

A PROPOSED METHODOLOGY FOR THE TEACHING OF MAPS

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ABSTRACT - Based on the psychogenic studies of J. Piaget, the teaching of scale, projection onto a plane, geographical position finding and cartographical symbols was applied in three phases. An experiment was carried out with children of 9-14 years, in order to evaluate the first phase. It was confirmed that in the experimental groups, objects were represented, maintaining a point of view (vertical) and proportionality to a significant degree. It was also found that the use of a base plane can serve as a guide for plane projection.

In this work, our intention is to propose a methodological orientation for the teaching of cartographical representation, targeted towards the later reading and comprehending the maps. Works like this are important when we consider the necessity of using maps in everyday life. The individual who cannot use a map is hindered when thinking about aspects of territory that are not registered in his memory. There is a direct implication to what was mentioned above for teaching; that is: schools should prepare students to comprehend, historically, the spatial organization of a society and to know the techniques and necessary instruments for elaboration of graphical images which represent it. Notwithstanding, teachers find that there are difficulties on the part of the students in comprehending the forms of spatial representation and geographical orienting.

Recent studies show that the dominion of space by man is influenced by psycho-physiological factors, as well as, social-cultural factors. The work of Marie Germaine PECHEUX [6] analyzes the hypothesis that spatial experiences and their consequences are the same for all mankind. The author considers that the basic sensorial modalities for spatial perception are vision, audition and proprioception in relation to touch. She also emphasizes the relationships between space and movement and the important role the corporeal scheme plays in spatial structuralization - there is a projection of the corporeal polarity onto objects, as well as onto space. PECHEUX based her studies on the work of Liliane LURÇAT [5], whose studies show that motricity is a generator of spatial order, which develops with age. And hence, we come to Piaget's studies [7], that attribute to action the crucial role that it plays in cognitive development. It is through this that the acquired schemes are mobilized and the perceptive data are put in relation. We also consulted other publications of interest regarding this theme [1, 2, 3, 4, 8 and 9].

The construction of cartographical concepts necessary for the comprehension of maps is based on the passage of spatial topological references to the projectives and euclidean, which occur gradually, from approximately 9 years of age on. However, the aforementioned studies lead us to conclude that, even having reached the formal operative level, the students still present difficulty in the understanding of maps. These difficulties are inherent in the proper nature of cartographical representation, whose domination demands learning. Therefore, the teaching of maps requires an adequate methodology bearing upon the psychology of space, as well as, on the mastering of cartographical representation. In the next section we present a proposal for teaching that seeks to satisfy these demands.

1. A methodological proposal for spatial representation

Based on theoretical study and the experiments that we carried out about space cognition and its representation, we have elaborated this methodological proposal whose principles are the following: construction of three dimensional models and graphics, problem solving process and the active participation of students.

We seek to adapt the proposal to the Brazilian school conditions, so that no special environments are required and low cost materials may be used.

The objectives that the proposed activities aim to develop are: the projecting of location references of the corporeal scheme onto objects in space; the developing of a variety of perspectives of the same object and its projection in two dimensions; the establishing of proportional relations among objects, as a basis for the notion of reduction in size and cartographical scale; the creating of a means of initial representation with a symbolism styled on cartographical language.

The proposal is organized into three phases. The initial phase is directed towards preparation for understanding the map, and it consists of the following activities: tracing the body of each child onto a sheet of paper with the projection of the referentials: right-left, back-front and top-bottom; Determination of the classroom quadrants from those referentials; construction of a maquette of the classroom; drawing of the maquette on an oblique perspective; projection of the maquette onto a plane; a blueprint of the classroom to scale.

The second phase is aimed at a deepening of the cartographical knowledge already initiated in the previous phase. It is comprised of the following: constructing a maquette of the school, and from it to project the blueprint of the school; constructing a maquette of an imaginary village, projecting its plan on a sheet of paper and creating a geographical position finding system; tracing in of the urban trajectory from the school to the house of each student; projecting the geographical position finding references, using a globe of the Earth; projecting the sphere of the Earth onto a plane surface.

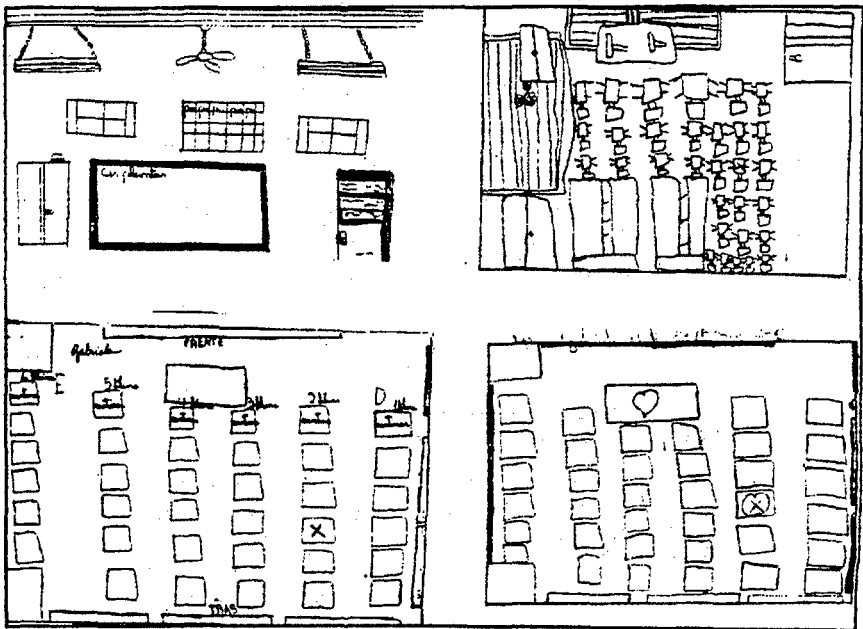
The third phase develops, more specifically, cartographical concepts, such as the following: cartographical generalization and topographical representation; latitude and longitude and calculation of distances and thematic representation.

2. Map teaching in school practice

We carried out the experiment in four classrooms (4th and 5th grades) to test the first phase of the proposal. The experiment was done with a control group for each grade. A pre-test was

administered, as well as a post-test which were evaluated according to the following criteria: geographical position finding, proportion and point of view, scored with a point system. The level of significance was evaluated by way of the Mann-Whitney U-test of . The instruments used were the drawings of the classroom from aerial perspective, first on a blank sheet of paper and afterwards on a sheet of paper with a rectangular base which represented the classroom floor. Three different modalities of analysis were done: (1) measurement of data, by way of statistical tests, (2) evaluation of factors of the learning method, by way of interviews and (3) analysis of graphical productions (drawings). It was verified that in the drawings of the students from the experimental groups, that objects were represented maintaining point of view (vertical) and proportion, in a significantly superior way compared to those from the control groups. The development of the representations done by children of the experimental group can be observed in Figure 1. Notice that the typical traces of the topological representation - a mixture of points of view, transparency, juxtaposition, absence of proportion - evolved to the orthogonal representation of the classroom.

Figure 1 - The evolution of a child's drawing in the experimental group.



We also discovered that the use of the base plane can serve as a guide for projection onto a plane, since it engenders the projective representation from the vertical point of view, in cases of small and well known areas.

In closing, the application of the methodology here proposed permits us to conclude that the active participation of the children in the construction of forms to represent space and to solve problems, makes up the path to intelligence, creativity and autonomy in the dominion over space.

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