth, Corman Park, Clavet, Marion Graham, Lawson Heights, Prince Phillip, Evan Hardy, Lakeview, Roland Michenor.

Education - B.Sc , M.Sc , Chemical engineering , Chemistry , Mechanical engineering, Architectural engineering technology , Business development , Civil engineering , Media relations , Broadcasting , Marketing , CAD/CAM engineering technology, Electrical engineering , Structural engineering , mechanical engineering technology , Nuclear engineering Phd. , MBA , B.A. French , computer science , Agricultural engineering , Aerodynamics , physics.

Other work experience includes: Aerodynamics, mining, Petro-chemical, Oil and gas industry, Power utilities, Broadcast television equipment design, Data communications, Business development, Computer programming, licensing, Research.

Languages include: Chinese, French, German, Croat, Swedish, Persian, Arabic, Cantonese, Tamir, Friesen.

One half of respondents were originally from Saskatchewan

Sports interests include: Hockey, tennis, golf, skiing, swimming, cycling, squash, baseball, motor sports, cross-country skiing, badminton, curling, snooker, table tennis, track and field, basketball, snowmobiling, racquetball, bowling, running, soccer, bicycle racing, skating, scuba diving, martial arts.

Fine arts: music and film appreciation, singing, band, guitar, bass, keyboard.

Travel/outdoors: hiking, camping, fishing, canoeing, travel (origins from Alberta, Manitoba, Ontario, Quebec, Egypt, Hong Kong).

Other interests: Chess, photography, private pilot license, Youth hockey coach, soccer, baseball, dog training, running a snow blower, personal computers, automotive repair etc., home renovations, Canadian ski patrol.

Surprises: Harvey Underhill's daughter is Barbara Underhill ... The World/Olympic pairs figure skating champion for Canada!

Educational Technology In Action

'ON 'Teaching and Learning

The electronics of the information revolution will help make computer assisted instruction effective for individuals. A recent study sponsored by Apple Computer Inc. predicted that by the Year 2000, students will be using Electronic Notebooks" with flat screens, memory chips, data entry keyboards, etc. that will serve as electronic links to both home and school. Roll call as we know it will disappear, and the electronic notebook will be used to monitor student attendance. In addition, the electronic notebook gives students an equal opportunity for learning by tapping the local resources of the school community.

The Impact of Technology On Educational Facility

C. William Brubaker, FAIA

CEFPI's Educational Facility Planner , November December, 1989

Chapter 6

The Economic Implications of Educational Change

Victor Anton

Abstract

Over the last decade Saskatchewan Education has initiated several proposals for change in the province. Several of these have advocated the increased use of educational technology and distance education within the provincial education system. These provide a stark contrast to our lack of meaningful progress in the implementation of permanent change. This chapter discusses the socio-economic reasons for this lack of success. Finally, this chapter offers suggestions for educational restructuring based upon an understanding of the present organizational structure, and insights into the future direction of education within the province.

> *People and organizations can deal with the future by ignoring it and letting it happen; by viewing it as a gradual incremental extension of the past; or by actively trying to influence events to make the future happen. The sheer speed of the new Information Age has virtually eliminated the first two options.* (Gary Scott, 1992 p. 1).

As educational technologists, our view is that planned, student-oriented educational change is necessary and imminent. To effectively create change in education will require the input and cooperation of all stake holders in the educational process.

The Need for Educational Change

The need to reform and revitalize education has been recognized in Saskatchewan for a decade. In *Directions: The Final Report* (1984), the stated goal of the new curriculum was to "...ensure quality education in all schools in Saskatchewan" (p. 7). Since that time, several reports have called for the resources and technologies necessary to accomplish this goal.

The Adaptive Dimension in Core Curriculum (1992) emphasized that teachers have the responsibility to adapt learning experiences to suit the needs of their students. They were given

the authority to select appropriate content, structure the learning environment, and choose instructional methods that accomplish this objective. The classroom envisioned in the new educational paradigm was to be learner-centred, and resource-based. Students were to be active participants in a cooperative, nurturing environment.

Scharf and Langois (1991) reviewed the need for the development of distance education as a viable means of providing a high quality of educational service in small communities and remote areas (pp. 180-181). Instructional technology was also regarded as a productive means of enriching the educational experiences of students throughout the province.

The *High School Review Committee Interim Report* (1993) discussed alternative delivery methods for provision of distance education to Saskatchewan schools (pp. 19-20). Correspondence courses, audio teleconferencing, video conferencing, computer assisted instruction, and computer networking are mentioned as possible delivery and support methods which could be utilized in providing a comprehensive set of program alternatives to students throughout the province.

The need for educational change and technological innovation is well documented. But, change of this sort has economic implications. The economic implications of change include not merely financial rearrangements, but more importantly, the impact of change upon existing organizational structures, upon individuals within the system, and upon outside stake holders. These implications are the subject to be discussed in this paper.

The Organizational Structure

The study of educational innovation invariably concludes that substantive change is extremely difficult to accomplish (Cuban, 1988). The existing organizational structure is rigidly hierarchical. It is characterized by a pyramidal structure of power, privilege, and access to information which is used primarily as a mechanism of control. This structure is firmly entrenched and extremely resistant to change. Any practice or change that threatens to disrupt this structure will encounter resistance (Hodas, 1993).

Technological innovations have encountered substantial organizational resistance to curricular and administrative improvement. Innovators logically expect that the tools which have revolutionized the collection, analysis, transmission and utilization of information in society will be welcomed by educators, and they are baffled when this does not happen. Only technological use that supports and enhances the existing structure has been readily implemented. Any usage that appears threatening to established roles or practices has been disregarded.

Existing educational structures model the factory as an efficient structure for the provision of goods and services. The product (a graduating student) is broken into components (subjects), which are produced and assembled in a linear fashion (grades). The economic implications of maintaining this model of education must be examined carefully given the present austerity of the provincial economy. All levels of educational bureaucracy must be examined to determine their present relevance. Rural school divisions have voluntarily begun the process by examining their continued viability and effectiveness. The provincial government should support this process by establishing an independent commission to examine the role, function and effectiveness of each level of the educational hierarchy. Beginning with the in-school

administrative structure and proceeding upwards, each bureaucratic level should be examined to determine it's relevance and ongoing need. The tasks of each position should be detailed to determine the education and skills required for effective performance. Modern schools need administrators who understand curriculum development and evaluation, educational psychology, and educational technology in order to deal effectively with changing schools.

Proposals for Change in Organizational Structure

The financial implications of instituting technological innovation are substantial. The front-end costs for the purchase of the required hardware, software, and maintenance services can be accommodated only if educational priorities are altered or revenues are significantly increased. Our existing system places highest priority upon the human component in providing educational instruction, administration, and community involvement in education. This model of education was developed during a period of relatively low labour costs, slow communications capability, and a predisposition toward local involvement in educational decision making. Each of these areas of involvement now comes with substantial, and steadily accelerating, financial costs associated with them. We should now examine our commitment to the existing model in light of obvious societal, technological, and financial changes that have occurred. Canadian business and industry has been forced to evolve beyond the factory model, to a technology-based production model, in order to survive. Education must follow suit.

Changes in School Boards

The role and function of local school boards may require modification to accommodate new social and economic realities. Originally functioning in a predominantly rural, agriculture-based environment, school boards provided for the establishment and control of local education during a period when education was based upon primary schools and community participation.

Society has evolved considerably since these beginnings. The degree of local involvement in decision-making provided by school boards in urban areas, or large, sparsely populated rural districts is questionable. Elected board members seldom change; incumbents easily maintain their positions on boards indefinitely, regardless of their personal motivation for office or effectiveness in office. School boards have become, in effect, an illusion of democracy. This illusion occurs at a substantial financial cost (Scharf & Langois, 1991).

If we choose to retain the board structure, then its effectiveness could be substantially improved. Some suggestions for improvement are:

- A viable means of ensuring ongoing communication with the public should be established.
- Electoral participation should be expanded to include all segments of society rather than simply owners of property.

- A form of the ward system should be instituted in each school district to enhance voter involvement during elections and board member accountablity between them.
- The strictly voluntary status of board membership should be legislated. No financial compensation for service beyond legitimate expenses should be allowed.
- A maximum of three consecutive terms of membership on a schooi board should be mandated. This provision would guarantee a wider base of participation from within the community.

Operating Costs

The operating costs of each school board's central office structure is significant and increasing. The size and complexity of central office structures reflects the expanding role that education is called upon to provide within the community. Pupil services coordinators, educational consultants, and program coordinators provide leadership for projects, direction for programs, or provide specialized services. Although necessary, their functions and services are often so thinly spread that the overall effect within each system is negligible. A provincially organized and administered structure could provide these necessary services in a more equitable and more efficient manner.

