Spatial concepts in individualization, subjectivities and singularization processes

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Abstract. Perception of space and its surroundings develops from the first months after birth. The notion of spatiality is present in the daily life of the baby. From the moment he begins to know his body, the baby identifies the part and the relationship with the whole (of his body) of the sensory. That is why, when talking about spatial perception, we do not necessarily limit ourselves to the schooled knowledge governed by the school curriculum. The present writing intends to approach the notions of space and spatial sense since the early years, from the reading of the cartographies developed in different kindergartens in Brazil and Colombia. This paper reflects on the processes of singularization, subjectivities, and individuation that involve the baby's early learning. This text offers approaches to the development of the notion of space in the baby. This research is of an interdisciplinary approach, which adopts a qualitative methodology with a descriptive perspective. Among the most important results are presented the cartography of the paths and the relations of babies, by experimenting the space related to the processes of individuation, subjectivities and singularization lived in various places for babies.

1. Introduction
The perception of space, and what surrounds develops from birth. From the above, when talking about spatial perception, we do not necessarily limit ourselves to the school knowledge and content in the preschool curriculum, it is necessary to emphasize that, when approaching the notions of space, in the baby, is given, in the majority of the times, the intervention of an adult (family, family members or teachers in the school), who, among natural dialogues of the baby, provide reorganizing experiences of their worldview that, possibly, exceed the limit of their bodies and the space where it is located. In other words, the vision of space, place or world is expanded. Thus, this paper is constituted based on cartographies developed in different kindergartens, mainly in Colombia and Brazil, within the framework of an international cooperation project, entitled: “Babies, individuation, subjectivities and singularization processes lived by them in different spaces”, by researchers from Brazil, Colombia and France, in some initial approaches made on the notions of space and initial meaning in the initial years. Next, we present the initial understandings about the development of Spatial Sense in babies and its contributions that this makes in the following years of life; subsequently, the methodology implemented in this research will be presented and, a cartography as an effect of the observation made in Colombia.

2. The spatial sense
One of the lines of research in mathematical education corresponds to the study of visualization, which is directly related to the perception of space (three-dimensional). This, in turn, relates the cognitive structures that mathematical objects represent (numerical, graphic, algebraic, verbal and gestural).
Despite the fact that research reports show progress between the development of visualization skills and the experiences that people face, even these do not report studies that allow us to know their development at an early age. Therefore, this research aims for knowledge of the development of these skills in children between 0-5 years.

From the first moment the baby begins to know his body, for example, when he identifies: hands, fingers or parts of the face and, at the same time, the relationship with the whole of what the body represents, from the explorations he makes through their senses, the notion of spatiality is in the everyday life of babies. In this sense, mainly, the baby uses his hands to identify where each part of his own body begins and ends; Then, as time goes by and experiencing new experiences, other relationships between your little universe begin to make sense, such as: identify the inside-outside, up-down, forward-back, side-to-side, etc.

In this way, the experiences, which relate the interaction with the environment, will help to enhance cognitive development and will facilitate, from the use of well-structured abstract concepts throughout your life, in your daily activities or scientific and technological research, the visualization and interpretation of reality. Indeed, to the extent that the baby interacts with the environment, through its movements, it appropriates a space (its universe), arises experiences of perception of (another) increasingly wide space, for example, in a simple rotation inside the cradle, in the attempts to walk, among other exploratory movements of the world.

Likewise, the notions of space, in relation to the learning of geometry in its school stage, help to consolidate a conceptual base. However, it cannot be deduced that this learning is given only when a teacher mediates in the classroom; on the contrary, each one of the learnings is developed in the experiences to which the baby is exposed from his first years, it means, the learning and consolidation of these notions is located [1]. In other words, these notions of space, and the subsequent development of concepts of spatial thinking, will allow a child, in the future, to be prepared to study the forms and their relationships, in addition to locating in the space and trajectory traveled, articulating axes of the geometric-metric thinking in basic education [2].

