Learning about bees in pre-school education: art and recycling in science education

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Short Abstract

Learning about the bees in preschool is so important as these insects are for the environment and life in the earth planet. In the context of supervised pedagogical practice of the master degree for pre-school and primary school teachers' qualification, an intervention project was developed in a kindergarten with 20 four-year-old children in a Portuguese city. Following an action-research, thirteen activities were carried out, from the reading of the children's book about bees, through dialogue about the morphological structure and social organisation of bees, as well as the exploration of recyclable materials and construction of a castle, hives and bees. Dialogues and draws allows us to evaluate the children involvement, conceptual change and their awareness of the learning process, as well as to contribute to the socioemotional skills related to environment and bees' preservation.

Introduction

Learning about the bees since early years is so important as they are for the environment, the planet, health, food and human life. The natural-scientific sciences seek "(...) to expand the knowledge and understanding that pupils have about the physical and biological world (...)." (Glauert, 2004, p. 71), that means, by talking about natural sciences we allow children more help in their discoveries about the world around them, starting with the first non-formal attempts, from alternative conceptions to scientific knowledge.

Barbosa (2009, p. 28) argues that through plastic expression, the student expresses "(...) emotions and feelings through materials (...)", as well as develops affections, interests, desires and values. Art influences the development of students' personality and, therefore, artistic activity should be stimulated through the senses, imagination and playful activities that expand the student's cognitive, affective, social and creative possibilities.

As Monteiro (1996) states, for creative thinking, the importance of the domain in which art and science merge was highlighted by the great philosophers/scientists of the 20th century such as Bohr, Einstein and Poincaré. It is notable that in their investigations the boundaries between the various disciplines often dissolve, and do not even proceed deductively through logic, but through visual thinking and aesthetics.

Research question and objectives

In the context of supervised teaching practice in pre-school education, a project was developed based on the children's interests. The main question was: "in what way is it possible to explore natural sciences through art? We tried to answer the children's curiosities about the world around them, through the development of a Project Work, an intervention methodology in pre-school education, under the theme of bees. The following objectives were defined

- To understand the importance of art for the learning of natural sciences and how art works as a building agent of integrated and significant learning;

- To understand how exploration works as a motor for child development;

- To reflexively evaluate the role of art education as being central to the construction of individuals.

Methodology

The whole intervention was based on the action-research approach, which is based on the identification of a problem to be solved. Once the problem has been identified, the need arises to make a diagnosis with the aim of carrying out a comprehensive description and explanation of the situation observed. Action research thus includes "(...) action (or change) and research (or understanding) at the same time, using a cyclical or spiral process that alternates between action and critical reflection." (Coutinho, et al., 2009, p. 360). In this sense, this methodology arises from the need to intervene in a given situation of a real context with the purpose of improving it, thus requiring the investigation of that same situation (Máximo-Esteves, 2008). It starts with the identification of the problem, or diagnosis, following the action plan, action implementation and evaluation (Cohen, Manion & Morrison, 2017).

This convenience sample included a group of 20 four-year-old children, being 11 females and 9 males, from a kindergarten of a city in the north of Portugal. Thirteen activities were carried out from the reading of the children's book about bees "Cuscas no castelo de Guimarães", through dialogue about the morphological structure and social organisation of bees, as well as the exploration of recyclable materials and construction of a castle, hives and bees, besides other activities.

For data collection a continuous record of significant situations was made by means of photographs (Figure 1), drawings produced by the children (Figure 2), audio and video recordings, of which content analysis and argumentation analysis were performed.

Given the internship context in which the project was developed, all the ethical procedures were previously stablished between the university and the kindergarten.

Results

Since the beginning of the project, parents, children, preschool teachers and local community were involved in the collection of recyclable materials for the children building of beehives (Figure 1), which they then painted, and a big castle (like a children play home in which they could come into) and several bees. The activities involved the cutting, collage and painting techniques.

Figure 1.
Recycled materials and building the beehive and the castle

The drawings of the bees were made at the beginning and at the end of the project (Figure 2), giving the children the opportunity to compare their productions and conclude on the evolution of their learning. In the third activity (beginning) the trainee asked the children *What is a bee?*, in order to identify children' previous conceptions. This activity occurred after the book reading and exploration. During the discussion children said that:
Boy1: "I know they are yellow and black."
Boy2: "I also know they are yellow and black because I've seen Cuscas."
Girl1: "It has two wings for flying."
Boy3: "It has five eyes as you said in the story!"
Boy4: "It has two little horns too."

After the discussion, the trainee asked the children to draw the bees as they know and she wrote the meanings they attribute to the draws. Figure 2 show examples of the first draw session.

When transcribing the drawings behind each sheet of paper, it was noticed that the children drew the flowers because they were aware that bees go to the flowers to 'take' the pollen from them. One girl said: "I drew a bee, I drew the honey from the flowers. It's a different coloured bee, a rainbow bee". Here we can see that this child already has a notion that bees have some importance for the production of honey and that this comes from the flowers and not from the bees.

Figure 2.
Children's drawings about bees at the beginning of the project (examples)

Several activities occurred and at the 12th activity the trainee asked children to make a new draw about the bees to compare with their previous, using the same method to write children ideas behind the sheet of paper.

Also the images represented in more detail the bees' morphology (Figure 3) than the environment that can be interpreted as a deep knowledge about the bees.

Figure 3.
Children's drawings about bees at the end of the project (examples)

When analysing the final draws, it was found that most children made a bee with all its physical characteristics such as the tongue, the two antennae, three parts of the body (head, thorax and abdomen) with a stinger, four wings, five eyes and six legs. Since this had not happened in the previous graphic records, the children noted that they had effectively learnt what bees look like and the functions they can perform.
From de discussion about the first and second draws an extract of the ideas show the evolution:

Boy2: "I drew a bee with honey, the trees, flowers for the bees to smell with their antennae. She is a queen bee and she is in the middle of the drawing and she has the drone in green."
Girl1: "I drew a bee. She has five eyes, six legs, four wings, she tastes pollen with her tongue and takes honey with her legs. She lives for 28 days and stings a little girl, gets the pollen and puts it in the hive inside the apiary."
Thus, it can be stated that the bee project was successful based on the children's final records.

Conclusions

The whole project in itself is proof of how it is possible for exploring to act as a motor of development for children because in almost every activity the children had the opportunity to explore something. The children's curiosity and interest are then the "engine" of all the work and learning. In this way, in this project, children were given the opportunity to manage their own learning process, presenting themselves as competent and capable beings, responding to their own interests and curiosity.

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