Administrative Changes

The ongoing function and effectiveness of in-school administration is an area currently under provincial review. The cost of providing in-school administration, in it's present form, is a significant expense that must be justified in light of changing local circumstances and societal change toward more democratic forms of leadership. In the past, in-school administration provided professional leadership in curriculum development, as well as leadership in the development of instructional skills. Educational innovation, program evaluation, and staff supervision were a substantial part of required duties. Currently, many of these responsibilities have been assigned to central office personnel, leaving clerical, organizational, and student discipline issues to in-school administrators. School-community relations, parental issues, and public relations issues have become an increasing part of the responsibility of school based administrators. In-school administration has accepted the additional role of liaison between the school and central office administration. This position, sometimes described as a 'gate-keeper' role, involves the resolution of conflicts of interest between upper level administrative authority and parents, students, or teachers.

The role of in-school administration could be modified to create a more effective and less expensive structure. Clerical, organizational, and public relations tasks could be efficiently handled by non-professional staff. Other functions of in-school administration could be effectively performed by adopting a team approach. Each team member could be assigned administrative tasks based upon training, competence, and experience. In this manner important educational areas such as curriculum, technology, psychology, and professional development could be administered by individuals with specific expertise.

All in-school administrative positions should be limited to half-time status. This would ensure that the primary role of educators—teaching—is conducted by individuals involved in administrative functions.

The current method of determining financial compensation for administrative positions should be studied to determine if existing practice should be altered. The existing system of payment, which is based upon the number of teachers assigned to a school, was designed at a time when schools were considerably smaller. Urbanization and centralization have contributed to the development of large institutions, especially at the high school level. Total costs for in-school administrative allowances, in addition to basic salary, for positions in such institutions could be as high $50,000.00 per year. The necessity of providing allowances of this magnitude is questionable.

Similarly, the salaries of central office administrators have escalated substantially. Chief administrators in large school divisions currently receive salaries in excess of $100,000.00 per year. This level of remuneration seems excessive, especially to the general public. An equitable method of determining maximum salaries for administrative positions that adequately compensates individuals for their credentials and responsibilities should be developed.

Social Barriers to Change

Economic considerations are usually cited as the primary reason for the lack of progress in the implementation of technology into schools. Although the financial position of school boards can be a significant factor in the adoption and implementation of technology, human factors often play a decisive role in determining whether change occurs. The most critical factor in determining the likelihood of change is the attitude of the administrative personnel. Support, encouragement and cooperation are required of those who initiate change. In order to promote change, administrators must understand the change process and it's potential effects. Roseabeth Kanter listed several reasons why people resist change, and several are briefly discussed below (Spina, 1988).

Loss of Control. The hierarchical structure of education suggests that this factor is important in educational change. Each level in the hierarchy can stifle change due to anxiety about the consequences of change on the existing structures and positions of authority within the structure. Personal involvement in the change process is the only effective means of counteracting resistance. Participation in the planning, creation, and implementation of new processes and programs fosters commitment to the innovation. Since the affective needs of participants in the change process are met by participation, each develops a personal commitment to the process. Irrational fears about loss of managerial control, status, or continued relevance can be tempered by involvement.

Uncertainty Created by Change. Educators at all levels simply do not know how technological advances will affect their existing practices. A full understanding of the need to adopt new approaches or technologies must be presented to counteract excess uncertainty. Opportunities to experience the beneficial consequences of the incorporation of emerging technologies should be provided to encourage participation. We should stress the idea that the logical implementation of technology involves the integration of new approaches and opportunities within existing structures and programs rather than their total replacement.

The Surprise Factor. Individuals generally do not adjust well to abrupt decisions and changes; initial reactions are often negative. It is important to provide information within a planned time frame that allows for full deliberation by educators. The process should provide

opportunities for individuals to adjust to proposals for change while protecting their own status and position. Threats to personal esteem can be minimized by allowing adequate time for change to occur and providing support for individuals involved in the process.

Substantial Extra Work. Additonal time and energy are required to plan and implement new programs or learn new skills than are necessary to follow existing routines. Support for change is required to encourage participation in it. Support should not only be moral, but should also involve financial support for resources and training. These costs must be included in budgets when change is initiated.

Past Grievances. If individuals feel that they have been unjustly treated, neglected, or coerced to make professional changes, the cooperation and effort required to institute change may not be available. Only in a spirit of genuine trust between teachers, administrators, and students, can change and innovation be promoted and sustained.

Real Threat Posed by Change. Participants in change may actually lose something when a system changes. It could be the direct influence of teachers to control student learning, or the loss of leadership status suffered by educators who are not skilled with emerging technologies. These losses can be balanced by new learning opportunities and teaching roles in order to encourage implementation.

The common theme implicit in all of these points is that in order to convince people to accept change we must communicate effectively. There is a need to ensure that those affected by change understand the underlying reasons, are provided with advance warning, are provided with adequate in-service training and, most importantly, are involved in all aspects of the change process.

Proposals for Provincial Involvement

The funding for education from provincial grants has been steadily declining for several years. This situation is likely to continue in light of the economic outlook for the province. The choices faced by school boards in responding to this situation are (1) increasing local taxation; (2) seeking other sources of funds; or (3) reducing services. Since public opinion mitigates against increased taxation, reducing or curtailing services seems to be the only option. All educational agencies have been forced to re-evaluate priorities and trim operations in the face of budget pressures. Further decreases in operational grants will necessitate restructuring on a massive scale. Schools will be forced to limit their role and further reduce services that they have been able to provide to students in the past. The responsibility for dealing with increasing social demands may have to be redirected to other government and private agencies for solution.

Increased communication and cooperation between school systems and the social welfare network will increasingly bind the K-12 education system into a provincial rather than a locally based system. The need to use technology to provide educational resources cost effectively on a provincial basis, and the requirement to integrate technology into all instructional areas, will hasten the movement toward increasing provincial involvement in educational operations.

The most effective method of improving educational efficacy and reducing cost is by reducing the size of the existing bureaucracies and promoting operational efficiency. The method of establishing meaningful reform is a subject of debate by educators. Robert Heinich (1991) declared:

> *School restructuring is the current hot item in education, but any efforts in that direction that try to work within the current framework will have little, if any, permanent effect.* (p. 237)

Leadership will be required from senior levels of government to ensure that meaningful reform occurs. A redefinition of provincial and local responsibilities in K-12 education would be a logical place to begin educational reform. Substantial savings could be created by supplying basic resources and services on a provincial rather than a local basis. Local input and control of educational functioning could remain unaltered. Examples of possible areas of increased provincial involvement might include the provision of:

- adult basic education programs;
- upgrading services for returning students;
- technological resources and in-service in their utilization;
- instructional resources for provincial curricula;
- agreed-upon administrative services;
- distance education services;
- a computer based educational network throughout the province.

A positive side effect of expanded provincial involvement in these areas would be an increased level of cooperation among school boards, especially in areas of the province where more than one school district exists within a geographical region.

Proposals for the Implementation of Technology

The present procedure for providing legislative grants to school divisions (Education Act, sections 304 - 313) provides flexibility in determining the basis upon which grants can be provided. The manner in which these grants are actually determined, based largely on pupil-teacher ratios, biases the mode of instruction away from technological resources in providing instruction to students. The teacher becomes the centre of instruction around which all educational activity occurs. Efforts to convince educational leaders that alternative modes of instruction utilizing technology as a major instructional approach should be initiated.

Local educational authorities should be given resources to introduce and maintain technological systems as a recognized part of operational costs. At present, no ongoing procedure exists for obtaining start-up funding to finance the planning and development of technology based instructional systems. Grant structures should be reorganized to provide the front-end resources necessary for involvement in technology based educational projects.

As with all instructional resources, technology based systems have a defined life expectancy. We must recognize that systematic replacement will be necessary as technological innovation occurs. Provision should be made to maintain and improve systems. School technology systems can not be allowed to become antiquated.

Wise investment in technological systems requires educational funding based upon a predetermined action plan. Before funding for technological improvement is provided to a school district, a detailed plan for its implementation should be required. The plan should include implementation details, plans for in-service training, system maintenance plans, and, plans for sharing results of projects with other jurisdictions or educational agencies. Large scale development of innovative projects requires a goal-based action plan. By the time a technology-based instructional project has been developed and validated in a classroom environment, the costs are substantial. Only by careful planning, based upon instructional goals and objectives, can we hope to incorporate technology based instructional models into existing practice on a large scale.

New instructional management models based upon both individualized and cooperative instructional strategies are possible through the adoption of technology-based instructional systems. These designs could foster a more cost-effective utilization of personnel, resources and facilities.