On the other hand, the baby, together with the development of experiences and the learning of spatial notions, identifies, in different images of the everyday that have been recorded in his mind but that, on occasion, turn out to be abstract by understanding in this stage of life, objects/people. However, as time passes and due to familiarity issues, in the sense that they become daily experiences, these forms take on more specific characteristics. It is, in this sense, as different theoretical referents [3,4] consider that the learning of forms and relationships, compared to the reference space, is necessarily done from visual perception. Therefore, according to the investigations, two important processes that intervene in the development of the spatial sense are evident: Interpretation of figural information (IFI) and visual process (VP) [3]. The IFI process is about which the interpretation of visual representations is given to extract information from them; however, for there to be Interpretation of the Figural Information there must be a physical referent and, in this way, the individual can begin to make the respective analysis. On the other hand, the VP process is defined as the process of converting information or non-figurative information into visual images or transforming images.

In this order of ideas, as the baby has contact with a wider universe [4,5], babies develop various skills, which are considered in the book Spatial Sense [6], of visualization in the learning of new notions. Now, there are seven: the first, eye-manual coordination is the ability to follow with the eyes the movement of objects in an agile and effective way, for example, when bringing an object to his mouth, since the baby he needs to coordinate his hand with his eyes to take it to a nearby path (his mouth); visual identification is the ability to recognize a figure by isolating it from its context; the preservation of perception is the ability to recognize that an object has invariant properties such as shape and size, despite the variability given by movement; the recognition of spatial positions is the ability to relate the position of an object with oneself, that is, the observer, for example, by identifying the other (baby or adult) in front, next, near, far, etc.; the recognition of spatial relationships is the ability to correctly identify the characteristics of relationships between various objects located in space, for example, when identifying the spatial relationships between the elements that constitute your body; visual
discrimination, is the ability to compare two or more objects identifying their similarities and differences, which occur when comparing their own body parts, with those of another baby, and identify that they are similar; and, finally, the visual memory, is the ability to remember the visual and positional characteristics that a set of objects had that was in sight but that is no longer seen or that has been changed position, for example, to the time to remember an object that the baby has left in one place.

3. Method
The approach of the present investigation, which adopts a qualitative methodology with a descriptive perspective, is interdisciplinary. Mainly, it is proposed to use cartographies to relate spaces in movements [7]. This research based on the interlocution between contemporary authors who, at the same time, mobilize important ideas from different disciplines (sociology, geography, anthropology, philosophy, pedagogy and mathematics), as evidenced in the distribution of research focus of Figure 1, aims to be a study of the development of spatial notions [8].

Figure 1. Project organization in the different research focuses.

In this order, for the analysis, the dialogic narratives that highlight the development contexts of the notions of space, spatial relationships and images will be made.

Thus, in Figure 2, the population is described, a total of 50 kindergartens, with which interdisciplinary and international work is developed and observations in other contexts, such as public and private environments in different regions of Brazil and Colombia. In addition to this, participant observation will be used, scilicet, photos, videos, field diary and cartographies made in Colombia.

Figure 2. Population with which the project is developed in Brazil-Colombia and France agreement.
Consequently, from the analysis of a cartography, a particular methodology, which characterizes this type of research and innovative in the field of study, inspired by the work of Deligny [9], of babies, the processes of singularization [10], subjectivities [11] and individualization [12] is presented. Among the most important results are the mapping of roads and relationships, experimentation of space and processes of individuation, subjectivity and singularization, lived in different places by babies.

4. Results
Visualization is closely related to understanding space. In general terms, if there is an adequate understanding of two- and three-dimensional forms, formed from an early age, this will result in the development of more complex concepts in primary, secondary and higher education. Therefore, thinking about visualization is to talk about the cognitive structures that relate the representations of mathematical objects, which in this case refer to the physical representations of space [13].

This paper represents a contribution to mathematical education, insofar as the recognition of mathematics, especially spatial geometry, is part of the curriculum, and therefore of the minimum training that a mathematically competent citizen should have according to national mathematical curriculum standards. It should also be noted that there is little research reported in mathematics education that refers to studies of spatial notions explored in the initial years (zero - five years).

