AN INTERNET ATLAS IN THE SCHOOLS OF QUEBEC: REALITY AND IDEALS

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Abstract

We are living in a period of technological change with, in many countries, a revolution taking place in elementary and secondary education. Teachers want age-appropriate materials that can be used in class and accessed by students on their own. One invaluable educational teaching material is the school atlas. What are the basic components for a school atlas that can be accessed on the Internet? Following general background statements on graphicacy and the impact of technology on education and mapping, the question posed above is investigated in relation to an ongoing study relating to the creation and design of a prototype Internet atlas of Québec for school children between the ages of 8 and 17 years. The atlas's projected components as well as the rationale for their inclusion and a **child-centered** architecture are presented.

Introduction

This paper comprises two parts. Part One sets the scene for Part Two and provides, for the school context, general statements on two issues: the role and nature of graphicacy and the impacts of technology. Part Two is concerned with a case study – the creation and design of a prototype Internet atlas of Québec for school children between the ages of 8 and 17 years. An overview of some aspects of Quebec's old curriculum, the new educational reforms and their impact are presented prior to identifying teachers' views on their "ideals for an Internet atlas". The realities of these ideals are explored through an examination of the atlas's projected outcomes as well as the rationale for their inclusion and design. These "outcomes" are; a bank or "suitcase" of concepts; interactive mapping capabilities; a collection of thematic and regional maps of Québec; a data base; pre-selected hyperlinks; a glossary; and a guide to the atlas site.

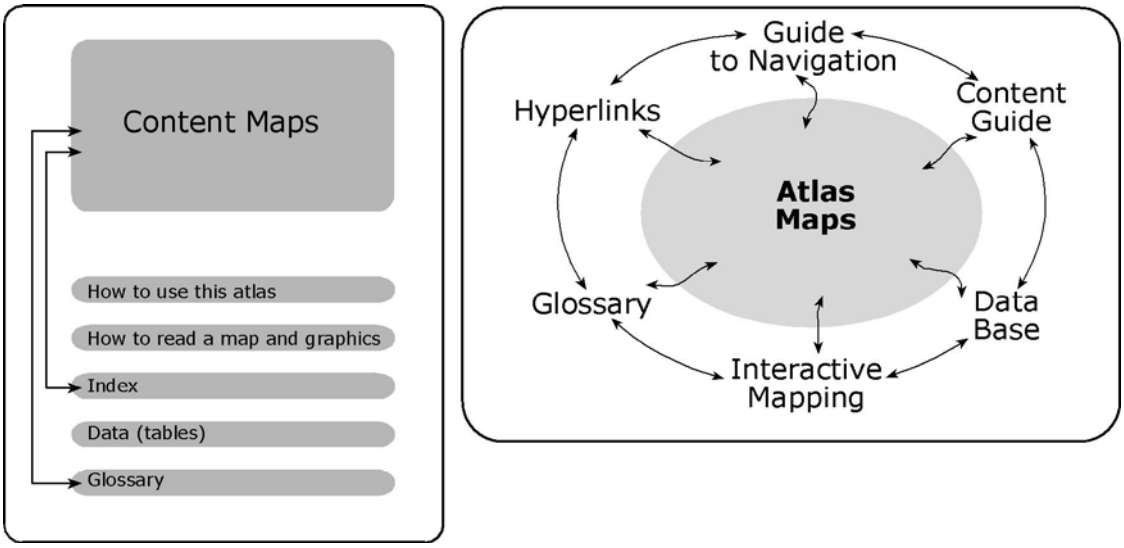
Part 1

Graphicacy

While literacy is obviously the cornerstone of society, in 1965, Balchin and Coleman, argued that "graphicacy" together with literacy, numeracy, and articulacy should be the "fourth ace in the pack". Graphicacy has been described as "the educated counterpart of the visual-spatial aspect of human intelligence and communication"(Balchin, 1976:34). Cartography is an important component of graphicacy since maps are, "an extremely efficient way of manipulating, analyzing, and expressing ideas, forms and relationships that occur in two and three-dimensional space" (Robinson et al., 1995: 9). However, a map is a complex form of graphic expression and *to use* effectively and efficiently existing maps (that is to read, interpret, analyze and synthesize spatial information) or *to produc*e maps requires an awareness and understanding of the

characteristics of all maps. These characteristics are that all maps use, scale reduction, involve geometric transformations, are abstractions of reality and use signs to stand for elements (Robinson et al., 1995).