Instructional Software

Existing inter-provincial cooperation in the design and development of instructional software should be maintained and expanded. Often, local and regional influences determine the instructional objectives upon which educational software is designed. Commercially produced products, designed for an international audience, often fail to meet these local requirements. We must develop our own capability to produce educational software designed specifically to complement existing courses. Production and piloting costs involved in the creation of software suggest that a regional approach is necessary to sustain development. Large scale adoption of these products can be encouraged by maintaining a moderate cost for licensing. The marketing of our products to other interested educational institutions, both nationally and internationally, could possibly contribute toward defraying development costs.

Conclusions

Increasing educational productivity will require changes in the governance structure and administration of education. New management models should incorporate technology to promote cost efficiency and eliminate unnecessary infrastructure. Centralization of selected educational responsibilities can improve cost effectiveness without endangering local input or reducing local control of the fundamental educational process.

The incorporation of technology as an essential instructional component can facilitate the adoption of open, flexible structures of school organization based upon student, teacher, and community needs. Rather than relying totally upon the classroom and grade structure, a more flexible working structure could be developed to use professional resources and give students more control over their education.

We must overcome both personal and institutional resistance to change in order to provide the highest possible level of educational service to students of the province. We must learn to be both imaginative and cooperative in our search for solutions to educational problems . This may well be the most difficult challenge facing both present and future educators in the province.

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Educational Technology In Action

In the K-12 Coalfield School in Tennessee the Tennessee Valley Authority has tested videodiscs for the past two years, filling the school with discs designed to help with mathematics, science dropout prevention, career counseling, and encyclopedia research. Compared to students at a local control school that formerly showed higher levels of science and mathematics mastery, Coalfield students now score far ahead in those areas.

Chapter 7

Distance Education and Computer-Mediated Communication: Tools for Educational Reform

Robert G. L. Longpré

Abstract

The purpose of this chapter is to provide a rationale for the use of computer-mediated communication (CMC) in the delivery of distance education. The relationship between teacher and learner, the focal point of instructional systems, is lost in situations where the learner and the teacher are separated by time and space. This relationship is recaptured to a significant degree when CMC is used. A brief survey of the delivery systems being used for distance education and their effectiveness in bridging the distance between teacher and learner will be presented to highlight the usefulness of CMC for communication in distance education programmes. The effective use of technology in distance education provides for economic and pedagogical solutions to the problems of a changing and mobile population. This chapter will illustrate how CMC can provide quality learning for those learners disadvantaged by traditional education.

> *One morning you wake up, look out your window and discover the world has changed in unrecognizable ways. You are told that we live in a global village and what happened 10,000 miles away will affect your small, rural community. You are told that the information age is here and that the industrial age is on the way out. When you look around your community you notice there are fewer shops, the hospital has relocated to a larger community, and fewer job opportunities exist. The population appears older, with fewer young people moving into the community. Many of the valued elements of community--trusted, longtime neighbors and friends, active school programmes, and community pride —have diminished. But you still find yourself paying more taxes. You lock your door at night. You begin to wonder if the community can survive. If it did, you wonder whether the quality of life will suffer irreparable damage. You begin to think about leaving.* (Miller, 1993, p. 100)

Saskatchewan education is embroiled in a period of massive changes. The communities, within which many of our schools are found, are themselves changing (Brown, 1992; Haughey, 1992). Small communities are becoming smaller. They cannot compete with larger centres

which provide more diversified services and opportunities. The ability of people to travel outside of their communities at reasonable costs, and the expectations for a wide choice of goods and services, has changed the commitment to community for those remaining in the smaller rural communities (Miller, 1993). Young families, the lifeblood of these communities, are finding little incentive to remain in their home communities (Thibault-Bélanger & Morin, 1993). Fewer career opportunities, dwindling services, and a numbing lack of choice and opportunity for their children contribute to the exodus. Those who stay in the community then find it difficult to maintain an educational facility for the the community's youth who remain.

All too frequently, the predictable reaction to the above situation has been the closure of small rural community schools. The tension caused within communities over the issue of keeping the community school open is exacerbated by the threat to the community's very survival. With school closure, students are typically bussed to another rural school. Yet even with these amalgamations, schools struggle to find the number of students necessary to offer diversified educational programmes. Often, the schools are forced to have a number of programmes delivered to the students via correspondence courses (Haughey, 1992). However, due to the dwindling tax base and cuts in provincial funding, further erosion to the system continues.

In a study of financing within the Saskatchewan education system, Scharf and Langlois (1991), proposed a reorganisation of the administrative structure characterised by fewer school divisions with fewer administrators. Another report, commissioned by the Saskatchewan School Trustees Association (1993), gave similar recommendations. In an attempt to manage education in a time of funding cuts, increased centralisation of the administrative arm is seen to be one of the prime focal points for fiscal management of educational costs (see also chapter 4 by Victor Anton). With the proposed centralisation, local school boards will be eliminated, which in turn has a negative impact on the viability of the community (Haughey, 1992).

Exacerbating the financial dilemma faced by the remaining schools is legislation which requires students to successfully complete an expanded number of compulsory and optional courses in order to receive a diploma. The Provincial *High School Review Report* (1994), proposes further changes to curriculum and course requirements. Changes in courses and course requirements, necessitate the staffing of the schools with capable teachers who have the requisite training to present these new and revised programmes. Redefinition of the educational programme puts added stress upon the smaller community schools (Black, 1992), stress which often culminates in the closure of smaller schools.

Schools have traditionally used distance education to acquire compulsory coursed which the local school could not offer. With the improvement in delivery methods and significant advances in technology, distance education now provides an effective alternative which will enable the province to continue to meet the needs of Saskatchewan students. Distance education can also serve as a means of promoting community survival, as a growing number of students take courses via a number of distance education delivery systems (Fittes, 1992; Saskatchewan Education, 1992).

Distance Education

Distance education refers to any situation in which there is a separation of learner and instructor by either time, place, or any factor that doesn't allow for face-to-face interaction

between the instructor and the learner (Keegan, 1990; Holmberg, 1974). Who are the consumers of distance education?

> *Nowadays distance education can be anything from mass media to 'boutique' education. It can be for literacy, agricultural or health education in developing nations, and for mid-career professional development ... it can also provide school subject diversity and choice for children, and workplace education for the 'restructuring' working classes. Within and beyond these examples, distance education is also expected to provide a more equitable form of access ... for people whose circumstances or disabilities have often made other forms of education difficult or impossible.* (Evans, 1991, p. 1)

In the Saskatchewan context, the clientele include a numerous and varied cross-section of our society (Saskatchewan Education, 1992): learners who are confined to their homes or institutions, learners who are removed by distance, learners who are constrained by time factors, learners who find that their educational institution does not offer the programme due to the absence of a qualified subject specialist. The audience for distance education includes any and all who wish to pursue learning, regardless of lifestyle, value system, age, health, or past educational experience.

Distance education requires the instruction to be presented to learners through the mediation of a variety of technologies such as letters and telecommunications facsimiles (fax), newsprint, television, both narrowcast and broadcast, video cassettes, films from the commercial film industry, and telephone and audio cassettes (Bates, 1984a; Brown, 1989; Brown, 1992; Kaye, 1989). Also entering the market, are educational kits and computer programmes, which provide a multi-media approach to course delivery (Hudson, 1992a; Schwier, 1994; Schwier, Brown, Misanchuk, & Proctor, 1992; Willis, 1994). This mediation by technology allows mass media to act as a relatively effective substitute for face-to-face instruction (Bates, 1984a; Hudson, 1992a; Schwier et al, 1992). The use of technology as a mediator between the educational system and the learner, allows for a broader participation in the field of basic education, training and retraining, as well as in higher education (Fortosky, 1983).

Distance Education: Designs for Communication

The distance delivery systems in our province range from traditional correspondence courses to innovative experiments using video and computer technology (Brown, 1989; Brown, 1992; Fittes, 1992). The delivery systems attempt to provide a complete learning experience which in turn emphasizes the disadvantage of being unable to be in a face-to-face learning environment.

The Saskatchewan Government Correspondence School (SGCS) is at present serving the distance education needs of thousands of students using a variety of technologies (Haughey, 1992; Saskatchewan Education, 1992). However, the use of print packages still remains the major medium for course delivery. Rumble (1986), stated that such approaches to education delivery are 'institution centred' and "fundamentally incompatible with a humanistic, person-centred approach to education" (pp. 27-28). The interactivity of correspondence courses is relatively low. Often a period of weeks separates the mailing of a lesson and the return of the

lesson with appropriate feedback for the student. Occasional telephone contact is offered as a supplement within prescribed hours, for those students requiring assistance with troublesome concepts or procedures. However, for the most part, the students spend most of their course hours responding, on paper, to directed questions with little mediation and dialogue between themselves and their correspondence teacher.

