

# AN ATLAS DESIGNED FOR CHILDREN - THE ELECTRONIC APPROACH AND REALITY

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## Introduction

This paper is approached through an examination of two questions. First, "In Canadian and Québec society in general, how widespread is access to the use of the new technology and what is its use in the schools?" and second, "How can the new technology, in the form of an electronic atlas, change the way basic concepts for the social sciences are presented and how graphics, such as maps, are used at the elementary level?" The first question will be considered by describing current knowledge of general household and school use of the Internet in Canada as well as the Province of Québec. The second question is investigated through the presentation of a exploratory pre-pilot research project conducted in association with a study related to the development of an proto-type electronic school atlas of Québec. To place the pre-pilot research in context an overview of two other items is presented: information about the new curriculum within which maps and mapping are to be incorporated and teachers' perceived needs.

## Technological Change

In Canada, as in many developed countries, most newspapers or magazines contain references to the Internet and World Wide Web (WWW). Not so very long ago, television viewers or radio listeners would be asked to (snail) mail their comments to a postal address. Now these media, for both adults and children, obtain feedback via electronic mail. Today E-commerce via the Internet pervades all aspects of Canadian society. We believe it is now possible to 'attend a funeral' via the Internet. In today's world computer technology and the Internet are here to stay and their use can only increase with the advent of easier and quicker Internet accessing via cell phones.

### *Canada - General*

In 1997, Canada conducted its first detailed survey on the household use of computer communications, which occurs when "someone connects a computer to a communications network to access information on the Internet, to send and receive e-mail, or to use electronic banking services"[ The Daily, 1999a,]. A year later there was a follow-up survey in over 38,000 households. The 1998 data revealed that a growing number of Canadians were using computer communications. In 1998 about 47.6% of these households were connected, up from 38.2% the year before. The 1998 survey data also revealed that Internet use is influenced by the income, education level and age(s) of the household. The higher the household income, the greater the use of Internet in their homes or work places. However, the usage disparity between highest-and lowest-income households is narrowed through access from schools and public libraries. The use of computer communications was found to increase substantially with education. Households headed by someone with a university degree were far more likely to use the Internet. In 1998, the most likely age group to use the Internet was 35 to 54 of age (46.9%), while the usage rate for the under 35 year age group was a close second (45.3%). The 1998 data also revealed that households of single parent families with unmarried children under the age of 18 were more likely than other households to use the Internet. More recent statistics indicate that, in 1999, the proportion of households that contained at least one regular Internet user jumped to 41.8% from 35.9% in 1998. In 1999, for the first time, home was the most popular location for Internet use at 28.7% of households, which was up from 22.6% of households in 1998. Possible reasons for this could be an expansion of Internet services offered to households and lower connection costs. The workplace was the second most popular location followed in third place by a school location, which rose to 14.9% from 12.1% in 1998. Internet use from public libraries was steady at 4.5% in 1999. "Other locations, such as the homes of friends, neighbours and relatives as well as Internet cafés, saw an increase to 4.1% in 1999, up from 2.6% the previous year" [The Daily, 2000].

### *Québec - General*

Currently, in Québec there is a move by the provincial government to provide more access to the information highway. One provincial government slogan is, "More and more the Internet is you and us". In 2000-2001 more than \$250 million is being invested to assist Québécois to connect to and use the Internet. This amount is to be partitioned so as follows: \$120 million for 200,000 families receiving family allowances to help them connect to the Internet; \$126 million for 10,000 small and medium sized businesses to encourage them to develop transactional Web sites and \$45 million to develop the information highway and modernize government services) [[www.quebeclic.com](http://www.quebeclic.com)].

### *Canada - Education*

In 1999 (January and February) Canada was one of the nations which participated in the Second International Technology in Education Study (SITES) [The Daily, 1999b]. The SITES survey was designed to profile the use of new information and communication technology in elementary and secondary schools [[www.mscp.edte.utwente.nl/sitesm1/](http://www.mscp.edte.utwente.nl/sitesm1/)] in the 30 participating countries. A comparison of Canada and the other countries which took part in the SITES survey is now available [Lortie, 2000]. Statistics Canada conducted the Canadian survey. A random sample of 4,000 schools, each received two questionnaires. The school principal completed one questionnaire while the other was directed at an individual responsible for the technology in the school. Both questionnaires included questions relating to the school's use of communications technology, the teachers' training and professional development, obstacles to the use of technology at the school and specific requirements.

