ABSTRACT

The Cartography Tactile Center of Metropolitan Technological University of Santiago, Chile is carrying out investigation, map production and training activities on map uses. From the 1994 a multidisciplinary and international group meets to develop projects with the Geography and History Pan-American Institute (GHPI) dependent from the Organization of American States (OAS).

The work that is presented in this opportunity is framed inside OAS project: "Design and Production of Cartography for Blind Latin America People ", which is being carried out from 2002. The main objective is: " The geographical space representation by means of 3D models for blind people's handling in 18 countries, 54 schools and blind benefit organisms. In the project context, the products so far have been political, physical, vegetation, climate and population maps and a geographic manual concepts, made in PVC and in third dimension with their due Braille system.

INTRODUCTION

All this material is in evaluation by blind people of the benefitted countries. It is important to provide knowledge of the procedure, preparation, tabulation and cartography evaluation by the elaborated project. In the making of the evaluation test participated especially a Differential Educator, a blind adviser, Geographers and a Cartographer. A guide of the evaluation process material, will allow interaction in a more expedite and surer way, between the professor and the student.

At present, a test is sent by Internet, and it should be responded on-line being connected to the web page of the Cartography Tactile Center. This allows an immediate and automatic form to store the results in a database and making of graphics.

During the evaluation process the students should give their opinion regarding fundamental aspects to consider in the improvement of future cartography, such as type of material used, dimensions, portability, simbology, relationship of represented information and its climbs, clarity of simbology and legends.

The obtained results of evaluations are quite encouraging and even in some schools they are already using the material before they carry out optimization processes material. For the above-mentioned, the expectations to continue the productive process and then to enlarge the sample of schools to those that will surrender the material allows us to look with optimism the deployed effort.

In this same sense the expectations to enlarge the use of cartographic material towards children with other limitations, and even normal children, take us to conclude that possibilities to think integration of children in the teaching and learning process of geography can be a reality for Latin America children.
ANTECEDENTS

Space perception is conditioned by some factors that don’t depend directly of the student, as quality of models, the **symbols design and the legends clarity**. The above-mentioned is still more excellent and complex, when the user vision sense lacks, so that all methodological effort is guided to achieve tactile models before conventional graphics (Hatlen P., 2002).

These models have the possibility of being decoded by blind children, and they are also attractive for normal vision students, which incentivates integration between both in a teaching and learning process of geography. In previous experiences it has been possible to evaluate the level of geographical perception of spaces emphasizing the recognition of big political divisions. In this opportunity partial results of perception at morphology level is to say the physical characteristics of a big way of relief and hydrography.

From the methodological point of view, the models have been generated starting from bases in analogical format, those that are perfected starting from compilation of cartographic information of different sources, then taken to digital format to be completed in their design and formal presentation in Arc View.

Starting from 1965, when Wilson Wurtzburger and Johnson noticed the necessity of having more investigations on tactile maps, we have observed how, they have gradually left developing studies on design and construction methods (Rowell and Ugar, 2004). In our country, these experiences have been developing approximately from 1991 (Coll A., 2000).

Tactile perception works from active kinestesics movements that allow people to perceive three-dimensional surfaces images with the fingers. In consequence visual restriction usually considers the reason why as an enough difficulty problem for those who suffer it. The future development of tactile maps to be used by this population should pointed to achieve products of great consistency and susceptible of being manipulated by those that cannot see. Blind people obtain knowledge about geography and places using different mechanisms and elements that allow them to obtain space information directly through the exploration, verbal explanations, sounds, scents and models.

These last ones and particularly in their 3D format have the advantage of facilitating generation visual and tactile images, they correspond to the properly denominated tactile maps Pino, F. and Coll, A. (2004). Indeed, the images that suggest or insinuate, are more important for visually handicapped than for those who have a normal vision, since the tactile cartography is constituted in a bridge towards reality, while for those with a normal vision, graphics and maps consist of an abstraction of the reality (Vasconcellos and Tsuji, 2004).

Experiences developed in different countries have demonstrated that the assimilation of knowledge in shared form (children with normal and blind vision) is more fruitful, provided the support of a prepared and qualified professor. These students by means of access to cartography and fundamentally with their professors support, can achieve important advances in understanding geographical space and localization and understanding of distribution of territorial variables.

