

The importance of tactile maps in the development of spatial thinking

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Abstract:

Our discussions are based on a decade of experiences of teaching Geography and Tactile Cartography to visually-impaired students using adapted teaching materials. In this section, we present the relationship between the use of tactile maps and the development of spatial thinking in blind or visually impaired children. We investigate how teachers can mobilize spatial thinking in the visually impaired students by using tactile maps considering the structuring characteristic of this resource for geographic science.

The Geography and Cartography teaching and learning process involving blind or visually-impaired students brings several concerns, among them the negligence in the use of maps in general, the absence of the tactile map as a didactic resource in Geography, the low production of tactile materials in large scale, the predominance in replacing sight with hearing in classes in general, the low level of proficiency in skills related to the use and interpretation of cartographic representations, whether tactile or graphic, by Geography teachers in basic education and, the most disturbing of these in our understanding, the absence of research in the investigating of how the apprehension of space occurs for a visually-impaired person.

The perception of the mapped space by a blind or visually impaired student is quite diverse, and adaptations in the materials and didactic procedures are required for this audience. Thus, they require us to go beyond the research in the geographic education field, reading articles about psychology, neuropsychology, spatial education and anthropology and constantly revisiting the epistemological bases of Geography in order to have a clear notion of the nature of Geography and Cartography teaching in school, producing consistent research in Brazil.

We identified studies highlighting the importance of drawing for geographic and cartographic learning for the visually impaired public, such as those by Ventorini (2007) and Silva (2020), which directly contributed to the investigation of the formation of spatial representation in these individuals. Silva (2020) addressed the connection between drawing, map and spatial thinking, seeking to develop spatial reasoning in the research participants.

Spatial thinking has theoretical basis in cognitive psychology, with emphasis on spatial cognition and has been studied since the 1970s. However, it gained more prominence in education when the terminology and guidelines for its development began to be used by the U.S. National Research Council (NRC) in 2006, becoming a reference in this area of investigation.

In general, the document defines spatial thinking as a collection of cognitive abilities that consist of declarative and perceptual forms of knowledge and some cognitive operations that can be used to transform or combine this knowledge. We can understand it as an amalgam of three elements: spatial concepts, representations, and spatial cognition. Its relevance lies in the extent to which it serves "to structure problems, to find answers, and to express solutions" (NRC, 2006, p.12). This passage is in line with the goal of learning from and through the map, in which the primary purpose is to enable individuals to make a critical reading of space.

However, what has been done in Brazil differs from what has been done in English-speaking countries. The latter is very much linked to geosciences and the production of digital maps, in order to fill gaps in the production of these resources. In Brazil, recent studies such as Jordão (2021), Castellar e De Paula (2020), Castellar (2017, 2018, 2019), Castellar & Juiliasz (2018), Rizette (2018), Richter (2018), Straforini (2018) Juiliasz (2017), Duarte (2016) among others, seek to bring light to a Cartography that is learned in school, revalidating the discipline of Geography as an important curricular component to make the student a critical and autonomous subject. For this, the authors relate the mobilization of spatial thinking fields to the development of geographic reasoning.

This is a very complex cognitive skill and of great importance for the development of the individual. Precisely because it is linked to autonomy and problem solving, spatial thinking is very pertinent to people who have some type of visual impairment. To develop this type of cognitive process in the public with low vision or blindness, for Geography, maps must be presented adapted, and their use stimulated.

In order to verify the connection between Tactile Cartography and the mobilization of thinking, we analyzed experiences with tactile maps developed and evaluated during Jordão's research (2011 and 2015) in basic education and related them to the fields of spatial thinking: concepts, representations and skills.

The research showed that, although spatial thinking is not explicit in the bases of Tactile Cartography, it is possible, through tactile maps, that most of the concepts and spatial skills are mobilized for the development of geographic reasoning, allowing the student with visual impairment to learn, reflect and dialogue about space. Thus, in addition to contributing to a consistent geographic education, the use of tactile maps enables a critical reading and action on the spatial dimension of reality.

This qualitative research was developed under a cultural-historical perspective, based on two distinct but articulated moments. First, we focused on the selection of a bibliography in the field of School Cartography, Tactile Cartography and Spatial Thinking linked to the teaching of Geography. The first result obtained was the construction of an updated theoretical support on the relationship between Geography and Cartography in teaching, reaffirming the validity of both in the school context.

The second result evidenced that a greater mobilization of spatial thinking mobilizes geographic reasoning, and, for visually-impaired students, it represents an element of autonomy, highly influencing the Geography teaching and learning process to this public. The context of this work consolidates the need for production of knowledge to the Universities, so that they subsidize the graduation in Geography in a solid and current way in its theoretical basis, with interdisciplinary and inclusive practices