In schools, maps illustrate texts in various disciplines. Where required by the curriculum, students may also encounter instruction relating to the development of "map skills.' Generally, such instruction is associated with the teaching of Social Studies or Geography and may involve, in addition to a text, the use of a school atlas. An atlas has been defined as a "[s]ystematic 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[objective] together with tools for navigation, informational retrieval, analysis and presentation" (Koop, 1993:129). A school atlas implies a product designed to meet the requirements of a specific clientele. The contents of a traditional paper school atlas is represented in Figure 1. Maps are the focus with bi-directional interactions between a map and one of the various components, e.g., the index and a map, the map and a glossary etc.



a. A traditional paper atlas. b. An Internet atlas.

Figure 1. Atlases - General Structures and Components.

Technology

Maps are also available to students in a digital format. During the last decade, there has been a worldwide increase in the use of personal computers, at work, in the schools and at home. There has also been the creation of the Internet and World Wide Web which theoretically has increased the availability of, and access to, geo-spatial information and data, both graphic and numeric (Kraak and Brown, 2001).

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. Recently at the Summit of the Americas, held in Quebec City, the 34 heads of state agreed to create a special fund to provide support for their countries experiencing problems linking their population to the World Wide Web.

The advantages of technology based instruction, and the value of the Internet is widely documented. These include interactive "free" bi-directional access to a current global network. Personal computers have enabled students to become both map users, (for example, using maps from CD ROMs) and map producers. Many students, of all ages, their teachers and parents have access to a wide range of software packages which allow them to create maps (e.g., "Kidpix" and "ESRI's GIS for schools"). It cannot be denied that the Internet will have an impact on what is learnt, where learning will take place and how students will learn. But exactly what type of impact remains to be seen. Internet atlases exist. Figure 1(b) portrays their general structure. As with the traditional paper atlas, maps are the central component. However, in addition to many of the same contents of a paper atlas, Internet atlases include bi-directional interactivity and hyperlinks. There are Internet atlases whose audience has been identified as school children (Bede and Williams, 2000; Siekierska and Williams, 1996). However, few studies on their use have been published and Wiegand says "there are few discrete models of cartographic applications of Internet technology" (2000, 81).

Part II Case Study – Prototype School Internet Atlas for Québec

Within Canada, education is the domain of each individual province. To understand some of the decisions made regarding the purpose, content and design of the prototype Internet atlas, it is necessary to examine some of Québec's past educational practices as well as new educational reforms, their impacts and teachers' ideas on "ideal Internet teaching materials."

Québec – The Educational Context

Between 2001 – 2006 many changes are scheduled to take place in Québec's school system as it moves from objective-based instruction to competency-based instruction. During this period, the provincial government proposes to provide students with more access to global electronic information (the information highway), both in school and at home (Anderson et al., 2000).

Under Québec's previous curriculum, elementary students' exposure to maps was primarily associated with the Social Studies program. At the high school level (Grades 7 –11, 12 to 17 years of age), there were Geography modules in Grades 7 and 9 (13 and 15 years of age)(Anderson, 1996). At the elementary level, students were first introduced to their own immediate environment, then the local school environment and their community (6-8 years of age). Students then studied geographic, economic, and social features together with their interrelations within a) the students' Region (9 years of age), b) Québec (10 years of age), and c) Canada (11-12 years of age). This elementary program paved the way for the History, Geography, and Economics programs in high school. For Grades 1 to 3, 'maps' were employed as tools to help students develop an awareness of the concept of space. In other elementary grades, maps were seen as playing a role in the development of cognitive skills.

