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Co-design in Public Spaces for Children: The Design Process of a Pocket Park

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Abstract: The active participation of users in the Design Process (DP) in architecture is a collective action, which aims to meet their real needs. In terms of open spaces for children, squares and playgrounds become leisure spaces known for being places of coexistence, interaction and entertainment. However, the vast majority of children's environments are planned and organized considering the perceptions and experiences of adults. Children become absent from the process of building the contemporary city. Co-design is an important tool for adding users to DP. The objective of this work is, therefore, to include children in the DP of a Pocket Park, using methods and tools to support co-design. The work was structured based on bibliographic review, Focus Group, Culture Maker and Digital Fabrication. The research indicated that the collaborative project promotes assertive communication between children and designers, welcoming their ideas and perceptions in a flexible way.

Key words: Co-design, DP, children.

1. Introduction

The need to involve users in design decision-making was recognized in 1971 during the "Design Participation" conference, promoted by the Design Research Society in the state of Manchester, England. On the occasion, studies referring to the practice, teaching and learning of participatory design in the project research, architecture, economics, planning and mechanical engineering sectors were exposed [1].

The Design Process (DP) in architecture is a collective action, in which the relationship between the actors involved is as important as the ideas generated. To conduct a project in an effective and sustainable way, meeting the real needs of users, it is necessary to consider not only the final product of the architecture, but mainly the steps required during the project's realization [2].

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1.1 The Way Children Learn to Interact with Your Environment

Regarding the design of spaces for children, it is of paramount importance to welcome the user during the construction of ideas, with the aim of collectively co-creating an environment, not only thinking about its usability, but above all, about its needs, values and preferences [3]. Including children in the DP is a practice that directly helps the construction of their own development, allowing them to explore their potential in a natural and playful way [4, 5]. The children's conceptions and understandings contribute to validating and certifying the decisions taken in conducting the DP.

Open spaces for children, such as squares and playgrounds, become leisure spaces known for being places of coexistence, fun and rest. Such spaces are intended to encourage interaction between children, adults and the environment that surrounds them. The equipment and objects present in these spaces encourage children to new experiences, and stimulate the development of cognitive, technical, socio-emotional

and behavioral skills. With this, the various sensory perceptions promoted by toys become a knowledge-building mechanism [6, 7].

The importance of playing in public spaces is relevant for all age groups, however, each age has its specificity with regard to the act of playing. Every child has their way of observing the world and interacting with it, playing and learning in a playful, pleasurable, natural and unique way, working on their genuine childhood frustrations, doubts and curiosities.

When playing, young people bring situations from their daily lives that directly or indirectly affect their development, as well as demonstrate their maturation. In addition, the child uses symbology as a way to express their inner perceptions [8]. Thus, to build a collaborative project considering the child, it is essential that the designers appropriate these resources as educational tools to fully understand the needs of users.

However, the vast majority of children's environments are planned and organized considering the perceptions and experiences of adults. Children become absent in the construction process of the contemporary city, increasing the feeling of not belonging in the city scenario. The lack of understanding about the potential of children's play space can distance architects from an inclusive and efficient project [5].

Thus, it is essential to build a flexible dialogue between the actors involved in the DP, through a clear and objective language, considering the child's naturalness, creativity and sensitivity, as well as the skills and competences of the professional architect.

It is noticed that toys are important inclusion and communication tools between children and designers during the DP [9, 10]. Toys represent in a practical way the knowledge and vision of children about the world, since the work with tangible resources leads children to a complete understanding of what is being addressed. From the same point of view, Arcer [8] points out that all material used should make the child think, so that they evolve from abstract concepts and speeches, to concrete materials and objects.

In this context, it is necessary to put oneself in the user's place, experience their daily lives, to understand their representation and experience, and then, together, build a collaborative project. It is not enough just to collect pre-project information. It is based on the principle of actively including users in decision-making, and also having a multidisciplinary team to understand each step of the DP [11].

1.2 DP and Co-design

Co-design is a design technique carried out together with the user and not just for their use. It is a creative method that involves designers and users at all stages of the program [1, 7]. During the method management, participants are encouraged to express their knowledge and experiences, through different tools that adapt to their reality.

