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ABSTRACT

This article approaches the methods and analysis of the development of a project entitled “Coffee with sustainability”, from the perspective of design. The project was developed at a private kindergarten and elementary school in the city of Belo Horizonte (MG, Brazil), featuring seven- and eight-year-old children as protagonists and professors as mediators. The project, developed by them, consists of a sustainable coffee shop, implemented within the school. The approach to curriculum content, such as Science and Mathematics, was reinforced by the epistemological bases of Design. As a subject in its own right, design presents methods, strategies, and tools that go beyond its own scope, frequently limited by trade and industry, and can therefore dialogue with other areas of knowledge production. There exists a designerly way of thinking and communicating that can be properly inserted in the educational context, especially when it comes to constructionism approach. During the process children became aware of methodological steps developing the prototype of a coffee shop which they shared with the whole school community.

Keywords

Project based learning, Design based learning, STEAM, Constructionism

1. DESCRIPTION

2.1 Description of your setting

The Project “Coffee with sustainability” was developed in a private school in the city of Belo Horizonte (Minas Gerais, Brazil). The school operates in the Kindergarten and Elementary School segment at extended time, from 9am to 5pm. Aligned to constructionism approach and multiple literacies, the school presents as a methodological basis the Project Based Learning¹ (PBL), aiming the importance of prototyping during the learning processes. Curriculum content is worked on in the context of a project, which can be worked on throughout the school year or can be a one-off project. Considering the role of the arts and how incorporating the aesthetic dimension² into pedagogy may enhance learning, the creative lab has a central place in the school. It is considered not just a physical space but also a concept, whereas learning can occur across varying space contexts. Therefore a group of ten children, aged seven to eight, developed the project during creative lab classes and during regular Science and Mathematics classes (called STEAM). Now we move on to the description of the Coffee with sustainability project, focusing on the aspects developed in the creative lab.

2.2 Description of the educational experience

Despite the possibility of access to industrialized toys, making has been an important element of the early childhood. Therefore this group of children who attends the school, commonly choose to build their own toys in their free time. In this context, a small group, composed of three girls, built a coffee shop. They made a mockup of the physical space, planned the decoration of the place, made the menu, made a cookbook and also announced job openings to hire employees. They claimed that as adults they would build a real coffee shop where they could work together. The idea caught the attention of the rest of the group, who also wanted to join the game. However, the small group did not allow them to participate. The teacher, careful with the social-emotional demands of the class and also looking for strategies that made sense to these children and would support STEAM skills development, proposed building a coffee shop with the whole class. A project that would be thought by everyone, for everybody. This establishment should be sustainable, considering the environment and the people involved. The planning process lasted eight months and covered most of the Science and Mathematics content developed during the year.

Aiming designing as a multidisciplinary practice and a facilitator of pedagogical processes, during three months, the creative lab classes played the role of supporting the development of both coffee shop's architectural, graphic and packaging design. Starting from Bruno Munari's³ methodology, a process panel was developed with the children, so that they could understand each stage of the project.

On the first meeting with the creative lab team, children were asked about their ideas. Therefore the process panel emerged from the project requirements and contemplated the directions: why, how and what they were planning to develop. The coffee shop should be an itinerant establishment, its structure should be built in wood, and if possible, easily disassembled, like a puzzle; reusable or biodegradable packaging; besides a graphic project that communicated the coffee shop values. From the project requirements, presented by the children during the first meeting, the process went to research steps.

Therefore on the second meeting the group was divided into teams based on each child's interests and facilities: the structure team, the packaging team and the graphic team. Each of them received a letter with a challenge. The tasks involved questions about how could the child plan a structure that could move, also what material could the child use to develop an eco-friendly package, besides understand why the coffee shop needs a logo. They worked in pairs, which each should develop a research about their topic. For two weeks this research contemplated packaging and branding books, interior design magazines and Pinterest. Children got excited during this stage. Probably because they identified themselves with some of the proposals found on the books and on the internet.

After research, children went to brainstorm ideas. They should generate as many ideas as possible and present them through drawings and diagrams. The practice was exhaustive for the most part of the group, but it was a turning point. From the ideas they had until then, they were ready for the moment of decision making. At this part, some children became interested in the topics of other groups. Therefore the structure, packaging and graphic teams previously formed, were no longer restricted. From then on, each class was intended to develop a topic and put into practice what the children had planned. From technical drawing and modelling to prototyping. At that moment they used all materials and tools available in the creative lab such as cardboard, Little Bits and Paint 3D to understand and develop the coffee shop structure; cardboard, craft paper and clay to test the packaging possibilities; acrylic, gouache, paper, fabric and wood to apply all the graphic project potentials.

Table 1. Tools, materials skills and results that covered each group.

	Structure Team	Packaging Team	Graphic Team
tools	Process Panel, interior design magazines and books, Pinterest, little bits and Paint 3D.	Process Panel, packaging and branding books and Pinterest.	Process Panel, packaging and branding books and Pinterest.
materials	Cardboard and wood.	Cardboard, craft paper, banana tree leaf and clay.	Acrylic, gouache, paper, fabric and wood.
skills	understanding how to turn 3D objects into 2D, comprehension about fittings and connectors	Understanding how to turn 3D objects into 2D, comprehension about visual identity.	Comprehension about branding, learning about xylography techniques.
results	Development of models, mockups and drawings that were sent to the team responsible for constructions and renovations in the school.	Development of sustainable packaging from banana tree leaves and ceramic cups.	Development of graphic material for application in products such as tote bags, ceramics and packaging, besides the coffee shop logo.

