SPATIAL CARTOGRAPHIC LITERACY AND THE ATLAS OF QUÉBEC PROJECT

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Presented at the Conference on Discovering Basic Concepts, held in Montreal (Canada), August 10–12, 1999 (Updated version)

Introduction

In the last five years research into the area of children and mapping has developed. Some of the experiments with children have involved giving explanations and then observing the way that instructions were followed and understood when reading maps. In the very near future, new technologies for communication and information access, such as computer assisted graphics and the Internet, will transform the way in which children are expected to work with geographic information. Electronic atlases, simulating cities or three-dimensional (3D) Geographic Information Systems (GIS) are only a few examples. The impact that these developments will have on teaching Social Sciences topics in a classroom needs to be examined.

In the past, maps were produced exclusively by cartographers. This is no longer the case, however, as more and more non-cartographers are producing and editing maps. Auto-drawing of maps by system users is currently available with some software on the Internet, such as Internet Maps Server (IMS) on-line. This is one means which will allow children to produce maps. This technology offers children methods of map production that are very different from being confined to drawing a map at a desk in school. Data banks and base maps will give these students the opportunity to work with real map products even though they may not have much mapping experience.

This said, however, the map reading skills of children have not changed very much. While the tools may have changed, the territory and the landmarks remain the same. Field studies with children in the classroom demonstrate that from the living space of the child to the logic space of an administrative boundary, landmarks adapted to the world of the user must be part of the mapping system dedicated to the child. As a result, children's participation in the establishment of the landmark network within the map production system should be encouraged. While some map reading problems stem from the user's inability to understand the cartographer's perspective, some of the problems originate in gaps in the user's training in cartographic language. But, at the same time, there should not be an underestimation of these maps users as they are sometimes very well aware of how to read the territory on a map, sometimes even better than cartographers. Figure 1, reproduced from the 1966 work by Cauvin, shows the three main fields of cartographic activity: from a reality base, the cartographer conceptualizes a map to translate the 'why' of it; then, the map is created; thirdly, the cartographic image is used by the map readers with their knowledge and experience. The figure illustrates the patterns of communication among the map author, the map and the reader.