The diverse range of mechanisms for conducting the project, allows for the expansion of creativity of both participating users and architects, creating new perceptions and design possibilities in accordance with the indicated needs. This joint work system needs to go beyond a simple informational contact, integrating user and designer at all stages of the project and not just at the beginning [7].

That said, the objective of this work is, therefore, to include children in the DP of a Pocket Park, using methods and tools to support co-design. The study was structured based on literature review, Focus Group and Culture Maker and Digital Fabrication.

1.3 The Relevance of Pocket Parks

Initially based in the United States, Pockets Parks are urban voids that aim to add new functions to spaces that are not being used in the middle of cities. Currently, with the dense growth of cities, Pockets Parks have the objective of being a refuge for the population. This space contains elements that welcome and encourage the permanence of users in

the places, with the use of landscaping and urban furniture [11].

The Pocket Park project implementation site is a vacant lot located in front of a school Monte Castelo. To conduct the project will be considered not only the understanding of the designers, but mainly the perceptions of users, who are children aged between 8 and 10 years old who attend school.

The Pocket Park theme aims to explore the urban void that is not used, to provide new interactions between the residents who would make use of the place. In addition, the implementation of the project in a vacant lot is a strategy to promote the socialization of the community, through a landscaping and urban furniture project, which encourages coexistence for the place. This action turns the unused space into an environment of coexistence, exchange of knowledge and knowledge [12], generating autonomy and belonging in the construction of the city. In this way, it was considered to use an idle space in the community, developing a series of educational activities, as well as generating inclusion of the child in the process of designing the local architecture, urbanism and landscaping.

2. Methodology

Co-design means creative cooperation during DPs [13]. This cooperation involves a diverse team including users, customers, researchers, designers, developers, architects, among others.

There are 3 levels of involvement that represent the relationship between the user and the service provider [14]: (a) informative: users only provide or receive information; (b) advisory: users are involved to comment on a pre-defined service or set of components; and (c) participatory: users influence decisions related to the entire system.

The active involvement of users naturally becomes an instrument for generating knowledge, capable of understanding their real needs, as well as defining objective guidelines with perception of values for the proposed action [7, 15, 16]. Thus, their participation is essential from the beginning of the project process, so that the final result reaches the best possible guidelines for the creation and execution of the project.

That said, this work starts with the conduct of co-design, which aims to understand and welcome the perceptions and knowledge of all participants. Different methods were applied, such as Focus Group and Culture Maker, as well as Digital Fabrication and Prototyping techniques and tools (Fig. 1).

The Focus Group is a method that aims to measure the conceptions and positions of a group of people, having as its main focus the interaction between the participants [17, 18]. Its structure is similar to a

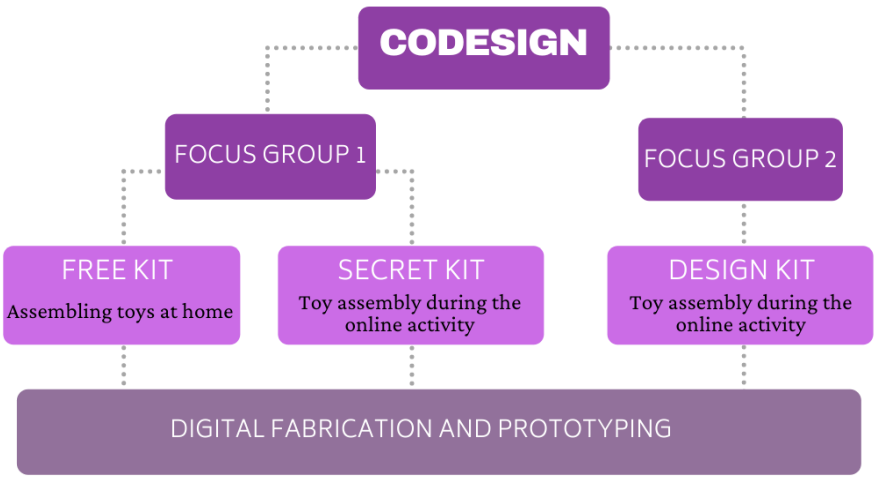

Fig. 1 Structure of the co-design process.
Source: authors, 2020.

meeting, in which a mediator stimulates debates through questions based on the proposed theme. The recording of the activity is carried out through video and audio recording, as well as notes made by the mediator [17].