Traditional use of the television for education follows the patterns established with the use of films (Bates, 1984b; Brown & Fortosky, 1986). The instruction, which is produced in isolation from the learner, is presented in a teacher-centred instructional style. Instructional television (ITV) is utilized in a number of courses by the SGCS as a supplement to the print-based courses, as well as providing additional resource support for smaller rural schools (Brown, 1991). Interaction between the learner and the instructor is non-existent.

An outgrowth of ITV, interactive televised instruction (ITI), attempts to remedy the problem of the missing two-way communication. In the ITI design, one-way video is complemented with two-way audio and two-way print communications (Brown, 1990; Fittes, 1992; Oliver & Brown, 1992). Students watch "live" lessons and are able to communicate with the instructor via the phone (Brown, 1989; Fortosky, 1983). Assignments and print materials travel between the instructor and distant learners via a facsimile machine. As well, there is use of an instructor who facilitates discussion in the distant classroom. The increased level of interactivity provides for a more dynamic learning environment (Dillon & Gunawardena, 1990). However, this design fails to meet the needs of learners whose learning institutions are not technologically linked, and those whose schedules preclude participation in the learning activity at the time of broadcast.

A second design using ITI allows for two-way video and two-way audio (Forsythe, 1984). This approach to distance education delivery meets nearly all the communication elements that are necessary to provide a learner-centred environment for education. As well, ITI is the design which is the most interactive of all designs because the learner and the instructor can see and hear each other (Tompkins, 1992). The main impediment to the adoption of this system, at the present time, lies in its cost. This improved form of ITI, however, also fails to meet the needs of those learners who are unable to meet the time schedules demanded by the nature of the system.

In an attempt to provide for learners who have been disadvantaged by place, time, and pace of learning activities, instruction can be presented in an electronic format using computers (Jones, 1984). The use of computers to present, instruct and test concepts, facts and skills to learners, and to use the computer as a manager of other media such as laser discs, CD ROM and video players provides for a more diversified learning environment that allows a learner to proceed at a time, place and pace that is best for the learner (Schwier et al., 1992). The hope is "to provide a rich vicarious experience which approximates genuine human interaction" (Schwier, et al., 1992, p. 11). The computer functions as a form of artificial intelligence in conversation with the learner. The learner is given the freedom of choice while navigating through the tutorial and its components at a pace and time of the learner's choosing (for a more complete discussion on the designs for distance education, see Keegan, 1990).

Computer-Mediated Communication

The computer can bridge the distance between the teacher and the learner across time and space much in the way that two people are able to be linked via the telephone (Holden & Wedman, 1993). Holmberg (1974), places the two-way communication link as a critical element in distance education. The use of a modem to link a teacher and a learner allows for authentic interaction in a written form, similar to letters. The difference between these electronic letters (e-mail) and the use of a postal service for paper letters (snail-mail) is transmission/delivery time. Electronic mail allows for quicker turnaround, allowing the learner to proceed through lessons with fewer delays at a time convenient to both learner and teacher, and immediacy, which is important for learner success (Holden & Wedman, 1993). Mail is delivered instantly and is stored until either party accesses the letters sent for reply.

Another feature of CMC is the ability to join into group conversations (Mathiesen, 1993) and group activity (Holden & Wedman, 1993) even though the members of the group are separated by time and or space. Conferencing via the computer allows learners to share ideas and cooperatively solve problems through dialogue and negotiation (Harasim, 1989; Henri, 1992). Dialogue and negotiation, critical components of the face-to-face instruction, are used to bridge a transactional distance (Moore, 1991). Dialogue via the modem, using both electronic mail and computer conferencing (Harasim, 1990), gives the learner more time to pose questions and format replies, with the opportunity to revise before forwarding the messages (Mathiesen, 1993), and allowing both learner and instructor the opportunity to close the physical and the psychological distance between them.

CMC and Distance Education

As recently noted by Proctor (1994), Saskatchewan has developed a vision and philosophy for education that puts the students at the focal point of the teaching-learning process (Saskatchewan Education, 1984). Students are to be given every possible opportunity to be "actively involved in knowledge construction" (Saskatchewan Education, 1988). With the focus shifting from teacher-centred mode of instruction, to a student-centred design, Saskatchewan Education (1991), proposed in its manual for teachers, *Instructional Approaches: A Framework for Professional Practice*, that instruction should be based on a multi-modal approach including direct instruction, indirect instruction, experiential learning, independent study and interactive instruction (p. 15).

Interactivity, the interaction between learners and teachers, is a prime measure of the quality of education (Collins & Bostock, 1993). CMC provides for interactivity that most distance delivery designs lack. CMC provides for interactivity through two modes. Computers can be linked together to form networks that span distance and time through "network-specific tools" such as e-mail, and through conferencing (Markwood, 1994). Networks can be designed to serve a very limited population, similar to a school classroom, or they can be open to the general public. The connections between each member of a group are maintained by a computer through modems and telephone lines.

The interactivity is asynchronic, for the most part; however, there is the potential for real-time interaction should the learners and/or instructor coordinate their times on the system.

The asynchronic nature of CMC allows learners to pose their questions while they are pursuing their studies, regardless of time of day or day of week (Cadigan, 1993; Mathiesen, 1993). The manner in which questions are prepared allows the learner time to construct and reconstruct questions with appropriate revisions. Often, in face-to-face instruction, learners are pressured by time to pose ill-formed questions. Questions are then held in storage until the instructor checks for messages. A response to the question can then be prepared in full, then e-mailed back to the learner. Neither learner nor instructor is prevented by time from communicating. Provision for a dedicated real-time session (electronic office hours), allows learners to pose questions, seek immediate feedback, and hold an "on-line discussion".

CMC also provides a forum for learners to communicate with others who are taking the same course. Peer-group conversation can help clarify concepts by providing additional points of view, and benefit from the different experiential backgrounds held by other learners. This ability to "conference" removes a final barrier to the implementation of the "Common Essential Learnings" (CEL's) in distance education (Saskatchewan Education, 1988). The ability to "work harmoniously in groups and with other groups" can be accomplished by electronically connecting students. Mathiesen (1993), Markwood (1994), and Wells (1992) provide us with examples of conferencing. A conference can be limited in membership, then reshaped to include others, as the group purposes change.

With learners linked electronically using appropriate computer hardware and software, the learners can also gain access to resources to enrich resource-based learning. Larger conferences exist which allow access for research and communication, conferences such as KIDSNET, NASA NEWS, FREENET, and USENET (Krol, 1992). Access is also available to major databases around the globe, permitting research on any topic conceivable, a resource centre at the fingertips. Public discussion channels are open for participation through the International Relay Chat (IRC). Real-time conversations covering topics from music, sports, politics, and philosophy to discussions of Star Trek programmes, provide the learner a chance to interact, or merely to listen as others discuss a topic of interest.

The Universities of Regina and Saskatchewan are already connected to a major electronic channel, INTERNET, as is the Public School system in Saskatoon. In rural Saskatchewan, there are a few individuals associated with the universities who have access to INTERNET for research purposes. As one of those, the author has conducted a computer-mediated communication pilot project to extend the communication component of several French-as-a-second-language classes.

A Case Study of CMC Dialogue

In the late winter of 1994, at Lanigan Central High School in the Lanigan School Division, a grade 11 French class was connected via Internet with a high school in New Hamshire. Fourteen students from Saskatchewan wrote letters in French to their partner class of five students. When they received responses to their initial letters, the Saskatchewan students excitedly exchanged French letters with a sense that they were truly communicating (and of course, they were!). At the start of the second semester in February, there was increased interest in "electronic twinning" with other schools.

Within weeks, the grade twelve French class was busily exchanging letters of significant length and quality to schools in New York State and Nebraska. The latest project being attempted by this class links them with electronic penpals from Belgium. The grade eleven French class is continuing its dialogue with New Hampshire with the mailing of biweekly French newsletters, a project that has the class working cooperatively on the production of the newsletter. The grade ten French class has established a link with a school in North York, Ontario. The novelty factor is likely responsible for the high interest in the project. However, the quality of the students' work has improved and the students are requesting solutions to communications that often go far beyond the required concepts of the classes. The need to communicate has opened the door for real learning which involves authentic "electronic" conversation.

The next stage of the project involves connecting our students to francophone students. This stage will test the students' abilities to communicate using the target language with an audience composed of native speakers of the target language. Without access to CMC, the potential for accomplishing a similar dialogue could only be attained through the use of regular mail penpals, an idea which has extremely limited appeal to students due to time delays.