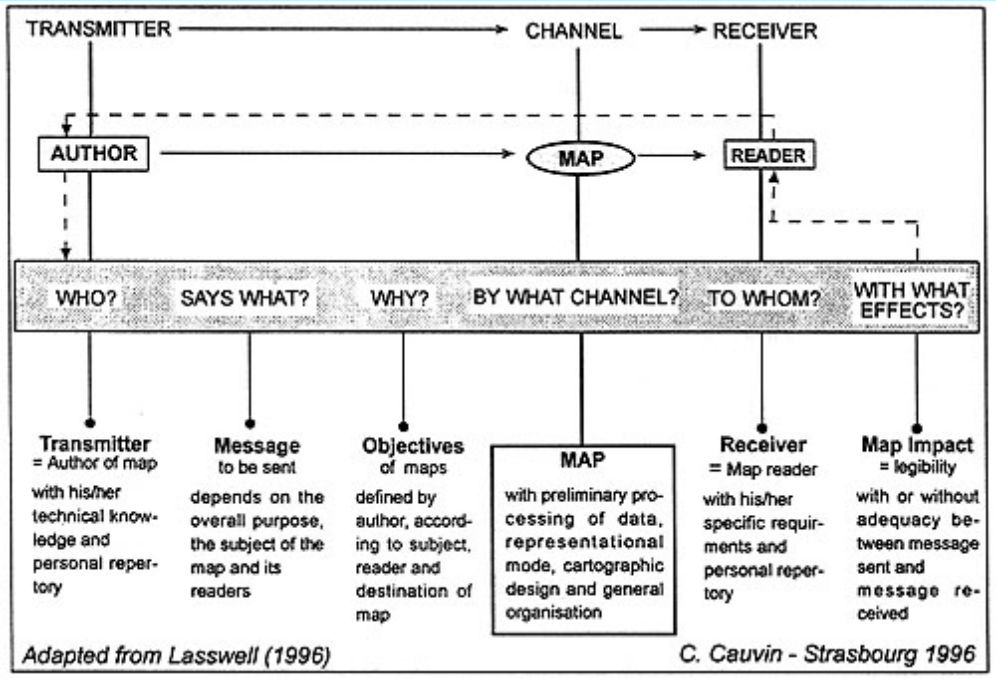

Figure 1: Cartographic communication: relationships between author, map and user

The reading of cartographic images

The reading of maps is, first of all, an understanding of the cartographic language. This map related understanding is a cognitive process. For this reason, map readers need to develop some specific map reading skills. In addition, as it is becoming increasingly clear, children need to participate in, and be made aware of this learning process. The skills required for the reading of maps are mostly linked to the coding and decoding of symbols used in the mapping context. Coding requires skills for reading, comprehension, analysis, interpretation, visualization and evaluation. Encoding of the map information requires conceptualization and construction skills, where the role of reader intersects with (map) author. Reading skills are necessary for the user to properly identify the information on the map. Users should then be able to accomplish simple tasks, such as symbol detection, discrimination, recognition and identification. The comprehension of the map artifact is the act of the user understanding the principle that the map is a symbolic representation of a part of reality. Comprehension occurs with a cognitive process which selects certain elements from the milieu drawn on a two dimension plan to create meaning.

A child's initial understanding of space

Space is organized on different levels and also has its own internal organization. These spaces are gradually discovered by children in different steps during the first years of life. Humans generally live in a daily reality which occupies the first level of space perception. The "I" is the window through which the others levels (scales) such as the neighbourhood, region and world are discovered. Moles and Rhomer (1972) believe that it is through individually lived spaces that we train ourselves to become map readers. With some imagination and intuition, the child is able to understand the organization of his or her milieu and then structure this environment from a personal perspective.

Starting from the body, the concepts of foreground and background will be understood. This axiom suggests that the analysis of phenomena in daily reality is hierarchically based and is related to the relative position of the subject observer. If we consider the possibilities afforded by the advent of new technologies for re-creating the real world of a child into virtual 3D animation, we must be aware that electronic tools might be an answer to some of the problems associated with the instruction of geographic phenomena. Electronic tools may be an even more powerful tool with the addition of sound for more auditive pupils (as compared to visual ones).

An Electronic Atlas of Quebec

This is a multimedia cartography product available on the Internet. A team consisting of more than 60 researchers from all Québec universities has been working for the past two years on a project to create the Atlas du Québec et de ses régions. This project has a strategic significance, not only for the Québec universities, but also for society as a whole since no such Atlas exists. Part of this Atlas is already available and can be seen on the Internet. The address is: .

The objectives of the Atlas go beyond creating maps that inventory land information. From a geo-referenced database, the Atlas proposes a series of maps of Québec at a general level at a scale of 1: 8 000 000. A second level of information analyses each of the 17 administrative regions. At the third level, each of these 17 regions will work on a local atlas, produced with local expertise. All this data will be available in the peripheral regions not only for consulting, but also for local use. After specialists from each area complete their work, this regional data will be incorporated into the Atlas Network. In brief, the Internet Atlas du Québec et de ses régions has the objective to support the analysis and depiction of the major elements driving the evolution of the Québec's regions as well as provide a set of tools to those involved in local planning and development.

A Project Supported by the University Network

The three levels of the Atlas, including all the groups in the region, follow the guidelines proposed by two Commissions: the Scientific Commission and the Cartographic Editing Commission. The Scientific Commission consists of 11 members from ten universities from all over Québec and from the National Research Institute. Orientation, objectives and quality control guidelines were established by this Commission. All the work and results should fully respond to the scientific criteria defined by this Scientific Commission. The Cartographic Editing Commission (CEC) also consists of 11 academic members from the same institutions who are responsible for all the geomatic standards and cartographic rules. A technical guide has been produced and a common geobase structured and distributed to all participants in the university network. In brief, the CEC will also be responsible for the multimedia editing of the Atlas content being developed by the Scientific Commission and researchers from all parts of Québec.