The new program has four components: Languages; Technology, Science and Mathematics; Arts Education, and Personal Development. At the elementary level, its implementation will start in the Fall of 2001. In the new curriculum, 'Social Studies' as a distinct program is replaced by 'Social Sciences' which is to encompass 'History, Geography and Citizenship Education.' According to the Québec Ministère de L'Education (M.E.Q.), Social Science is being seen as providing "tools for social integration by helping them [students] gain a broad understanding of the functioning of societies and the geographic organization of territories" (M.E.Q., 1999, p. 256). A student's first exposure to "Social Sciences" will be in Cycle 2 (students 8 - 9 years of age). Thus, any mapping concepts introduced prior to this age will be components of the four Cycle 1 programs mentioned above. Cycle 2, for students 8-9 years of age, is organized around the competencies

related to describing and interpreting change in the organization of a society and its territory over time. The MEQ's described teaching materials for this Cycle include:

- 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.

The move from objective to competency-based instruction forecasts many changes for teachers and teaching. Students are to become involved in more group-work that is inter-disciplinary in focus, 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. What role could an Internet atlas play in the provision of such materials? Should its role be simply one of furnishing data or should it be a tool that directly assists in the learning processes of the child?

"A School Internet Atlas – Teacher's Ideal Characteristics"

In Canada there is little published material on the needs of teachers and their students. In a 1971 paper, Grime explored the teacher as a map user. In an more recent attempt to identify current user needs, a private school book publishing company conducted two focus groups (Les Éditions CEC, 2000). Each focus group was made up of participants (Cycle 2 teachers from the Montréal area, who used a variety of materials to teach Social Studies) and a moderator. One group was composed of eight teachers who were comfortable using computers in their teaching, while the seven participants in the second group did not make use of computers for teaching purposes. Each session included specific questions directed towards identifying the importance, nature and use of an atlas.

In response to their current use of teaching materials, atlas use was perceived as insignificant -- due to the unavailability of such a resource at the Cycle 2 level. Regarding atlases, the teachers indicated a preference for paper atlases -- which were seen as complete and accessible to all, both physically and economically. The second choice was for 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 hardware requirements and expense. An Internet atlas was their last choice of the three available media. Although permitting student access to large amounts of data, it was seen as problematic due to availability, access, and teacher-controlled navigation.

Despite these rankings, the teachers were open to the idea of new materials. For an Internet atlas, teachers wanted a well-designed, **age appropriate,** easy to use, interactive product, with sound, stimulating and relevant textual and graphic information – maps, photographs and illustrations (static and animation) and identified links to appropriate sites containing support material! The teachers also wanted self-correctable concrete activities, such as quizzes and games. Teachers also indicated that accompanying hardcopy related teaching exercise books be available to supplement this kind of Internet-based activity.

Current Reality – Constraints for an Internet Atlas

This raises the question: Can an school Internet atlas satisfy all these requirements? Particularly, in the light of the constraints, problems and issues facing the schools. These include the number and location of computers, access to technical support and teachers requests for (1) more time to explore ways to use the Internet and (2) training opportunities to upgrade their computer skills (SITES, 1999). The uneven quality of access to the network, which impacts on the time it takes to get a response and information, is another very significant constraint.

Components of the Prototype Internet Atlas of Québec for Schools

There already exists, on the Internet, a pilot multimedia cartographic product of Québec, (*Atlas of Québec and its Regions* at: < http://www.atlasduquebec.qc.ca>)**.** Designed for the post-secondary clientele, such as college and university level or professionals from the consultant milieu, its aim and content make it pedagogically unsuitable to function as a school atlas in the classroom context. Thus an 18-month project, subsidized by the Information Highway Funds of Québec, is underway to provide the pilot for an appropriate Internet school atlas whose objective is to support teachers and students, particularly in the context of the province of Québec's newly implemented elementary and secondary curricula. Figure 2. presents the proposed structure