The class connections were achieved by posting letters to a "conference" on Internet called International Electronic Classroom Connections (IECC) and K-12 Euroteachers. Other conferences exist which enable classes to meet and connect with other classes as well as providing a forum for meeting penpals. For the purposes of our next project, we will be providing interested students an access to a discussion group on Internet called *Causerie*, a Café campus for chit chat in French by a conference group that has a large number of both francophone and francophile participants.

Conclusion

With the notion that learning is a community affair, it is natural to want to include the extended community in the education of our youth. CMC provides a conduit that connects the most distant with the most urban through a medium which promotes a democratic form of learning (Mathiesen, 1993; Egnatoff, 1992). Since there are different groups of distance learners, there must be different delivery systems to meet their peculiar needs. However, regardless of the delivery system used, the use of CMC in the design of the delivery of the educational programme, is an essential factor to maintain interactivity and communication between the course of study, the instructor and the learner.

Who will have access to learning, training, and the achievement of educational objectives? If any are deprived of the right to education, then there needs to be a change in the design and the delivery of the system that allows that situation to exist. Technology has provided many models that allow for equitable access. Each situation has a number of possible solutions that would provide the desired goals. The task is to examine the needs of the learner, the goals of the programme, and the associated costs, then propose a set of possible solutions.

The design and delivery of distance education should reflect the goals of education outlined by Saskatchewan Education in the Core Curriculum. goals which look to instructional strategies that are learner-centred and which are evaluated in a manner that is more formative than summative. CMC offers much to both learners and teachers so that the vision of Saskatchewan education can be achieved with reasonable ease. As well, CMC provides an economically and

pedagogically sound avenue through which some smaller schools can remain viable thus supporting the survival of many small rural communities.

Recommendations

- adopt CMC as the preferred channel for communication for paper-based correspondence courses. Assignments could be sent and received using e-mail thus avoiding the long delay between the completion of a lesson, and the receipt of comments from the assigned marker. Directed questions from the learner to the assigned tutor/instructor would successfully bridge time difficulties often encountered using the phone. The bulk of the course, the lessons, would remain in print form for ease of production.
- adopt CMC as the preferred channel for communication for courses that are computer-based (multi-media formats included). The need for a human contact to discuss ideas, problems and concepts needs to be addressed. As with the correspondence course, that link can be maintained using CMC.
- adopt CMC as the preferred channel for communication for ITV courses, such as the courses offered by the University of Saskatchewan. The weekly broadcasts (as well as narrowcasts) fail to address the needs of the students who encounter problems at inconvenient times. Electronic office hours would enable timely resolutions of problems. Either the instructor of the learner could initiate dialogue.
- adopt CMC as a medium to introduce cooperative learning where learners would otherwise be isolated. The use of dedicated conferences, as well as the ability to join public conferences would provide the means for learners to develop and construct knowledge based upon negotiation and dialogue.
- provide regional nodes for connections to Internet and other communications channels, so that all learners in the province would have extended access to resources for research. The use of this dimension of CMC would provide a rich information base for the provision of resource-based learning.

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Educational Technology in Action

Students can digitize and customize video images from CD-ROM, video cameras, videodiscs, VHS Tape and live television, They create multimedia reports, projects and videotape "books" Sharing the computers encourages students to work cooperatively. In-class computers linked with the local cable company allow students to see national and international news, business reports and sports events.

Educational Technology In Action

Most schools are made of bricks and mortar, but eight school districts in West Texas have created a school made of modems and microchips that cost just $5,000 to build. Academy VS-BBS (Virtual School Bulletin Board System) stays open 24 hours a day, 365 days a year, and is reached by thousands of students using modem-equipped computers and telephone lines...

Students dial the Academy free of charge to read and write E-mail messages, exchange information through on line forums, search data bases of information, and acquire free software they can download onto their own computers. They also read on-line tutorials and lessons, take tests to gauge their skills, ask questions, tutor peers, plan collaborative projects, and get answers to their questions — almost as though they were in a traditional four-walled school building.

Chapter 8

Industry/Education Collaboration: Opportunities and Approaches

Robert O. Powell

Abstract

One of the clearest and most persistent clarion calls for educational reform and increased attention to educational technology has come from business and industry. Several models of collaboration between education and industry are emerging, offering innovative perspectives on how partnerships can be formed to address educational problems. This chapter repeats the call for collaboration between education and business and industry, reviews some examples of successful collaborations (most notably COMETT, a strategy for higher education/industry partnerships in Europe), and identifies challenges which face Canadian education.

"A competitive world has 2 opportunities for you; You can lose, or if you want to win you can change. Winning is not easy nor is changing. We can do it with inspired educators who are prepared to instill enthusiasm and curiosity in their students about the world of work, of life long learning, business, information technology and the foundations in math and science that will be a prerequisite for a successful career in the 90's and beyond."

Lester Thorough, Dean
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The economic and educational landscapes of the developed world are changing—rapidly. For example, in 1983, the government of Japan declared information a commodity and knowledge an industry. The Japanese reorganized their schools and their economy to activate this position. While the same position has not yet been adopted by the schools and economies of North America, it ultimately will be, and the change is underway. This chapter challenges the largest player in the knowledge industry, public education, to seize the opportunity for making changes.

If we are to address the issues surrounding educational reform, we require a culture that supports schools and change. The two countries ranked at the bottom of all the industrialised nations of the world in terms of their commitment to primary and secondary education are Canada and the United States. We need a structure, a national vision of the role our nation will play in the information revolution (Daggett, 1991). Is the information revolution really a revolution? "A decade ago (mid 1970's) about 77% of jobs involved at least some time spent in

generating, processing, retrieving, or distributing information. By the year 2000, that figure will be 95%." (Cetron, 1988, p.9). Within 15 years, virtually every job in our country will require some skill with information gathering, processing and delivery technologies.

Japan has declared its economic vision by adopting an industrial model of information. Germany has articulated a vision of its economic condition for the next ten years. The European Community has had a strategy for higher education and industry partnerships for a decade. Great Britain has had a Council for Industry and Higher Education since 1987. Ireland has a national strategy to harness the potential of its higher education system. Coldstream (1992) advises that the European business community is taking the lead in using technology for many purposes (including instruction) and is pressing schools for graduates who can fit more readily into technology-based work environments. It is endorsing concepts of schooling that incorporate communications and computer technologies. Business leaders have now become advocates for more productive schools and collaborative ventures between higher education and industry have grown.

A publication entitled *Inventing our Future: An Action Plan for Canada's Prosperity* (1992) outlines Canada's recommendations[1] for far-reaching social change. This document addresses industrial and educational concerns and maps future directions, but we have yet to respond to the recommendations. While the rest of the developed world actively prepares for participation in the new knowledge industries, Canada appears to be reluctant to move.

In recent years, collaboration between higher education and industry has become a highly topical issue. Compared with only 10 or 15 years ago, the climate of opinion about such collaboration is strikingly different. At about the start of the 1970's, collaboration between education and industry was widely regarded as taboo, an attitude linked partly, no doubt, to the social unrest of the late 1960's. When it occurred at all, discussion usually centred on the dangers or disadvantages of closer links between universities and industries rather than on their possible benefits. Today, all European and most Eurasian governments, irrespective of political allegiance, are calling for this kind of cooperation and taking measures to facilitate it (Cerych, 1985, P.7). Meanwhile, at this point in time, Canada has only a position paper discussing the subject of education/industry alliance.

Throughout our country there are scattered examples of industries collaborating with education for the purpose of furthering their respective interests. Though these initiatives exist, ferreting them out proves to be difficult. There is no national strategy or formal group in Canada to promote partnerships; fugitive literature is the most likely source of information. A more fertile stand of information is found in European literature.

Two important collaborative efforts have been in process for nearly a decade in Europe and a great deal has been published on their experiences. They are COMETT and The Council for Industry and Higher Education—European Community and United Kingdom initiatives respectively. What follows is a summary of these initiatives and a discussion of their successes and failures. Canada might consider this information as we embark on a journey to form industry/educational partnerships. It may be presumptuous to assume this journey will happen, yet analyzing the European experience in light of the dilemma of the Canadian educational condition, one could assume that there is no other choice if we are to be productive, competitive members of the global community into the next century.