A Dynamic and Interactive Tool

The decision to publish an electronic atlas for Quebec was made in 1995. Although the feasibility of such a project was still in a preliminary phase, the original team chose a dynamic and interactive atlas rather than producing a paper atlas that would subsequently be transferred to a CD and then onto a network. There was an evaluation of its potential for diffusion, its decentralised form, updating its content and the possible re-editing of the maps. The future implications of this new technology must be considered for the ways in which it may alter the actual construction of maps, dictated by the way they are read. Electronic atlases are dependent on the size and resolution of the screen, and the sequence of images required to cover dense thematic information on a large scale, for example. These atlases have great potential, with the advantages of being dynamic, interactive and adapted to the requirements and questions of the user. With these new configurations come new concepts and paradigms of map collections. Atlas authors must be aware that they are serving a large population of users, from the anonymous surfer to the specialist researcher that may be mining for data to support their work. Atlases are becoming closer to reality, on a real-time basis than ever before. They can support the user who may be following political changes or observing current natural phenomena, especially with permanent references to commonly known landmarks on the national map. The effects of climate, such as hurricanes, ice storms or flooding are all good examples of events that people can follow via the Internet to obtain more information regarding geographic location or regional consequences of such conditions.

Using the Atlas

Because of the wide range of people using the Atlas of Qu6bec on the Internet, it must be very user-friendly and offer, beyond high technical quality, an easy way to locate the files and links implemented on such a site. In the Atlas du Québec, three levels are initially presented. At the National level, we use three scales depending on whether it describes the whole territory, the large northern part with a few settlements, or the southern part with large urban centres. At the National level, a second difficulty concerning the different types of territorial subdivisions needs to be addressed. With 17 administrative divisions, 96 Municipal Regional Councils (MRCs) and more than 1,600 municipalities (most located in the south of the Province) the dimension of the screen and the capacity of the user to read so much detail highlight the problems of understanding the territory in its entirety. In addition, the zoom tool is not the best solution. A series of maps on the same topic present another type of problem. When viewed on a sequential basis, the global point of view is poor. Also, for the most part, on a computer screen it is harder to remember the image that was shown in the previous three or four (or more) steps. To respond to these queries, symbols, tables of content, thematic research, and year of data collection, plus screen requests with hot spots on the maps or around the image (legend and buttons) have been implemented to guide the user.

Multimedia presents a new way of accomplishing these tasks with the use of animation and audio. In the Atlas, animation is used to show the evolution of population density from 1871 to 1996 (with one dot representing 500 people from census data collected every ten years). Land appropriation over the 125 year period is quite evident as dots appear and disappear in some peripheral areas. In the Atlas, animation replaces many static map images and can be much more effective. The audio is just being tested, with narration accompanying maps in place of text. It is surely a positive tool for a large segment of the public.

Future developments

The Atlas du Québec Group is working on an interactive tool that would transform the map reader into a map author with 'four clicks' of a map application on the Internet. Data banks are being prepared, and a user will be able to construct a map by selecting a geographic territory and data linked to it. Users will also be able to choose colours and the type of presentation. But some of the most interesting perspectives we plan to develop are related to its educational application. There is a School Atlas Project which is in an early phase of development. It is being prepared as an interactive teaching aid for teachers and students in connection with the new curriculum being developed for Québec's elementary and secondary schools.

References

Cauvin, C. (1996). In favour of teaching theory in cartography suggestions from an academic program. Cartographica, XXXIII, #3,21-28.

Moles, A. and Rhomer, E. (1972). Psychologie: Psychologie de I' espace. Bruxelles: Casterman Collection.