

**Restructuring Schools Using
Learning Technologies –
Four Challenges for the Teaching Profession**

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Abstract

Economies of scale have traditionally precluded the appointment of specialized teachers to small classes in rural schools in Canada and in most other parts of the world where young people are educated in areas beyond major centers of population. In some areas of Atlantic Canada an innovative solution to the problem of providing advanced and specialized instruction in small schools in rural communities has been to create new educational structures by linking schools electronically into school district digital intranets. Within these new educational structures virtual classes can be organized that link teachers and learners across dispersed sites both synchronously and asynchronously.

As small educational institutions electronically interface, new academic and administrative relationships are emerging. Some rural Canadian schools are becoming, in effect, sites within federated teaching and learning structures. While these new structures enable resources to be shared and, accordingly, educational opportunities for learners to be enhanced, a number of challenges are emerging for educators, administrators and policy-makers.

Restructuring Schools Using Learning Technologies – Four Challenges for the Teaching Profession

Small schools are usually associated with rural communities. In a resource-based economy, these educational institutions play significant roles in the economic infrastructure because without the provision of quality education, many people are reluctant to live in remote communities. Since the advent of the Internet in teaching and learning, many changes have taken place in the organization and development of small rural schools. Today small schools in some rural Canadian communities are technologically sophisticated and are developing new ways of organizing teaching and learning. These changes have to be considered in the context of change from industrial to post-industrial society.

The Context of Technological Change in Schools

In 1976 Bowles and Gintis published their theory that the organization of schools in the United States of America is shaped by and therefore corresponds to the organization of corporate life in that country. The central ideas of their book *Schooling in Capitalist America* have since been taught to a generation of students preparing to become teachers and have become known as the "Correspondence Theory."

With the industrial revolution in Europe and North America in the last century, urbanization became a dominant feature of the ways in which people both lived and worked. With the growth of industrialized societies there was a need for workers to learn to read so that they could follow written instructions from their employers. According to the detailed analysis by Bowles and Gintis, the relationship between schools and work influenced all levels of school organization. According to the correspondence theory we have built our schools around the needs of factories and other institutions of industrial society and so it should be no surprise that many of them reflect this relationship today in the ways they are administered. Students preparing to enter industrial society have, appropriately, been taught in organizations that meet the expectations of industry.

In the late twentieth and early twenty-first century a new correspondence between the world of work and the organization of education is emerging. This model is based on a move from the mass production model of the factories and schools of nineteenth and early twentieth century industrial society to the individualized learning model of the information society. In the late twentieth century more and more workers earn their livings using information and communication technologies and fewer are employed in heavy industries and factories. Access to information, communication of information, storage of information and retrieval of information are important in the information society. Workers who can program computers, write software and organize data are in particular demand by employers in the late twentieth century and in many developed societies demand for this sort of expertise outstrips the supply of available workers. Schools are, increasingly, expected to provide employers with workers who are technologically literate and able to take their places in workplaces that are increasingly oriented to working with information. In post-industrial society, information workers are often in such demand that they have portfolios of jobs, working on contract for several employers to each one's specialized, individual requirements. Can it be argued that there is "correspondence" between this new, post-industrial employment reality and the organization of classrooms, schools and education systems in 2002?

The Changing Educational Environment

There are four features of the changing educational environment that influence the ways in which we both provide and access education at the present time in rural communities in Newfoundland and Labrador:

1. *The inter-connectedness of schools*

At a time when the economies of many countries are becoming inter-dependent, so individual schools as well as school systems are able to link with one another. Global economic changes of the last decade have shown that national economic systems cannot survive by sealing themselves off from one another, and nor, we predict, can national school systems. Many schools today, particularly those in rural areas of countries like New Zealand, Australia, Finland, Iceland and Canada are changing by interfacing with one another electronically with profound effects on how they provide education for young people and their families.

2. *The electronic basis of contemporary education.*

Many universities and colleges as well as high schools are now looking to telecommunications technologies to provide new opportunities for teachers and learners. For example, Parents, teachers, and school administrators across the United States are watching Polk County, Florida, site of the nation's first school to offer a completely online curriculum, in a classroom. There will be no classroom teachers, although there will be counsellors, school facilitators, and resource teachers on hand to guide students, and the online teachers will visit students periodically. The whole idea is to customize education and services for students, so that educators can examine a child's needs and more easily design education to meet those needs. This can be accomplished much easier if you are working with mature students in an online school (Educause, 2000).

Some universities are also using a Tele-learning approach towards training future teachers. Students of California State University's California State Teach program can learn from home using bulletin boards, real-time discussions, e-mail, and occasional webcasts. The drawback to such a program is that online training does not guarantee competency, since it cannot duplicate certain instructional techniques (Educause, 2001) The question that many educational institutions face today is not whether to get wired to use new telecommunications technologies in classes, but how these technologies are to be effectively used for improving teaching and learning.