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1 See Appendix A for a summary of the report

COMETT

In 1992, Prosser and Durando reported on COMETT (European Community Action Programme for Education and Training for Technology), which has been in place since 1986 and will operate until 1995. COMETT is a practical programme of university-industry cooperation, It is by far not the only such strategy, but it is perhaps the only one that tackles the issue on a transnational basis. COMETT deals with what we believe to be the most telling immediate and longer-term issues for both education/training and industry success, namely:

- the broad-based impact of technological change;
- the essential link between knowledge creation and its dissemination and exploitation;
- the economic and education structures through which the above processes occur, namely the relationship between our highest centres of learning and productive industry;
- bringing university and industry together in a voluntary way in which each side can be open about the dichotomies that divide, and, arguably, should divide, two entities which are often considered to have fundamentally different strategic objectives, although they are deeply complementary. In a very simplified form, on the one hand, the university is dedicated to knowledge in all its forms and branches, its long-term development, and its open dissemination. On the other hand, the industry is concerned with immediate innovation and exploitation of this new knowledge, short and medium-term economic return, and thereby legal and commercial constraints of the distribution of that new knowledge.

COMETT is concerned with changing attitudes in both higher education and industry, and about creating lasting change in behaviour (Prosser and Durando, 1992, p.346). COMETT is comprised of members from 19 countries covering the entire geographical area of the European Community and most of the European Free Trade Agreement countries. This initiative is based on collaboration and partnership. There are basically three separate initiatives set out by COMETT and reported by Prosser and Durando: University/Industry Structures; University/Industry Exchanges; and University/Industry Joint Training Projects.

Since 1990 COMETT has supported more than 200 university/industry consortia, 7,000 student placements and 100 personnel exchanges annually and 470 joint training projects. The joint training projects have spawned over 1,270 courses, 720 sets of training materials, 148 studies and numerous databases and newsletters. This probably represents 20-25% of the expected final output of COMETT II by 1995.

The COMETT undertaking has its successes and failures but overall the initiative is considered an overwhelming success. The three objectives set out at the formation of COMETT I: faster industrial application of the results of fundamental research, improved output of technical skills and more effective transfer of technology between sectors and regions appear to be being met (Prosser and Durando, 1992, p.347).

There are many lessons to be learned from this broad-based project. The following is a summary of Prosser and Durando's findings.

General Higher Education/Industry Cooperation

- Higher education-industry cooperation is not an end in itself. The most successful cases of cooperation occur when the cooperation is adopted as a means of achieving specific goals.
- Higher education institutions and companies, but especially the former, need to integrate into their institutional mission a strategy regarding higher education-industry cooperation.
- Companies will, rightly, be primarily concerned with the direct and shorter-term benefits from higher education-industry collaboration though companies are increasingly aware of a wider social responsibility with regard to education generally.
- Skills and training needs analysis are vital areas where higher education-industry cooperation is indispensable. This is urgent in view of the clear and persistent skills gaps which are emerging. There are no standard tools for an analysis to match current training supply and the shifting demand. Such tools need to be developed.
- Management of the interface between higher education and industry should be linked to the top level management within the organization. It should also be specifically assigned and resourced.

Cooperation Structures

- These structures should be well resourced and managed, transparent and accessible internally and externally. Only the larger companies appear to be positioned to assign a specific department or manager the responsibility for contacts and cooperation with higher education. The smaller companies can collaborate within a regional or sectorial consortia (eg. petro chemical, pharmeceutical, mining).
- Such consortia have proved that they can have a substantial impact on the development of training policy, provide a cost-effective infrastructure for addressing the training challenge, form networks for information exchange and cooperation and act as catalysts in many of the activities and programs (e.g. student placements, technology transfer, R&D, etc.).

Exchanges and Staff Development

- Student placement in industry provided high level recruits for companies, had a demonstrable impact on the economic performance of the company through technical development undertaken by the student, stimulated new European market contacts, provided the impetus for strengthening cooperative partnerships between participating organizations and contributed to an increased training culture.
- Given that the supply of student placement opportunities is sporadic, it is important to have a local administrative arrangement for community funded placement grants.
- Any scheme for student placement should include a network providing the location of placement opportunities, a coordinated scheme for placement offers and acceptances,

quality assurance in the selection and monitoring of students during placement and student support during placement including: financial, academic, linguistic and welfare.

Successful Personnel Development and Exchanges

- A need for a corporate and educational culture which supports and encourages bilateral cooperation is essential.
- A commitment to cooperation should be seen as an integral component of the job description.
- The commitment to working in industry should be granted the same importance as teaching and research when performance is assessed.

Joint Education and Training Projects

- Cooperation in education and training projects is the most effective way of matching supply with demand for qualified personnel.
- The production of training products has identified a market for these materials beyond what they were initially developed for.
- Training of trainers is essential and a good opportunity for higher education.

Higher education and industry will increasingly compete in providing qualified and adaptable trainers. The issue will present a particular challenge to higher education, in regard to which it has been estimated that by the year 2000, 60% of teaching and learning activities will be in lifelong learning (Prosser and Durando, 1992, p.338).

University/Industry Joint Training Projects

Expertise in open and distance learning is a common factor linking higher education and industry. Joint training projects offer excellent opportunities for assistance in strategic areas such as:

- The widening of access to higher education in Europe by supporting the extension and development of distance education and training (at both initial and continuing education levels). There are special opportunities here to strengthen educational infrastructures in less favoured and remote regions and for those categories of citizens that have inadequate access to education training;
- The promotion of distance and open learning for the recurrent and continuing training of the workforce (in particular subject material experts), with special attention for the priority sectors of industry, critical to the future of the Community (EC) internal market;
- The promotion and introduction of new, notably computer-based, learning technologies for in-company training, benefiting from and exploiting transnational collaboration and networking of open and distance teaching universities. This can also promote

collaboration between open and distance learning institutions and conventional institutions of higher education. (Prosser and Durando, 1992, p.347)

Though highly successful, COMETT, in eight years, has experienced growing pains. One shortcoming has been its failure to develop a process for systemic discussion and analysis of its collective experiences. A need exists to formalize an information gathering and dissemination process regarding its experiences. Another area demanding attention is a process to improve the management capabilities of those responsible for COMETT projects. Phenomena which led to this diagnosis include:

- Proliferating networks: Many networks have sprung up as a result of COMETT and many institutions participate without a clear vision of why they are participating. Many suggest it is to keep their options open. The net effect is that many of these networks contain ineffective partners and their contributions are difficult to assess.
- Internal tensions: Consortia, though consisting of a variety of partners, lack real collective initiative as they are caught up in internal rivalries for funding and other benefits accruing from COMETT.
- Resources to match ambitions: Strategic goals are established by member institutions but the resources allocated (size and quality) do not match these visions. It appears to some that participation in projects is a function of how much revenue can be generated rather than how much benefit will accrue the participant. Higher education may be treating the activity as 'just another project.'

Because of these shortcomings, COMETT has given greater attention to systematic training support for those engaged in running its projects. Plans are in the works (1992) for a modularized training program targeted at consortium managers.

Any project the magnitude of COMETT will suffer growing and operational pains. The successes reaped by European educators and business groups far outweigh any angst experienced by the participants. The attitude appears to be one of turning difficulties into opportunities given the many successes of COMETT; it has raised awareness about the value endemic to university/industry cooperation.

Council for Industry and Higher Education (U.K.)

Another such academic/industry cooperation initiative is the Council for Industry and Higher Education in the United Kingdom. The Council is a private initiative of the U.K. business community (larger firms predominately). It has grown into a recognized force that has shaped the strategic agenda for higher education in Britain.

Though the British business community has not been know for its collaborative/cooperative association with higher education, it became apparent that this missing link was needed for the good of the British economy.

> *Business people in Britain have rapidly come to see that their future against international competition lies only in adding value to their products and that the source of that quality and added value can lie nowhere else but in the national stock of brainpower. Our products, processes, and services must*

compete by being cleverer. Schools, universities, polytechnics and colleges are responsible for nurturing that brainpower. Accordingly, educational aims and performance have suddenly come to seem of paramount importance to business leaders . (Coldstream, 1992, p.365)

It was this realization that provided the impetus to promote a successful British, higher education, experience. In 1987, the Council was born. The Council for Industry and Higher education is an undertaking at the highest level. Leaders of the academic and business communities collaborate on articulating a collective message to universities, colleges, companies and governments. The message focuses on long term concerns and suggested approaches for change.

The Council is a self-funded entirely independent body comprised of 37 very large companies and 13 academic institutions. Meetings are infrequent (the players are very busy) and last precisely 105 minutes. Published papers and confidential memos to policy makers flow from these meetings and as a result the business community of the United Kingdom is heard (and respected) within the academic community.

The first undertaking of the Council was to provide a rationale and strategy for business/academic relations. In 1987 leading academics and business people arrived at a unanimous statement, consisting of eight elements for Britain's educational directions into the 21st Century (see Appendix B for these elements).