The Culture Maker is considered an extension of the "Do It Yourself" (DIY) movement. It is based on the premise that people must be able to create, manufacture, repair and build objects of the most diverse types and functions, with the most varied types of materials. Another important point in the Maker universe is the creation and manufacturing spaces, which have Digital Fabrication and Prototyping equipment, such as the 3D printer, laser cutter, equipment and accessories for electronics, robotics, programming and carpentry. These spaces are known as Makerspaces or Digital Fabrication Laboratory [19].

Digital Fabrication is a production system using Computer Numeric Control (CNC) equipment [20]. In terms of architecture, this system is indicated as a technique oriented towards the elaboration of the final product of the building on a real scale, that is, it allows designing and executing the elements digitally. Prototyping, on the other hand, is indicated as a technique for the production of prototypes, that is, products made on a smaller scale, commonly used for initial conceptions of projects [21]. The equipment usually found in the process of Digital Fabrication and Prototyping in architecture is laser cutting machines, CNC milling machines, vinyl cutters and 3D printers.

The techniques and tools of Digital Fabrication and Prototyping were used to make support materials for communication between children and designers. The children assembled, customized and created toys with geometric molds, parts and tools, designed and made using a laser cutter and 3D printer. They represented their design ideas and intentions through drawings and hands-on activities, using a floor plan with the dimensions of the land and measures of the public walkway.

3. Pocket Park Project Process

In total 25 users were involved in the process, 2 teachers and 23 students aged 8 to 10 years from the school Monte Castelo. A set of materials was made, consisting of three kits called Free Kit, Secret Kit and Create Kit. Each participant collected their kits from the school office.

The practical activities of manipulation and exploration of materials were mediated through meetings via an online platform. The meetings were recorded for later data collection and analysis. To better conduct the dynamics, at some specific times the participants were divided into simultaneous rooms.

3.1 Workshop 1

The first Focus Group was called Workshop 1, and aimed to introduce users to the concepts of the Maker Culture. The activity was divided into two stages. Initially, the participants received a Free Kit, to be collected at school, prior to the online meeting, which contained pieces in MDF (Medium-Density Fibreboard) 3 mm made in the laser cutter, together with an instruction manual, illustrating the step-by-step process for assembling two toys: a bus and a catapult (Fig. 2).

During the online meeting, students were divided into simultaneous rooms, with approximately 5 to 7 participants per group, under the guidance of 1 to 2 mediators. They presented the ready-made toys (buses and catapult), and pointed out their difficulties and discoveries during the process of assembling the objects.

For the second stage, a Secret Kit was provided (Fig. 3), which students were instructed to handle only during the online meeting with the participation of the mediators. The kit consisted of a set of materials: 10 screws and 1 hex key/cardboard hole (manufactured with PLA (Polylactic Acid) on the 3D printer), 4 Paraná paper modules with slots (5 units each).

Students were instructed to think and create a toy they could use to play in the Pocket Park that would

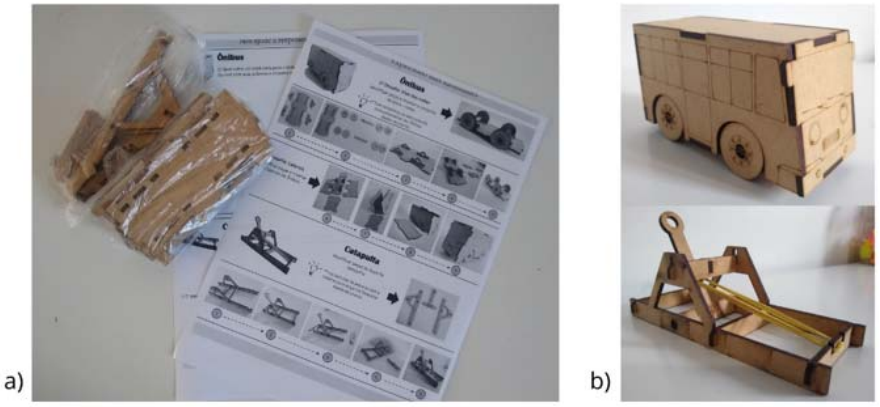

Fig. 2 (a) Free kit components, (b) bus and catapult.
Source: authors, 2020.