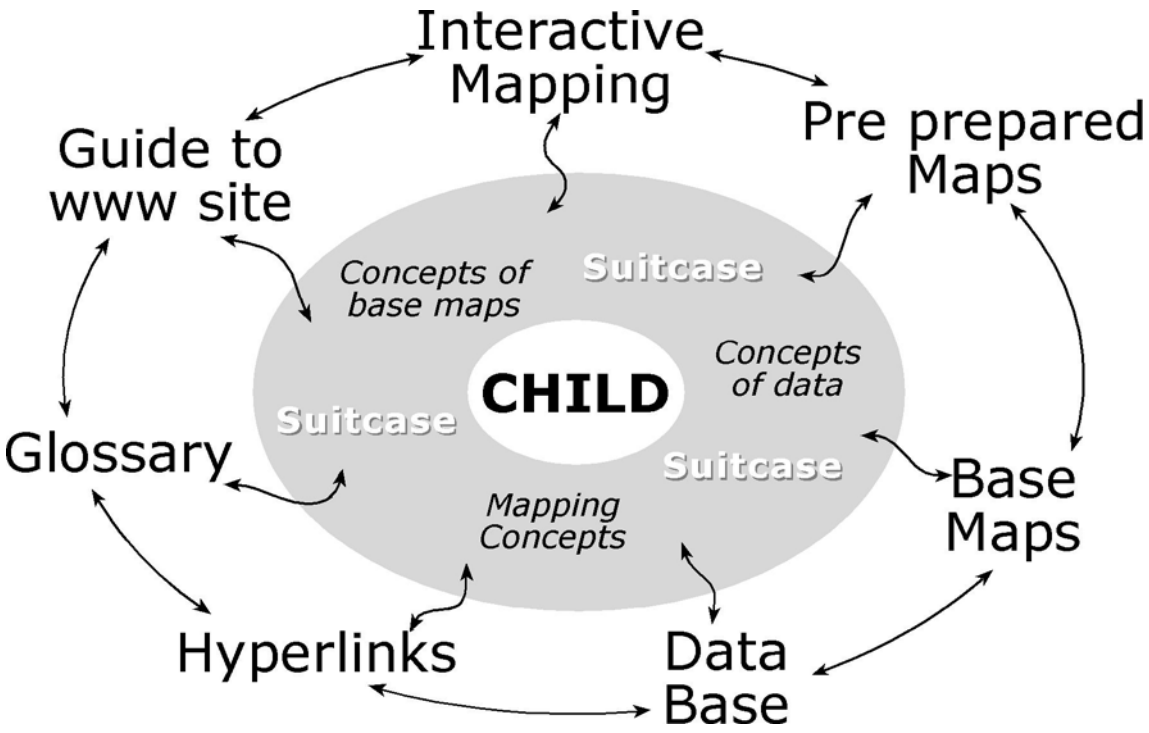


Figure 2. Structure of the Prototype Internet Atlas of Québec.

of the prototype atlas and identifies the projected deliverables of the project which are:

- a bank (suitcase) of 'concepts'
- an interactive mapping 'tool box'
- a collection of maps (thematic and base maps)
- a data base
- pre selected hyperlinks
- a glossary
- a guide for surfing the atlas site.

The bank or "suitcase" of concepts will contain concepts basic to the understanding the nature, role and processes of working with (this is using and producing) maps and diagrams. Users will be able to produce their own maps using the interactive 'mapping tool box'. The collection of maps will comprise a reference collection of 720 thematic maps (40 thematic maps of the whole province of Québec and 40 for each of Québec's 17 regions) as well as simple base maps and blank maps. Some of the general themes to be treated are: population, history-heritage and regional characteristics, climate, vegetation, environment physiology and relief, the economy (revenue), communication networks, education and culture**.** Data, supporting both the themes of the maps of the atlas and the Ministry of Québec's curriculum cycles, will also be available. Pre-selected hyperlinks are to be included to respond to teachers' and students' queries related to the contents of the atlas. The glossary terms included will be interactively linked to relevant text, graphics and hyperlinks within the atlas. To assist the user to identify the atlas's components, their possible options, and to interact efficiently and effectively with the atlas site, a guide to the site will also be necessary.