It was first expected that the business community would view technology transfer (the collaboration of research and exploitation of results) as paramount. These expectations proved to be shortsighted. "Company chairmen across the UK are perfectly sure that their first interest lies in the supply, not of research results or academic publications, but of broadly educated people, flexible, adaptable, and equipped for a working life of continuous learning, training and updating (Coldstream, 1992 p.368)." The first concern of the British industrialists was for the students and their teachers.

A striking change, evidenced in the letters we received, was the corporate concern, now widespread and often passionate, with the process and output of teaching. We hope that level of interest will be translated into greater recognition of those institutions and staff who stand at the forefront of the art of communicating the world's knowledge to others (see Appendix B for prizes given by industry). To enlarge the UK's capability in the competitive practical world, the quality of the learning process is seen as central. (Coldstream, 1992, p.371)

This British Council, in 1987, wanted the curriculum to be rebalanced towards science and technology while emphasizing continuing education and the needs of adult and part-time students.

We believe, however, that the principles of mathematics, science and technology, properly understood and taught (which is not easy), must now be part of the foundation of an excellent liberal and general education, quite as good as any in the past and much more apt in equipping its students to live and work in the information society. (Coldstream, 1992 p.368)

One would also have expected an overwhelming influence on the academic community from business interests. There were concerns that the monetary drive of the industrialists would overwhelm and set in second place, the humanities. Once again pleasant surprises surfaced.

The Council believes that the scholarly pursuit of the humane disciplines, which provide new forms of thought and renew the language of public debate, not only is thoroughly proper but is in fact vital to the thriving and prosperous society we all look for. One purpose of our economic efforts, corporate and individual, is to provide good scope for scholars, thinkers, artists and writers to enable them to speculate, to argue, to develop our culture, and to pursue other activities valued as ends in themselves.

Very few complained that the financial community posed any threat to academic independence. The business community was comfortable with the notion of leaving the matters of education to the educators; they only wanted to know that their voice was being listened to.

The Council members expected practical outcomes from their efforts. "In 1987, the Council criticised as far too low official projections that student numbers would increase only four per cent by the year 2000; now the growth forecast for the same 13 years is approximately 75 per cent (Coldstream, 1992, p.374)". Further, the Council prompted the government to undertake a study to ascertain what constitutes good teaching; this was done.

The Council agrees amongst its members that the channels of communication for industrialists and educators are, indeed, open. This mutual respect and understanding has resulted in a discernible increase in support from the business to the educational community. This support amounts to about about 350 million British pounds annually in various categories (see Appendix C for categories of business contributions).

> *"Universities are now receiving on average about six per cent of their regular income from business, though percentages at individual institutions vary quite widely."* (Coldstream, 1992, p.375)

The Council has not established a time frame for its existence. It will remain an entity providing there continues to be constructive output. The plans for 1993 included:

- how to expand membership and provide guidance to course developers;
- how to diversify institutions so that they do not all attempt to strive for traditional academic excellence; and
- how to ensure that teaching is given priority.

Between the Council for Industry and Higher Education and COMETT, there are about 20 years of experience in business and industry collaboration upon which Canada can draw. I hope Saskatchewan seizes the opportunity to formalize the partnership process involving industrialists, business leaders and educators; the time has come to respond.

I present my research and ideas in a spirit of collegiality. Though I have, at times, strong words condemning the attitudes and performance of some policy makers, teachers and education administrators, I am well aware of, all around us, pockets of excellence in the educational domain (see Appendix D for a Canadian case study). It is my hope that the creativity, spontaneity, and productivity that drives these centres of excellence will be enthusiastically sought out by those who direct change and that these initiatives will be emulated.

In summary, I hope I have demonstrated that there are models that can assist Canadians in improving the condition of our educational environment. There are calls for a new future from parents, teachers, business groups and governments for the education of our children. We should embrace rather than fear change.

Recommendations

1) Establish an educational reform committee comprised of proven educational reformers, industries, parents and young adults.

2) Pursue an understanding of COMETT and the Council for Industry and Higher Education.

3) Adopt recommendations from *Inventing our Future - An Action Plan for Canada's Prosperity.*

4) Embed information technologies management into the core curriculum of our two universities in Saskatchewan.

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Appendix A
Recommendations from *Inventing Our Future: An Action Plan for Canada's Prosperity*

Focus educational and training systems on results

- a Canadian forum on learning to define goals, and promote innovation and partnerships for excellence in learning, and
- competence-based systems for all levels of education and training where success is defined by measurable skills.

Establish a national quality institute

- Business, labour, educators, governments, communities, special interest groups, consumer and retail organizations, and media to set up the Institute, with quality networks in all regions and sectors of Canada. Costs would be shared by the participants.
- Develop and implement consumer education programs. Introduce to primary schools, basic instruction on how to become a responsible and demanding consumer and continue the instruction in secondary schools and beyond.
- Canada spends 7.2 percent of its gross domestic product on education, the highest percentage of any developed country, and a total of $55 billion a year on both education and training. Yet it is clear form the Prosperity consultations that Canadians are concerned we are not getting value for our investment.
- There is broad agreement that improving the quality and relevance of education and training is the most important priority if we are to prosper. Canadians want refocused, reinvigorated learning systems with stronger ties to the community and the working world. These systems must apply new ways of teaching, and make full use of innovation and available technologies, as well as new models of delivery such as distance education.

Canadian forum on learning

Challenge: To establish a body that would bring together providers and users of education and training from across the country and enable them to work constructively together in pursuit of common goals.

Action: Establish a Canadian Forum on Learning ...

Change the focus to competence-based systems

Challenge: To change the focus of Canada's educational and training systems by basing them on results, and to introduce competence-based systems.

Action: (1) Define success in learning; (2) Develop appropriate measuring tools; (3) Inspire the necessary changes in teaching methods and organization; (4) Determine a set of qualifications for admission to continued education; (5) Establish a registry of skills, knowledge and achievements of individuals Canadians.

Monitoring system achievement

Challenge: To establish indicators of performance, based on Canadian and international standards, for education and training.

Action: Develop for use across Canada, a set of indicators of system achievement that can be used to assess student achievement relative to Canadian and international standards.

Commitment to quality and service

Challenge: To make institutions more responsive and accountable to students, families and communities and to encourage institutions to provide more information on performance.

Action: Apply the principles of continuous quality improvement to learning institutions.

A good start for all children

Challenge: To ensure that children get the right start in school. We must make the well being of our children the highest priority.

Action (Paraphrased): Provide parenting skills; prenatal classes; nutritional and diet support; early childhood education; programs for abused women and children; and, support for programs for abused women and children.

Bringing the world of work into schools

Challenge: To ensure young people are ready to enter the world of work when they leave schools, colleges and universities.

Action: Provide secondary and post-secondary students with practical knowledge of the workplace through co-op opportunities, job opportunities and school-business partnerships; allow secondary school students more opportunity to develop skills in technologies, trades, business and the applied arts ..., make accurate information on nonprofessional careers in trades, technologies and the applied arts more widely available in schools and to parents; encourage school partnerships with community businesses and organizations; help teachers become more familiar with the workplace environment; give all students the opportunities be become familiar with practical applications of mathematics, science and technology by: integrating the use of computers into the classroom, starting in elementary school; including hands on learning about familiar tools, machines and technologies in elementary and secondary school studies; developing a mandatory course to make secondary school students more familiar with basic technologies; bringing people who use these technologies into the classroom; providing teachers with the necessary training and support; providing the equipment and software needed; and, encouraging student interest in technology, mathematics and science, particularly among young women.

Completing secondary school

Challenge: To increase the number of young people completing secondary school. A concerted effort by communities, parents an educators is required to ensure that all young Canadians have a strong foundation before leaving school.

Action: Develop and implement strategies in each community to ensure that all youth complete secondary school.

Post-secondary institutions

Challenge: To encourage post-secondary institutions to become as flexible as possible and responsive to changing requirements.

Action: Use more information and communications technology to increase access and flexibility.

Employer-led training

Challenge: To encourage employers, particulary those with small workforces, to increase work force training.

Action: Promote a dedication to quality by training employees, as required, to work with new technologies. Training should include upgrading of literacy, numeracy and other needed skills.

Management training and executive development

Challenge: To improve the skills of Canadian managers and future managers.

Action: Develop a statement of competence-based qualifications for Canadian managers and use it in redesigning post-secondary management and administration programs and in hiring and promoting employees.

Telecommunications and information technologies and learning

Challenge: To find new ways of using technology and of tailoring learning to the needs of the individual so that people have more opportunities to learn.