Fig. 3 (a) Secret kit, (b) paper modules, (c) screws and key.
Source: authors, 2020.

Fig. 4 (a) Model, (b) labels, (c) practical application.
Source: authors, 2020.

be designed in front of the school, using materials offered in the Kit. It was possible to use different materials to compose the projects, such as colored glue, pencils colors, pens, recyclable materials, adhesives, among others.

3.2 Workshop 2

For Workshop 2, the Pocket Park project process stage was foreseen in the land located in front of the school. As a way of applying the co-design method, the participants received the Create Kit, consisting of a model made of 3 mm MDF on the laser cutter, and 20 white labels measuring 4 × 4 cm (Fig. 4). A 2 × 2 cm mesh was projected on the surface of the model.

Students were instructed to draw public equipment, vegetation, toys and spaces on the labels that they would like to be part of Pocket Park. Subsequently, the drawings were pasted onto the model, using the

mesh as a reference. Finally, each student presented their project, explaining their design choices and decisions. For this activity, participants were not divided into simultaneous rooms.

4. Results and Discussions

4.1 Workshop 1 Results

The Free Kit aimed to introduce participants to the concepts and principles of the Maker Culture. During the online meeting, students talked about the experience provided by step 1, which consisted of assembling their own toy at home (bus and a catapult), in order to gain feedback on the lessons learned during the assembly process. In addition, they pointed out their difficulties, as well as an introduction to the instructions for assembling the toys, delivered with the kits.

Students expressed great satisfaction and fun during the activity. For as teachers who follow the project, in addition to a creative initiative, it was an opportunity for connection between parents, teachers and students, in which the activity was carried out jointly, that is, as children participated in an online educational activity, in the environment family, and at times the parents or guardians were able to give their opinion, helping with some task.

In step 2 of the Secret Kit manipulation, with the objective of creating a toy to be used in Pocket Park, the participants reported having had a lot of fun creating “several possibilities”. Students use some materials they had at home to help in the toy DP, taking as an example, string, glue, colored pencils and colored pens. Different toys were made, including: cars, planes, weathervanes, motorcycles, lightning rods, carriages and robots (Fig. 5).

Emphasizing that, some students created objects with contexts different from those requested in the activity. An example was a student who used the pieces to make a rest bench to compose the Pocket Park. Afterwards, he assembled everyday objects, such as a chair, a table and niches for the wall. At the end of the activity, each student presented their toy to the group, informing the name given to the toy.

4.2 Workshop 2 Results

To carry out the Pocket Park DP, the students used a mockup, adhesive labels and colored pencils or colored pens. As it is familiar land to the students, as it is located in front of the school they attend, only a brief introduction to the project’s implementation area was necessary. A mediator presented images of the terrain’s surroundings, using Google Street View. It led to some questions, including: (1) Where is the safety strip located on the streets perpendicular to the terrain? (2) Is there any vegetation on the ground? (3) Is there a bus stop close to the land? (4) What is the type of building on the land adjacent to the project area, house, and building?

Next, they were asked to design and place on the model the objects, toys, public equipment and vegetation that they would like to be part of their project. Participants interacted in a dynamic way and showed a lot of excitement. During the activity, they shared their ideas, design decisions, and explained and justified their choices.

Fig. 5 (a) Created cart, (b) student assembling toy, (c) assembled toy.
Source: authors, 2020.

An important aspect to highlight was that the students created and represented interactive paths and pedestrian crossings for Pocket Park. They planned spaces to play associated with the activities they carry out at school. In addition, they showed creative solutions for the development of the project, identifying and dividing the activities of their choice in the project network.

5. Conclusions

This work aimed to include children in the DP of a Pocket Park, using methods and tools to support co-design. To achieve its objective, a bibliographic review was carried out, as well as Focus Group and Maker Culture strategies, with the contribution of Digital Fabrication and Prototyping techniques and tools.