Thus, for the presentation of this paper, a cartography (Figure 3) has been chosen in which, with the aim of portraying the routine of a child with autism spectrum disorder (ASD) features, in addition the movements are described of a 5-year-old boy, who is enrolled in pre-kindergarten. Among his most repetitive behaviours is the fluttering of his hands and, when something is not to his liking, the action of running through the classroom space. On the other hand, their behaviours in the classroom respond to routines already established during the school stage, namely, the child arrives directly at the bag closet to keep his suitcase; later, he looks for a workshop inside the room, and chooses it according to his preferences. Generally, he starts with the play role in the drama workshop; then, the exit to the main park is made, so that the child knows that, after this workshop, he must go to the Row area and, after 15 minutes of recess, the child returns to his position, which he identifies because he finds his name marked there, which is in the centre of the room.

At the end of the time for the children's round, he runs in search of his favourite place, the reading workshop, to lie next to the books; there, he tries to read a little, and, at first glance, "pretends" to be asleep, since, in reality, he is in search of his own space to relax during the school day. However, at that time, the child is observing the same space in relation to another point of view of the observer, which implies that, with the sole movement of the child, when laying his head on the ground, the world can be recognized from other spatial relationships. Finally, it makes different movements between the different reorganizing experiences [14] offered by the Workshop in which the child travels freely.

According to the above, despite having marked routines, the child explores the space that offers different experiences and movements, sometimes standing, when traveling a certain area, or sitting when focusing his attention on a single place. In this way, when arriving and leaving his suitcase inside the bag closet, the child knows that crossing the main door he finds, on his right, the place where he deposits the suitcase, in this sense, he finds the favourite and everyday places, such as reading workshop or the drama workshop, which shows the recognition of space through the conservation of perception.

Another example, evident in his behaviour, is that in the first moment in which they establish routines in the classroom, the student, although “pretends” to be sleeping when approaching his favourite place, as is the Reading workshop, is pleased of exploring other spaces. In this way, other visualization skills are developed from short spaces of your daily life.

It should also be noted that the classroom where the child is located proposes different reorganizing experiences that allow us to recognize that, despite having the space for “math workshop”, there is no single type of activity / game that allows the child to visit this space. It means, to a greater amount of experiences of this type, can be, in this case, reflected in the transition to primary basic education, if it is possible to consolidate more mental images and relate them in an appropriate way.
5. Conclusions

In conclusion, during the first months of life, and from the different explorations of their universe, babies reach different approaches to space recognition. Thus, mainly, the baby uses its hands to identify where each part of its own body begins (where the feet, hands, etc.) ends, in other words, the notion of spatiality is present in the baby's daily life. In this order of ideas, from the moment he begins to know his body, the baby identifies the part and the relationship with the whole (of his body) of the sensory. In addition to this, his first approaches to other concepts of mathematics, for example, that of number, but not as a representation of a quantity (modern Arabic symbol), on the contrary, as a body representation of two hands, one year, among others. On the other hand, when talking about spatial perception, we do not necessarily limit ourselves to school knowledge governed by the standardized curriculum, from the first years of schooling, but to development by its approximations to its space. In other words, the perception of the environment and the notions of space develop from the first months, after birth, through the baby's environment.

Finally, to develop the Spatial sense, the first notions in babies are constituted from the relationships what makes from his visual perception of space, relationships between objects, representations of forms, symmetry, among others. Thus, the union of the representations observed by the baby, constitute the images of the memories that remain in the mind and allow, every time you face a new experience, (re) organize his perception of the world, in relation to others (adults or children) or with objects with different characteristics than those already know with your daily experiment. As paper's reflection, it becomes pertinent, as a central element of visual perception from the set of mental representations that are made of physical objects, relations of concepts, among others, to think about the proper development of the spatial sense during early childhood.
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