The survey concluded that the majority of Canadian schools are connected to the Internet for educational purposes with more than 9 out of every 10 students at the elementary, intermediate and secondary levels in Canada attending schools that had access to the Internet for educational purposes<sup>1</sup>. On average in the participating schools, during the last school year, the pupil computer ratio in elementary, lower secondary and upper secondary was 9:8:7. About 4 in every 10 students at the elementary, intermediate and secondary levels had used e-mail by the end of the school year. In addition, 73% of students attended an intermediate or a high school that had its own site on the WWW [Cyber Atlas Source, 1999].

The survey results also revealed that Internet use was expanding. Only 12% of the participating schools' elementary students attended a school without Internet access for instructional purposes, while less than 3% of students attended intermediate and secondary schools without Internet access [The Daily, 1999b].

However, the survey also revealed that despite the great steps being taken to introduce computers to schools and connecting them to the Internet, the education systems face significant challenges. These include the need for more computers for the students, the lack of sufficient copies of software and insufficient technical support to maintain the computers and solve minor problems. Teachers' needs included more time to prepare courses that require the use of computers and to explore ways to use the Internet in their teaching. The principals also identified a need to provide training opportunities for teachers to upgrade their computer knowledge and skills, as they move towards taking fuller advantage of the new information age [The Daily, 1999b].

### *Québec- Education*

The available Québec data reveals that pupil-computer ratio in elementary-secondary schools for the three levels, elementary, lower secondary and upper secondary, was 11:11:9, higher than the comparable Canadian ratio. Unlike most provinces Québec did not experience the same levels of many of the challenges. Insufficient numbers of computers was cited as a major problem in only 50% of cases (compared to 60% in most provinces). Similarly, the scheduling of computer time was less of an issue at all ages in Québec as was the lack of time for teachers to explore the opportunities of using the Internet and the WWW. However, "teachers' lack of knowledge or skills in using computers for instructional purposes was seen as a major obstacle"[1999, Council of Ministers, Canada p.73]. A detailed comparison of the provincial data, collected in the SITES survey, is expected to be available the fall of 2000 [Lortie, 2000].

Data of trends of Internet use when coupled with the recent financial incentives of the Québec government would suggest that there will be an increasing demand in schools (by teachers and students) for electronic materials (CD-ROM and Internet). But what electronic materials should be provided?

### **Québec - The New Curriculum**

The response to such a question needs to be based in knowledge of the curriculum as well as the needs of the users. In Canada, education is a provincial domain. Each province's Ministry of Education determines the goals of education, general educational objectives and course of study for each subject. Over the next six years (2000 - 2006) many

changes are scheduled to take place in Québec's school system as it moves from object based instruction to competency based instruction.

Under the old curriculum, elementary students' exposure to maps in Grades 1 to 6 was primarily associated with a social studies program while at the high school level there were Geography Modules in Grades 7 and 9. At the elementary level, students, 6-8 years of age, were first introduced to their own immediate environment, then the local school environment and their community. Then, students studied the geographic, economic, and social features together with their interrelations of their Region, Québec and, Canada. In the early elementary grades 'maps' were seen as a tool to help students develop an awareness of space while in the other elementary grades maps were seen as playing a role in development of cognitive skills. The elementary curriculum paved the way for the History, Geography, and Economics programs in the secondary school [Anderson, 1996.].

In the autumn of 2000 four parts of the new program (Languages; Technology, Science and Mathematics; Arts Education; and Personal Development) are to be implemented. 'social studies' as a distinct program has been replaced by 'social sciences' which is comprised of 'History, Geography and Citizenship Education.' The social sciences role is to provide, "tools for social integration by helping them [students] gain a broad understanding of the functioning of societies and the geographic organization of territories" (Ministere de l'Education (M.E.Q.) 1999). A student's first exposure to "social sciences" will be in Cycle 2 (students aged 8-9)<sup>2</sup>. Thus any mapping concepts introduced prior to this age will be components of the four Cycle 1 programs (Languages; Technology, Science and Mathematics; Arts Education and; Personal Development). Since the Cycle 2 of the new curriculum is not scheduled for introduction until 2001 there are few published details on either the proposed program or exactly how this is to be implemented. However, what is known about Cycle 2 is that it is organized around three competencies with stated expectations (Table 1). In the context of these competencies the described teaching materials include (M.E.Q. 1999):

- using a geographical and historical atlas with simple maps and limited scope;
- using maps that show different scale representations of the territories;
- using simple and varied written, visual and media materials.