Decisions Impacting on the Architecture of the Atlas Components

A requirement of any application for funding is the identification of the project's 'deliverables'. Comparing Figures 2. and 1b. reveals that the "deliverables" of the prototype Internet Québec atlas closely mirror the general components of an Internet atlas. However, based upon information about the curriculum reform, perceived requirements of teachers' and students' and the nature of the Internet, the architecture developed for the pilot atlas is fundamentally different from the general Internet structure shown in Figure 1b. **The prototype atlas is child-centered**. As such, it provides students with the opportunity **to think for themselves** about the organization and use of space. Students will be able to construct knowledge through their own experiences with the means put at their disposal. Their mental schema, together with interactive access to a suitcase of cartographic concepts, various sources of information (thematic maps, data, hyperlinks, glossary) and an ability to create their own maps, provide the means for learning about the nature and limitations of maps, as well as contributing to their logical formation and developing knowledgeable Québecers aware of their immediate and global environment.

Another significant decision taken relates to the actual content that will be provided for each component. **Four different levels of treatment are proposed for both the Interface and supplied materials.** These levels are: Level 1 (Cycle 2, 8-10 years of age), Level 2 (Cycle 3,10-12 years of age), Level 3 - Junior High School (12-14 years of age) and Level 4 - Other (15 years and older). For each level, there will be appropriate terminology (e.g., glossary), as well as attention to the number and type of thematic maps available (their content and design), the nature of the concepts, and the provided data, hyperlinks and interactive mapping capabilities.

Work has now commenced on the development of a sample of these level-appropriate materials. A *Macromedia* package containing *Flash*/*Freehand* is being used. This was selected as *Macromedia* has invested heavily in the development of Internet application software. *Flash*, a current standard in Internet applications, can be linked easily to other Internet applications. *Flash*/*Freehand's* vector file format permits the production of 'light files' which can rapidly be downloaded, zoomed and recycled. The entered data is currently in an *Access* database, with long term plans to transfer this into a more robust structure such as SQL (Standard Query Language).

Conclusions

An Internet atlas, with the possibilities of up-to-date multi-level information, interactivity, animation and sound, has the potential to inform and motivate teachers and students, in a "fun" and easy manner, to learn

about and present many aspects of Geography, History and Citizenship in the context of new Québec's curriculum. However, given the inter-variability of school hardware and software and the fallibility of the Internet, it will not be possible to satisfy immediately or realistically many of the teachers' demands relating to teaching materials on this medium. The success of an Internet Atlas for schools lies in identifying and utilizing the medium's strengths to provide access to materials that can be meaningfully linked by the child to geographical problems and their everyday reality. Developing a prototype **child-centered**, multi-level Internet atlas for Québec school children is an exciting challenge in the development of hypermedia educational cartographic materials.

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Biographies

Jacqueline M. Anderson is the Chair of the International Cartographic Association's Cartography and Children Commission formally the Cartography and Children Working Group. Now teaching Cartography at the undergraduate level at Concordia University in Montréal, her particular research interests include the design of maps for elementary school children, school children's knowledge of and attitudes to maps, and the development of meaningful instruction for both children and teachers using traditional and electronic methods (CD-ROM and the Internet).

Jean Carrière has been a Full Professor at the Département de géographie de l'Université du Québec à Montréal (UQAM) since 1971. His primary research areas include scholarly and thematic atlases adapted to new technologies for communication. He is currently head of both the Atlas of Québec Project and pilot to develop a prototype of an Internet atlas for school children 8 to 17 years of age.

Janine Le Sann received her doctorate in Geography from L'École des Hautes Études en Sciences Sociales à Paris (EHESS). She has been teaching Education at the Universidade Féderal de Minas Gerais in Brazil since 1976. Her research interests include the use of cartography as a teaching tool at the primary level, using municipal school atlases to study local space, and examining the role of regional atlases**.**