Perception of geographical spaces however, is conditioned by some factors that don't depend directly on the student, such as:

- a) quality of cartographic models
- b) type of materials used in their making
- c) design of the symbols and
- d) clarity of legends.

The models to use in a process of teaching and learning like one that is suggested, should have the possibility of being decoded by means of tact and should also be attractive for students that have a normal vision, with which: **In “teaching geography learning process” the integration between both is incentivated,**
OBJECTIVES

1. Give to know the integration importance of geography teaching-learning in Chile and Latin America.

2. Show some cartographic models that are being used by Latin American students with this purpose.

3. Show the results derived of material evaluation processes by Latin America students.

METHODOLOGY

The general outline work suggested by Pino and Coll (2002) is applied in this opportunity. All stages are important, however it highlights that related with simbology definition and selection (Pérez E., 2001).

On the other hand, it should be mentioned that the methodological focus has been guided conceptually by positions pointed out by Norman and Bobrow in Freeman, 1976, for what they nominate input mental figures No 1.

![Diagram](image)

**Figures No 1**

The previous outline represents the input mental process (Norman and Bobrow, 1976, in Freeman, 1976). This is characterized by many entrance accesses (inferior leaves) and several exits in the superior part. Those of entrance have sensorial information in common (tact in blind people case).

The central part represented as a tools table is basic available data; they incorporate gross data by means of our sensorial platform. The mental images and then the knowledge are those that later on support working in a decision taking.

EVALUATION

One of the fundamental stages in this whole models productive process that will be used by Latin America blind students and with vision, is related with material evaluation (Coll A., 2000).

The evaluation process is one of the methodology stages that allows to correct errors and to improve quality of models. It is an interactive process in which participate three components:

- Blind students,
- Educators and
- Cartographic models
The subjected aspects to evaluation are:

a) Design Maps
b) Used materials
c) Symbolization
d) Information (quality and quantity)

The tool used consists on a group of selected maps and a test that apply it directly by teachers to their students (Vasconcellos R., 1993). The sample students corresponds of basic and middle education whose ages averages vary from 10 to 19 years, of Latin Americans schools that received material (54 schools). It is appreciated a group of following pictures (picture 1, 2, 3, 4 y 5 show different aspect to evaluation process).

### RESULTS
The understanding of some of geographical concepts, related with relief forms should be translated in an improvement of mental images of geographical landscapes that blind and normal vision students have of their respective countries.

Finally it is important for us the integration objective in the teaching of geography. Here the material by it alone should be able to wake up the enthusiasm of all stimuli this way, a combined work among blind children and with normal vision.

Following, one can observe some maps generated by the project, those that were subjected to an evaluation process whose partial results are shown next in the conclusions.
CONCLUSIONS

The elaborated models by the corresponding project went to each one of OAS countries that are collaborating, those that have the responsibility of proceeding to carry out corresponding evaluations. The evaluation process has been very slow because not all schools respond appropriately to the requirements and specified terms.

The conclusions that are shown in this opportunity have been elaborated with a part of answers that we have received. It is expected in the medium term to have, to our disposition the entire test that correspond to the countries which are working with us. Next, some excellent aspects derived of tabulation and interpretation of the evaluations that we have received in the Tactile Cartography Center are mentioned.

In connection with Geo cartographic concepts manual, it should be mentioned that the results are quite satisfactory. This material has generated a great enthusiasm in all children, with and without vision.

The understanding concepts level in general presents a near 55% mode, and the difficulty levels in some concepts are near 40% in average.

The “river delta” concept was one of the most difficult understanding for children. Difficulty level and later recognition only reaches 37%. It is possible to explain this low percentage by an ignorance of concept, before the cartographic model quality that represents it.
On the other hand, the concept easy to understand for children was "island". This concept reaches 90% of understanding.

In general the items with design related and material type used in models construction, quantity and quality information contained and capacity of the legend to decoding facilitate, reached acceptance means values of 60%.

As for the capacity that models possess to help mental maps from the territories generate, level of each country level, the acceptance percentages are of 70%. Finally to world scale, the understanding level is 30% average.

BIBLIOGRAFÍA


Freeman (1976). The Structure of Human Memory, compiled by Cofer, Ch.