COMPETENCY	EXPECTATIONS RELATED TO COMPETENCY
To describe the organization of a society that existed in the past and its territory and that society's contribution to present-day society.	Students are expected to learn about the organization of societies. In studying one or a few societies, its links to its environment, and changes as well as the changes that the society's made to its territory to meet its needs receive attention.
To interpret change in a society and its territory.	Students are expected to develop an understanding of the concept of change, and causes of change as well as exercise critical judgement and use simple arguments.
To be open to the diversity of society and their territories.	Students are expected to compare societies and territories at a given point in time in order to learn about differences between them. Students are also expected to exercise critical judgement, be able to identify strengths and weaknesses and back up their points of view with simple arguments.
<i>Source: M.E.Q. 1999.</i>	

Table 1: Competencies and Expectations of Geography, History and Citizenship Education -- Elementary (Cycle 2).

The move from object to competency based instruction should bring about many changes in teaching. In theory, students are to become involved in more group-work that is inter-disciplinary in focus. Instead of an annual evaluation students' competencies will be assessed on a cycle basis with the role of the teacher moving from providing information to guiding the process of learning. There is also to be a greater emphasis on child centered group-work. These changes will result in the need to access up to date information about many different subjects quickly. Can the provision of such materials be the major role of the new technologies?

One invaluable teaching tool is an atlas. This has been defined as a: " Systematic and coherent collection of geographic data, in analogue or digital form, representing a particular area and/or one or more geographic themes, based on a narrative, together with tools for navigation, informational retrieval, analysis and presentation" [Koop, 1993, p. 129]. Several paper atlases, provincial atlases and one regional atlas, were teaching materials available for use in Quebec's old curriculum. There is also the (Canadian) National Atlas on the Net and National Atlas on Schoolnet [Bede and Williams, 2000; Siekierska and Williams, 1996]. Given the existing paper and electronic atlases and the direction, structure and content of Quebec's new curriculum as with the increased access to the Internet what should an electronic school atlas of Quebec provide for its users?

### Users Needs - Teachers

To identify users needs, in April 2000, a private school book publishing company conducted two-focus groups [Les Éditions CEC, 2000]. Each focus group was made up of participants and a moderator. The participants, who were Cycle 2 teachers from the Montréal area, used a variety of materials to teach Social Studies. One group was made up of eight teachers who were comfortable using computers in their teaching while the seven participants in the second group did not use computers in their teaching. In each session, the moderator explored the participant's satisfaction with the current teaching materials used and (in the light of the new curriculum) perceived needs. In addition, specific questions were directed towards identifying the importance of, nature and use of an atlas as well as their thoughts on an electronic atlas (e.g., audience, content).

It was interesting to note that problems encountered by the teachers using computers mirrored those identified in the SITES survey. These included the number and location of the computers, problems with the unreliability of the Internet as well as difficulties accessing it, and the heterogeneity in student home access.

In their current use of teaching materials, atlas use was perceived as insignificant -- due to the unavailability of such a resource for the Cycle 2 level. For such an atlas the teachers' first preference was a paper atlas -- which was seen as a complete tool and accessible to all -- physically as well as cost-wise. This was followed by a CD-ROM atlas which, although interactive, educational and allowing for self-correction, was seen as less available to students in a class due to the hardware requirements and its cost. An Internet atlas was their last choice of mediums. Although permitting student access to large amounts of data, it was seen as problematic due to its availability, access, and teacher control relating to navigation.

Despite these rankings the teachers were open to the idea of new materials. In connection with a CD-ROM atlas teachers wanted a well-designed, age appropriate, easy to use product, with sound that was, colourful, and interactive, containing stimulating and relevant textual and graphic information - maps, photographs and illustrations (static and animation). The teachers also wanted self-correctable concrete activities, quizzes, games etc. For an Internet atlas, in addition to all the items listed for the CD-ROM atlas, the teachers wanted identified links to appropriate sites containing supporting materials such as data together with accompanying hardcopy related teaching exercise books. This raises the question; "Can a school Internet atlas satisfy all these requirements?"

### An Electronic Atlas of Québec for Schools

A pilot multi-media 'Atlas du Québec et de ses régions' (Atlas of Québec and its Regions) exists at: <http://www.atlasduquebec.qc.ca>. This product, however, is unsuitable as a school atlas. An 18-month project is currently underway to provide the pilot of such a school atlas whose objective is to support teachers and students in Québec's new elementary and secondary curricula. The project is subsidized by the Information Highway Funds of Québec. There are six, interactively linked, projected outcomes:

- a map collection of 340 maps (40 thematic maps of Québec and 40 for each of Québec's 17 regions);
- a data warehouse supporting regional information;
- an exploration window with hyperlink systems dedicated to sustaining the teachers' and students' queries on different topics;
- a bank of concepts and terminology supporting geography teaching;
- a "tool box" to allow users to become map authors, creating maps easily from a database adapted to competency levels;
- and a guide for surfing the Atlas site.