3. *Diverging employment opportunities.*

Until the early 1990's when there was a moratorium placed on the *Cod Fishery* most jobs involved physical labor and as a result many high school students could leave school and find reasonable paying jobs working in the fishery. Since the moratorium the province has found itself in a transition from a resource-based to a knowledge-based economy. The knowledge-based economy carries with it a high demand for a well-educated and technologically literate society. In fact, the gap between the technologically literate and illiterate is likely to translate into different employment opportunities and, ultimately, diverging standards of living. This puts considerable pressure on schools to ensure that young people leave with at least some skills in the use of information technology.

4. *Appropriate technologies for classrooms*

Most of the computers that are used in schools were designed for businesses or researchers. There have been few attempts to design computers specifically for classroom use and teachers and students in schools have had to adapt hardware that has been designed for other purposes. With the changes that are taking place in education, the mass provision of appropriate technologies for schools – flexible, durable and inexpensive - will become increasingly urgent. For example, Michigan Technological University have supplanted some of their desktop PCs with Sun Ray Computers or Internet appliances because of the potential savings in time and money that they offer. Using information appliances, most computing is handled by the servers, removing the need to purchase, manage, and support specific machines. While meeting with some resistance at the university level this technology might be appropriate for grade schools (Educause 2001).

Tele-learning for Rural Students in Newfoundland and Labrador

Many communities in the Canadian province of Newfoundland and Labrador are characterized by geographic isolation, rural lifestyles and high rates of out-migration. Approximately two out of three schools are located in rural communities. Thirty one percent of schools in the province are designated “small rural schools” (N=122) and 75 of these have fewer than 100 students. Seventy of the small rural schools in this province are classified as “all-grade” (K –12) which means that they must offer a senior high school program. This presents educational administrators with significant challenges.

The recent re-organization of Primary, Elementary and Secondary education in Newfoundland and Labrador into ten school districts provided an opportunity to develop the first digital Intranet in the province. In school district No. 8, (The Vista School District), there are 5165 students enrolled in 18 schools. The schools range in size from

650 students down to 40 students. In eight schools in this district there were senior students who wished to study “Advanced Placement” (AP) courses in four subjects: Biology, Chemistry, Mathematics and Physics. (Advanced Placement courses enable students in their final year of High School throughout North America to begin undergraduate degrees if these courses are passed at grade levels specified by the university of their choice). The challenge that this presented for the eight small rural schools in the Vista School District was to provide University-level instruction for small numbers of students.

Although AP courses are a well-established feature of senior secondary education in the United States and Canada, it is unusual for students to be able to enroll for instruction at this level in small schools in remote communities. In fact it is rare to find high school students in small and remote communities anywhere in the world who are provided with instruction in university-level studies. In Iceland (Stefansdottir, 1993), New Zealand (Stevens, 1999b, 2000; Stevens and Moffatt – in press) and Finland (Tella, 1995) there have been attempts to provide alternative models for the delivery of education to rural students. The Vista school district initiative challenged the notion that senior students in small schools have to leave home to complete their education at larger schools in urban areas. The initiative accepted the challenge of providing university-level courses to students within their own community schools.

It was not possible for any individual school in the Vista school district to provide AP instruction in all four subjects at the AP level on its own and a new collaborative structure had to be developed. A three-stage process was followed to implement tele-learning in this part of the province.

(i) The Development of AP Courses for the Internet

The development of AP Internet-based courses in Biology, Chemistry, Mathematics and Physics took place within a development team in each subject area. A lead science teacher in each discipline was paired with a recent graduate in each of the disciplines of Biology, Chemistry, Mathematics and Physics who possessed advanced computer skills including web page design,

Java and HTML. The lead teacher and the graduate assistant were advised from time to time by Faculty of Education specialists at Memorial University of Newfoundland in each curriculum area and, where possible, scientists from the Faculty of Science. In most rural communities in this part of Canada, digital telecommunications infrastructures do not enable schools to have a high-speed up-link to the internet. All schools involved in the project had DirecPC satellite dishes installed to provide a high-speed down-link. Appropriate software had to be identified and evaluated for both the development of the resources and the delivery of instruction within the Intranet. Many software packages were evaluated and finally WebCT was selected. This package enabled the instructor to track student progress, it contained online testing and evaluation, private E-mail, a calendar feature, public bulletin board for use by both instructor and student, a link to lessons and chat rooms for communication between teacher and student. For real - time instruction, Meeting Point and Microsoft NetMeeting were selected. Students had to learn how to communicate with each other and with their instructor using these new technologies before classes could begin.

(ii) Teaching AP Science to Rural Students Using the Internet

The electronic linking of eight sites (or schools) within the Vista School district to collaborate in the teaching of AP Biology, Chemistry, Mathematics and Physics created a series of open classes in this part of rural Newfoundland and Labrador. This new electronic structure became known as the Vista School District Digital Intranet. The School Board responsible for administering this district selected the lead teachers to teach each subject. The four AP teachers came from different schools in the district and were, in fact, the people who developed the AP courses for Internet delivery. Each of the four teachers had a tele-presence in each of the participating schools for that part of the school day during which classes were electronically connected, or on-line.