3. CONCLUSION

3.1 Results

Considering Children Designers⁴: Interdisciplinary Constructions for Learning and Knowing Mathematics in a Computer-Rich School, there are three main reasons for inserting design mindset into the learning context: the first one is that design motivates learning; second one is that designers make things happen; and the third one is that design evokes self-knowledge.

During the process of planning the coffee shop's architectural, graphic and packaging design, the group of children understood the importance of each stage of the process. They had moments of excitement but also had moments of discouragement, both theoretical and practical classes. The Process Panel was a support and a way for children to understand the existence of the methodology, but they had

possibilities to cross the methods boundaries. The learning process is a constant movement of expansion and contraction. The professor's role during this journey was exactly to understand how and when to expand and to retract. From this perspective, we move on with some analysis and conclusions about the coffee shop development.

Although the large amount of materials and tools available, children should also experience and comprehend how to work with what you have, without wasting, understanding boundaries and adapting the project. The idea of using banana tree leaves arises from this context. The packaging team was using craft paper to prototype their projects. That was a relevant moment to observe the understanding children had about proportion, measurement and how they could turn 2D paper into 3D objects. However, they were disregarding the quantity, the applicability and the craft paper material life cycle. The teacher realized the process needed an intervention. After a discussion about sustainability with the class, the group understood they should go back to the research step and then survey other materials possibilities. The generation of ideas, through sketches and prototypes, came as a frequent activity during the route. From this great amount of alternative production, children had the capacity for decision-making and also acquired awareness about the process. Banana tree leaves came as a possibility, as a biodegradable and flexible raw material.

Figure 1. Children's awareness about turning 2D into 3D objects.

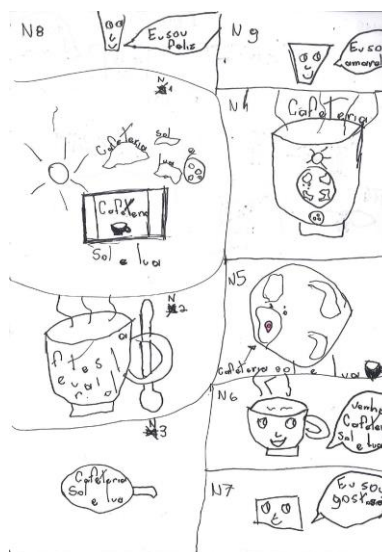


Figure 2. Prototyping banana tree leaves packaging.



While planning the graphic project, children generated a great amount of logo. They worked the color palette, the figures and shapes and their application to products. At the time of decision-making the whole group chose to maintain the first logo they had developed. The argument was that the first logo had already been published, so the school community already knew the Coffee Shop through it. If they changed their visual identity, they could lose customers. Therefore in addition to the repertoire acquired through research and experiments, children also acquired a comprehension about branding.

Figure 3. Children's brainstorm during the graphic project process.



At the moment the products developed for the coffee shop and its own structure were taking shape and children became excited, the importance of the prototyping process during project-based-learning was clear. Prototyping is procedural. Designers learn, build and rebuild through prototype, as well as children.

3.2 Broader Value

The elaboration of the “Coffee with sustainability” project made it possible for the curriculum contents of Science and Mathematics to be taught and learned in a socially relevant context for children. They had the opportunity to solve real problems using scientific concepts, to work with technological and engineering tools to build a place they thought, to serve their friends and family. In addition they established rich and responsive discussions about environmental responsibility, sustainability and the role of each citizen in maintaining our life on the planet.

The development of the coffee shop prototype within the creative lab classes allowed the project to be sustained throughout the year, in terms of children's engagement and assimilation of Science and Mathematics contents related to the project theme. The discussions held with the creative lab teachers about the coffee shop structure, the materials with which the establishment would be built and the development of packaging was essential for the project to establish itself in the STEAM approach. The children had the opportunity to use Science, Mathematics and Design knowledge to make critical and conscious decisions about issues related to the construction and operation of a sustainable establishment. The PBL approach enables socially relevant themes to be worked in curriculum content, in which the prototype is based on being a concrete entity, which aims to serve the community in which it is inserted. In this way, the creative lab, through a designerly way of thinking, supports and sustains the elaboration of projects that present the prototype as a concrete entity, such as the sustainable coffee shop.

The implementation of the coffee happened in the last days of class (December- 2019), with the inauguration of its physical space. By 2020, children will have the opportunity to work in local administration and finance, plan the products to be marketed and work as a team to serve the school community.

The development of the project has enabled learning achievements that deserve to be highlighted. Children demonstrate greater environmental awareness, and report situations outside the school environment where they acted and/or positioned themselves on the need to take care and protect the environment. Working with financial education has broadened children's understanding of the value of the objects, toys, and food they eat. The maturity in relation to the stages and processes of a project is visible. Children accepted the necessary changes along the project stages easily, understanding that the changes are also part of the process. And finally, in relation to peer relationships, children are playing leadership roles with more autonomy and respect, rectifying their positions and attitudes.

4. BIOS

Thais de Azevedo Vieira: She will present the article in the Fablearn Conference. Graduation in Product Design/Teacher of Creative Laboratory at Casa Fundamental.

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