The idea of an atlas, whatever medium, (Internet, CD-ROM or paper) poses numerous methodological problems. The questions concerning the new methods have conceptual and practical significance. In reality, what can an Internet atlas offer students and teachers that cannot be found in a CD-ROM or a paper product? What are the advantages and

disadvantages of each of these materials? At first glance the most evident differences appear to be related to the method of presentation (screen versus paper), manner of presentation (animation, sound and 3D, the currency of the information, and the possible audience - both its size and diversity (students, teachers and the general public). The first challenge is to understand the full potential of each of the mediums for the users, their similarities and differences and to exploit these so they complement one another.

## Pre-Pilot Study

In April of 2000 a preliminary investigation was undertaken in which Grade 3 students' (8 to 9 years of age) interaction with several graphic mediums was observed. Only a brief overview of this investigation is provided here, as it is a major component of focus of the workshop, "An Atlas Designed for Children -- the Initial Pilot" being presented in the conference. Students at this age are expected to be familiar with elements of the physical landscape e.g., lake, island, mountain, etc. Twenty-six students participated in the study that comprised three parts: setting the scene; working with different maps and graphics; and an evaluation. Setting the scene involved a class lesson in which groups of students discussed, identified and classified different elements of the physical landscape. The final component of the lesson was the provision by the instructor of verbal definitions and graphic sketches of the eight terms; creek, stream, river, lake, valley, plain, island and mountain. The instruction purposefully included interactive activities as well as verbal and visual components to accommodate the students' different modes of learning. In the second part of the study, each student was then asked to identify examples(s) of the eight physical features on one of the following five graphic mediums (produced at scale of 1:50 000 on all of the same area): a three dimensional colour model; black and white panchromatic photo mosaic; topographic map with names; topographic map without names, and a black and white three 3-D computer generated simulated flight over the area (known as a fly-by). On the first four mediums the students were asked to identify examples of the physical features and record these observations by tracing on a clear acetate overlay. In the fly-by, which could be paused, students pointed to a feature on the screen. All the students were asked questions relating to their ease of use of the medium for the task, the geographic area represented and finally, if they could locate the school or their own house. The final part of the investigation required students, individually in a class setting, to match for each of the eight landscape features investigated, the term (e.g., island), with its definition, plan view and a horizontal perspective. The specific finding of the pre-pilot study will be presented in the workshop mentioned above. One conclusion, however, is that students did not perform equally on all the mediums and that some features were more readily identified on some mediums than others were.

## Conclusion

In general in Canada, and more specifically in the province of Quebec, current data suggests that an increased use of computers as well as access to the Internet, from both home and school, is inevitable.

With the implementation of Québec's new elementary and secondary new curriculum where the emphasis is being placed on developing competencies through child centered inter-disciplinary projects, it is also inevitable that the new technology will change the teaching of basic concepts associated with social sciences. However, it is too early to say what these changes will be although some speculation is possible. If the problems in the schools relating to hardware access and maintenance and teachers' training are not resolved an increased level of frustration among both teachers and students will become more prevalent.

An Internet atlas of Québec for schools provides the prospect of cheaper, more timely and more easily revised information as well as the ability to include sound and animation. It presents the prospect of allowing students to work with information interactively, in visual and auditory modes as well as an ability to include a means whereby users (students and teachers) can identify their understanding of some of the basic concepts needed to work effectively with maps and diagrams; materials possible; and global access to both current and related materials (glossary terms, exercises, examples, data). However, the development and design of such an Internet atlas to meet the users' perceived needs (and often-unrealistic demands -- such as animation, animation and more animation) raises more questions than it does answers. Given the current state of the technology and the challenges facing its implementation and use in the schools it will not be possible realistically to satisfy many of the teachers' demands. Before embarking on the production of an Internet atlas for school use it is necessary to identify what can best be provided by the different mediums (such as topographic maps, three-dimensional models, aerial photographs and fly-by) and formats (paper, CD-ROM and Internet). The success of an Internet atlas for schools lies in identifying both the potential of each of the formats and mediums as well as how they best complement one another for producing age appropriate materials. Such a task will provide an exciting challenge for those interested in the development of multi-media educational cartographic materials!

## Notes:

1 "The schools were public and private elementary and secondary schools, classified into mutually exclusive groupings as follows:

- Elementary: schools in which grade 5 is taught [pupils 10 years of age]
- Lower secondary: schools in which grade 9 is taught [pupils 15 years of age]
- Upper secondary: schools in which the final grade of secondary is taught" [age may varies with the province, pupils 17 -18 years of age]. Council of Ministers, Canada. (1999), p. 70.

2 At the elementary level, 'Cycle 1' replaces the former Grades 1 and 2, (students aged 6-7 years of age) and 'Cycle 2' the former Grades 3 and 4, (students 8-9 years of age).

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