It is noticed that the lack of urban planning directly affects leisure spaces, especially in urban centers, making open spaces isolated, excluded and difficult to access points. It is necessary to build strategies to raise awareness of the importance of preserving existing squares and playgrounds, especially in urban areas, as well as encouraging the design and implementation of new open leisure spaces.

The environment is part of the individual's formation, as it defines relationships, as well as stimulates actions and movements. The design of public spaces aimed at the use of children helps the little ones to expand their knowledge, develop skills and competences, and strengthen their sense of citizenship, their cultural and identity formation. The quality of space has a great impact on a child's development. With this, it is understood that the child's gaze humanizes the city. This look encourages greater interaction between people, creativity and a playful way of taking advantage of spaces.

Under the methodological bias, the collaborative project presented in the research under the guidance of co-design, demonstrated a great contribution to DP of architecture and urbanism. The Focus Group strategy proved to be appropriate to be applied in the DP with children, as it promotes communication between different users who include different perceptions and experiences, contributing to the construction of decision-making in architectural projects.

The co-design activity was carried out in a period of pandemic and teaching, thus, the dynamics in the online and synchronous format proved to be adequate for the context. The making of physical kits for collection at school stimulated student participation. It was possible to understand that in the co-design process of any type of environment, it is extremely important that the participants manipulate different materials, so that they can manifest themselves through the manipulation of concrete elements, in this case, toys and the model, made by means of laser cutter and 3D printer. Furthermore, the applicability of Digital Fabrication and Prototyping techniques and tools proved to be effective for making the elements and conducting the dialogue between students and designers.

The Maker Culture concepts are great allies for conducting the DP with children. It was possible to approach design aspects in a playful and fun way, through objects present in children's daily lives, taking toys as an example. This practice allowed the construction of an assertive and flexible dialogue, welcoming their ideas and perceptions in a clear and objective way. The children felt that they belonged to the space.

With regard to practical activities carried out in a real world context, it is understood that they enabled the empowerment of students in the process of creating and innovating products. The proposal to structure the workshops with activities of increasing complexity, that is, initially presenting the concepts of the Maker Culture, and finally, using the concepts in the Pocket Park DP, generated autonomy for problem solving and decision-making.

Under the PP bias, the students were able to understand the mesh of the land proposed for the

Pocket Park project, represented by the model. However, in some cases, there was a great disproportion in the representation of the design elements proposed by the students through the drawings on the stickers. Thus, it is necessary to create a strategy for future studies, aiming at approximation and better understanding of scale, enabling greater efficiency in the design representation.

Another point to be highlighted in the conduct of the DP is related to the quantity and distribution of design elements. Even though the stickers for designing the elements were distributed so that their size was proportional to the mesh represented in the model, the participants did not demonstrate a clear spatial understanding. This observation was made through the analysis of the models. In some projects, students placed the elements very close together, not respecting the minimum space between one element and another.

This work is the result of following up on other activities that have already been carried out through the insertion of tangible objects during the DP with children. As an example, there is the DP for landscaping and an inclusive playground in two different cities, which had the participation of children with and without visual impairment. The first of the initiatives was to raise awareness and PP (Process Project) of an inclusive playground for a square located next to a school. One hundred children aged 6 to 7 years participated in the DP [15]. However, unlike the practice applied in this work, the activity did not have a scale definition for the representation of the intended toys. The second initiative had the participation of ten students with visual impairments, aged between 6 and 12 years old. In this activity, participants compared the school's known and existing playground with the playground of the square to be modified, obtaining a comparative scale of space sizes [22]. In addition, Digital Fabrication and Prototyping were also used as a resource for the fabrication of tactile models and architectural plans, to facilitate communication during the PP held with adults for the new headquarters of the Blind Passofundense Association [15, 16, 23]. In this case, the dimensions were perceived by comparing the tactile plan of the current headquarters with the DP tactile plans of the new headquarters used in several co-creation rounds of the new project.

The objective for future work is to study new alternatives for conducting the dialogue between children and the designer, considered essential in the DP. These practices can occur through the applicability of new toys, which are present in the world of children and which help us to interpret their needs and desires, as well as new forms of representation of design elements for application in the model, including them effectively in the DP. Finally, it is understood that there was a rich exchange of information and learning between designers and participants.

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