From the eight schools that together comprised the Vista School District Digital Intranet, 55 students initially enrolled in AP Biology, Chemistry, Mathematics and Physics courses. By participating in classes in real (synchronous) time using audio, video and electronic whiteboards over the Internet, combined with a measure of independent (asynchronous) learning, senior students were able to both interact with one another online as well as work off-line in their own community schools. From time to time social occasions were organized so that students could get to know their on-line AP teachers and the other students in their virtual classes personally.

A question facing teachers and school administrators in the initial stage of the Vista School District Digital Intranet was whether students who were not used to being unsupervised could cope with their new freedom and accept increased responsibility for their learning. At the conclusion of the school year the students were unanimous that, to be successful in an on-line AP course, it was necessary to be able to learn independently, to be able to cope with a high volume of work and to be willing to ask teachers and other learners questions as they arose (Stevens et al, 1999).

The development of this new, electronic educational structure in rural Newfoundland was an attempt to use information and communication technologies to provide students with extended

educational and vocational opportunities. Many students who were participants in the virtual classes learnt about the potential of information and communication technologies while studying their AP courses.

(iii) New Ways of Teaching and Learning

Students in the Vista School District Digital Intranet were frequently subject to scrutiny by their peers as they responded through chat-rooms, audio and video with their AP online teachers. The Digital Intranet provided students with access to multiple sites simultaneously as well as the opportunity to work independently of a teacher for part of the day. The need to prepare for classes before going on-line became increasingly apparent to both teachers and students if the open, synchronous, science classes were to succeed. The advent of the Digital Intranet had implications for students who had to interact with teachers and their peers in a variety of new ways. The teaching of each of the four AP Science subjects in the Vista Digital Intranet took place within classes that were open between participating sites. Many students experienced difficulty expressing themselves and, in particular, asking questions in open electronic classes when they did not know their peers from other small communities. However, as the students became more comfortable with one another, particularly after the first social occasion, inhibitions such as asking questions on-line were overcome.

For those students in the first Digital Intranet in Newfoundland and Labrador a new learning opportunity was provided. They were able to study advanced science subjects, at University level, as members of virtual classes without leaving their small, remote communities.

Four Challenges for the Teaching Profession:

The development of new ways of providing education in rural Newfoundland and Labrador by bringing schools into collaborative relationships has generated four challenges:

Challenge One: What is an appropriate location for tele-teachers - in schools or between schools?

Teachers are appointed *to* schools, but in Newfoundland and Labrador, a growing number of them are actually teaching *between* schools. Tele-teachers electronically enter and leave a growing number of schools (sites) across rural Newfoundland and Labrador in the course of a school day. Is it now appropriate to recognize the emergence of a new educational professional - the lead teacher with subject expertise and responsibility across a network of schools? A relevant development for educational policy-makers to consider is the emergence of charter teachers in Scotland.

Challenge Two: Where should control be located in electronic teaching and learning structures?

Principals in rural Newfoundland and Labrador increasingly have teachers who appear electronically in their schools and who also disappear electronically. Where is control appropriately located when schools link electronically to share resources?

Challenge Three: What is appropriate pedagogy for integrating on-site and on-line learning?

Rural educators have made considerable advances in bringing on-line instruction to their senior classes and currently there are developments to extent this to other areas within schools in Newfoundland and Labrador. The pedagogical challenge facing educators, curriculum developers and administrators at present is the integration of on-site instruction with on-line learning to blend physical and virtual education.

Challenge Four: What is the future of the small school in Canada – physical or virtual?

How far can educational networking be extended? At present most networks are at the school district level. It is possible to move beyond the structure of school district intranets to personal intranets?

Innovative solutions to these questions have direct implications for the teaching profession, for the funding of schools, for the scheduling of classes, for the organization of classrooms and for the delivery of the curriculum.

Restructured Schools and

Post-Industrial Society in Newfoundland and Labrador

Schools in rural Newfoundland and Labrador are increasingly integrating with one another both academically and administratively. As classrooms are extended in terms of time, space, organization and capacity, teachers are challenged to develop pedagogy for tele-learning to facilitate the integration of physical and virtual instruction.

Students in rural communities in Newfoundland and Labrador are making increasing use of the Internet, learning in virtual classes within Digital Intranets and accessing an expanding range of web-based instruction. In the current school year there has been a doubling of the number of schools in rural Newfoundland and Labrador that use tele-learning to expand educational opportunities in Intranet-linked classrooms.

The theory that schools reflect the organization of industrial society has found widespread support over the last two decades. In this country Industry Canada has promoted the education of Canadians for “a digital world” (Information Highway Advisory Council, 1997) and Collis (1996) has argued that tele-learning is the future of distance learning. There is a measure of agreement between these positions. At the present time we are seeing a challenge to the provision of education in industrial society by the emergence of tele-learning and the mass provision of information.

There are technological, organizational and pedagogical challenges to be considered by the teaching profession as schools move from being providers of mass education in classrooms based on age and in some cases, ability and even gender, to become something else. In Newfoundland and Labrador the emergence of new educational structures and processes portend a shift away from schools as we have known them as information and communication

technologies facilitate new pathways for both teachers and learners. Can it be argued that there is now an emerging correspondence between education in rural Newfoundland and Labrador and the organization of post-industrial Canadian society?

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