The development of geometrical knowledge starting from arts education

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This poster is focused on the development of students' geometrical knowledge through connections with arts education. More specifically, we present a set of didactic activities and tasks for elementary school students that involves geometry and arts, in an interdisciplinary perspective, and we also analyze and discuss their potentialities in the development of students' geometrical knowledge.

Theoretical framework

The teaching of geometry should contribute to the development of the geometric knowledge of the students since the kindergarten, namely with regarding to the characteristics and properties of geometric forms and the relationships between them, the spatial relations and corresponding representation systems and the geometric transformations (NCTM, 2000). As Freudenthal (1973) point out "Geometry is grasping space. And since it is about the education of children, it is grasping that space in which the child lives, breathes and moves. The space that the child must learn to know, explore, conquer, in order to live, breathe and move better in it" (p. 403). In this sense, there is a dialogical relationship between the development of geometric ideas and the full exploration and experience of space. These geometrical ideas are useful in representing and solving problems in other areas of mathematics and in real-world situations (NCTM, 2000). In parallel to these ideas, research indicates that when students can recognize and use connections among mathematical ideas and can recognize and apply mathematics in contexts related with other subjects, their understanding is deeper and more lasting (NCTM, 2000). Mathematics are embedded in several tasks that students do at elementary school, so it is crucial that teachers integrate subject areas. When teachers connect mathematics with others content areas the students perceive that they explore more mathematics then they would work in a specified time only for this subject (Bamberger & Oberdorf, 2007).

Research question and method

This poster has underlying the researches developed by two preservice elementary teachers in a context of internship (Nunes, 2017; Sobral, 2015). The goal of these researches is to describe and analyze how students deepen their mathematical knowledge and their knowledge about arts education through the exploration of tasks with interdisciplinary characteristics. From a methodological point of view, the study is of a qualitative nature (Patton, 2012). The participants are second grade students, from two classes, that solved different tasks proposed by their teachers (prospective teachers). In one of that classes were proposed four tasks that have as starting point the observation of famous artist's paintings. In the other class were also proposed four tasks, but in this case these tasks have as context the body expression activities. The data collection was realized in the probationary period, along four

weeks. The data include the solutions of the students, field notes and transcriptions videorecorder excerpts of the task's exploration in the classes.

Results

The results revealed that (i) students increased their spatial sense, in particular they were able to identify geometric figures embedded in work of art; (ii) they had some difficulties in identifying symmetries of reflection; (iii) students produced "works of art" correctly using plastic expression techniques; (iv) students increased some geometrical ideas through the integration of movement with mathematical tasks, in particular, they were able to use geometry specific terms to describe the movements of their own body.

Summing up, it is possible to develop mathematical ideas and deepen knowledge about arts education in an articulated way. Moreover, learning through reflexive tasks about mathematics and arts education is an adequate approach in elementary school that help students to think in an integrated way.

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