Action: Expand the use of telecommunications and information technologies such as computer-assisted learning, distance education and video/television by:

- increasing the number of computers and variety of software in schools by 30 percent a year to ensure that all students have access to computers and are using computers as an integral part of education within five years;
- ensuring that every classroom has a cable drop and telephone line;
- preparing teachers and staff to use computers effectively as they are introduced into classrooms;
- setting up or using existing centres in communities as learning resource centres with the latest learning technologies and opening them for use by employers, unions, schools and individuals;
- incorporating technology in the design and delivery of educational and training materials, courses and programs;
- encouraging greater use of computer-based approaches in upgrading, literacy and numeracy programs; and
- changing policies and practices to encourage more technology-based training methods, and eliminating barriers or disincentives to the purchase and use of technology-based approaches.

A Learning Network Based on Technology Links

Challenge: To bring learning to people in the home, the classroom and the workplace by making better use of existing communications links.

Action: Use existing telephone and cable lines to create an effective and inexpensive electronic highway network. This network could eventually link to the high technology electronic information highway.

Teacher preparation

Challenge: To ensure teachers and other learning professionals are properly prepared at all times for continuous change in the Canadian learning environment.

Action: Modify teacher preparation curriculum and upgrading programs so teachers can work within systems based on competence and individual progression.

- Ensure that teachers are trained to use computers and other technical aids in their classrooms....
- Develop and apply standards of competence for teachers, especially in mathematics and science, through regular recertification of teachers.

Research in education and training

Challenge: To discover the best ways of teaching and achieving results.

Action: Increase the amount and effectiveness of applied research into education by setting aside a fixed percentage of federal and provincial research funds for applied research and development in education. Research supported by this fund should be directed to priorities established by the Canadian Forum on Learning.

International focus to education and training

Challenge: To prepare Canadians to meet the challenge of globilization.

Action: Increase the international focus in curricula, research and scholarship.

Commitment to learning

Challenge: To encourage all Canadians to make an active commitment to learning throughout life and to support education and training for all Canadians.

Action: Take the initiative to participate actively in learning and in the education of children.

Campaign in support of learning throughout life

Challenge: To increase commitment to learning throughout life by making Canadians more aware of the value of learning, the need to learn and the different learning options available.

Action: Put in place an effective Canada-wide communications campaign that would build of the following messages:

- learning is necessary throughout life;
- Canadians can choose from a wide variety of occupations and jobs;
- learning is not restricted to classrooms; and

- learning is related directly to individual and collective economic success.

Author's Epitaph: *Inventing the Future: An Action Plan for Canada's Prosperity* outlines numerous success stories about Canadian schools and businesses to illustrate their recommendations. Saskatchewan is not mentioned once.

Appendix B
Eight Elements Marking a Strategy for Higher Education

Council for Industry and Higher Education (Coldstream, 1992)

1. We must change our higher education system from one geared to a small minority to a more open system which brings many more people to a generally higher level of education than they attain now.
2. The universities and polytechnics must broaden and rebalance their courses towards mathematics, science and technology as part of the general provision on which specialist education is built.
3. Universities and polytechnics need to provide appropriate courses for mature students who have entered working life and to undertake professional retraining as one of their central objectives.
4. We must set strategic priorities for scientific research. Government must protect our outstanding national science base, unqauntifiable thought its output may be, as the seedbed of future marketable technologies.
5. Higher education needs to be restructured and well managed to meet these purposes. This will include some quite rapid concentration on research effort and some measures for its direction towards programmes of probable long-term economic relevance.
6. We must move progressively to a situation where customers of higher education, both individuals and industry, contribute significantly to its cost and exercise significant influence as customers.
7. Industry needs to involve itself in higher education.
8. The current effort to broaden and redefine the secondary school curriculum must be sustained.

Appendix C
Categories of Business Contributions to Higher Education

(Coldstream, 1992)

Companies reviewing their approaches to higher education have plenty to choose from. Possible forms of support, proposed by the Council in the checklist Elements of a Corporate Policy towards Higher Education are tabulated below. The menu reflects the developing marketing imagination shown by many, if not all, of higher education institutions.

Type of Activity	Direct $ Contributions	Other Efforts
Regular courses	Scholarships Sponsorship of students Staff salaries Matching grants in response to government initiatives	Visiting lecturers Occasional lectures Sandwich placements Work experience Work Shadowing
Special Courses	Fees Customized courses	
Research Grants and Development	Contracts Teaching companies CASE schemes LINK schemes	Equipment donations
Consultancy	Institutional Individual members of staff	
Other	Donations and benefactions Joint Ventures (Science Parks)	Joint Ventures Membership of university and polytechnic committees Buildings

Appendix D
CASE STUDY 8: CANADA

(Centre for Educational Research and Innovation, 1992)

The following case study was contained in *Schools and Business - A New Partnership* published by the Organization for Economic Cooperation and Development

SOFIE - An industrial training centre in Quebec

"...Custom-tailored training services using the latest technology... an increasingly cooperative approach which will focus even more on individual needs and self-teaching." (Scheme description)

The Partners

- Area businesses
- Davignon School Board
- District of Bedford Protestant School Board
- Government of Quebec
- Government of Canada

The Project

The Townships Corporation for industrial training Inc. (SOFIE) is a specialised training centre set up by the region's school boards. The centre has the modern high-tech equipment needed to deliver up to date programs, which is lacking in the region's existing vocational training courses. Courses cover operation and maintenance of industrial machinery, welding and machining. Eighty-five per cent are delivered at the centre and 15 per cent on site throughout the province.

The centre's management is overseen by a board of directors representing the partners. Government has provided the 3.8 million (Canadian dollars) initial financing required to establish SOFIE and purchase equipment. Business has provided further financial support, material resources and personnel. The school boards provide equipment and free use of space.

The Main Objectives

- To develop a skilled workforce
- To facilitate learning among workers

Evolution

The project was established in 1986 in response to the need for up-to-date training programs. The region's school boards secured support from the Canadian and Quebec governments to

establish the centre. Initially, the centre catered exclusively for workers and the unemployed, but from 1991, courses were also attended by students still at school.

Appendix E

R.G des Dixon's Prospectus Toward a New Model of Education

- Ultimate allegiance will no longer be to just a single nation-state but rather to the planet and to a planetary moral code that students in compulsory global studies programs must synthesize from all cultures on earth.
- It is possible to teach nearly all young people who pass through schools to read, write, speak, and listen. But profound changes in strategy and priorities will have to be made.
- Teachers of media literacy (along with teachers of English) bear primary responsibility for the well being of democracy through awakening each generation to assaults on freedom of expression and to the consequent obligations of every citizen to maintain and enhance that pivotal freedom.
- National governments should take a great leap toward the universal health of their citizens by supplying two nutritious meals (and vitamin supplements) daily to all children who wish to partake.
- All schools sports team should be organized, managed, coached, and officiated entirely by students, with teach acting only as consultants. Physical education must be compulsory, and programs must guarantee at least 30 minutes per day of sustained, vigorous exercise for every child.
- For both students and teachers, absenteeism more than 2% of the time should be considered unacceptable.
- Instead of compulsory schooling, we must make universal schooling available and guarantee the right to it. Moreover, the right to schooling must carry with it whatever support is needed to make attendance feasible: fees, supplies, food, clothing, housing, emotional nurturance, and so on.
- There is no other initiative that any developed country could take to reduce the dropout rate and improve attendance that would be nearly as effective as adding residences to schools.
- Teaching should be like other performing arts: the union should negotiate a minimum rate of pay and leave to individuals the decision of whether to work for scale or negotiate payment above scale. Stars command higher pay.
- Even in the present model of schooling, teaching requires organization. In the schools of tomorrow every teacher will need organizational skills on a par with generals and chief executives.
- Responsibility for the formative evaluation of teachers (and hence the routine supervision that is implicit in formative evaluation) must be taken away from principles and given to counsellors, who would be employed by every school board to help teachers plan their professional growth.
- Today's curriculum is largely Victorian, a late 19th century expression of the Industrial Revolution as applied to the education industry. We have tinkered with it but we have not changed it. To provide promising alternatives -- curriculum ideas that will turn schools

around and connect them to the present and future instead of the past -- we need permanent international, national, and local curriculum think tanks staffed by visionaries.

- If strong nationhood is the goal (rather than a weaker federation of states), the highest level of government must specify the content of each nation's cultural curriculum, because, without a shared national culture and the shared national values that accompany it, successful nationhood is unlikely.

Educational Technology in Action

Students can take classes in Japanese and Russian through a link-up with the Universities of Nebraska and South Carolina. The school is a pilot site for implementation of an interactive multimedia product which contains 180 hours of interactive learning including classic literary works by Shakespeare, Tennyson and others.