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CO-PLAYING WITH SURVEYCUBES IN A CHILDREN'S MUSEUM: PILOTING A PHYSICAL, PLAYFUL AND PARTICIPATORY SURVEYING TOOL

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Co-Playing with SurveyCubes in a Children's Museum: Piloting a Physical, Playful and Participatory Surveying Tool

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Our study focuses on piloting of a playful, participatory and toy-like surveying tool presented in three-dimensional form—the SurveyCube. The motivation for our research was to find out in which ways the tangible tool facilitates intergenerational interaction and co-play by engaging families to fill out the survey together during their visit to a children's museum. The pilot was carried out in 2019 and resulted in altogether 66 filled surveys analyzed in this paper. The main findings of our research demonstrate how a new way of collecting data from children and their parents facilitated playful interaction within the museum space and highlighted, which areas of the exhibition attract most attention and interaction from the visitors. The contribution of the study is in showing how playful interaction with museum exhibits can be encouraged and generated in visitors by using more toy-like surveying tools with manipulable interfaces and intergenerational appeal, which afford cognitively, physically, and artistically challenging object play familiar to many children.

Keywords: Interaction design, Playful survey tool, Intergenerational play, Comicubes, Audience research

1 Introduction

Gathering feedback and opinions with playful tools is an approach that remains largely unexplored (Schmidt 2010). Opinion mining surveys and quizzes (Krause et al. 2012; Weichselbraun et al. 2011) are tools that can be used to apply playful approaches to serious tasks that are meant to offer engaging experiences to users. Our study examines the effects of innovative survey design in connection with intergenerational and playful experiences in a children's museum. The museum is an interactive museum based on the characters form Finnish Mauri Kunnas' popular children's books. The museum lets visitors immerse

themselves in play regardless of age: playing, dressing up in role-play costumes, experiencing colorful sights, and sounds related to the story worlds. Each room is based on a certain book or books and affords various forms of play to take place.

Gray (2008) describes play to have five defining aspects: 1) play is self-chosen and self-directed, 2) play is an activity that is process-focused, 3) play has structure, or rules, which are not dictated by physical necessity but emanate from the minds of the players, 4) play is imaginative, non-literal, and mentally removed from "serious" life, and 5) play involves an active alert, but non-stressed frame of mind. It has been said that play functions as social glue, connecting people. Play-based experiences that simultaneously spark visitors' interest, while engaging them in interaction, may benefit from folding visitor feedback into the design process (Taylor & Serrell 1991).

Following Parker (2006), museums should be designed not only to teach but also to have fun. To promote playful behavior, the goal of the museum under scrutiny is to attract and enchant visitors with phenomena related to spatiality and storytelling, goals that fit well into various aspects of play. The aforementioned aspects of play (Gray 2008) are in line with our own views about visitors' interactions within the museum and provide a useful starting point participatory interaction design. What interests us are playful tools, essentially the design of innovative play-based interfaces, which are not offered in a digital, but instead, a physical and multisensorial format. Our study focuses on piloting a playful and participatory surveying tool based on Comicubes —a physical and three-dimensional cardboard tool intended for conceptual design and prototyping (Heljakka & Ihamäki 2016; 2017; Ihamäki & Heljakka, 2020).

Our playful surveying tool referred here to as the SurveyCube, is an experimental plaything, a three-dimensional play-object that consists of a foldable cardboard cube with six sides and instructions written in the Finnish language on each side. On the A side of the cube, we tell shortly about the context and researchers responsible for the study and give our contact e-mail, collect anonymous background information about the visitors to be filled before entering the exhibit (number of visitors—children and adults—and the region they come from), and present tasks to consider after the museum visit is completed; how much time was spent in the visit, which was the participants' favorite exhibit in the museum, which of the playful activities presented in the SurveyCube was the most fun for the participants to conduct, and which was the most fun/most challenging thing the group experienced when filling the SurveyCube. The playful tasks associated with different means of expression—word games, drawing and coloring tasks—and presented on side B of the SurveyCube, were designed in connection with each of the five exhibition spaces of the museum, serving as both an activating tool inviting children and adults to connect with each other through co-playing, as well as a means of collecting visitor feedback about their engagement with the museum exhibits.

1.1 Background

Radical museum design is more experimental and less architecturally determined (Russo 2012). In fact, some museums have become more of an activity space for audiences, which invite playful behavior. Berland et al. (2020) investigate reframing scientific practices as museum play with young children and other research interprets the interaction with exhibits at a broad level. Lindgren et al. (2013) are explicit about fostering collaborative play, other studies describe individual engagement. We envision that the introduction of a physical, playful, and participatory tool piloted in a children's museum, will evoke a vibrant debate about the affordances and activities of intergenerational play in museum spaces (Lindgren & Johnson-Glenberg 2013).

Despite the ongoing technological evolution, the material dimension of play is not diminishing (Heljakka & Ihamäki 2017). As known, although the computer has vast possibilities as a "manipulative," it is not a substitute for building in three dimensions (Hewitt 2001, p. 14). In our pilot study, we have introduced the SurveyCube—an invitation to engage family and group members to collaborative play during their museum visit. The cube format, or block, has longstanding roots in the history of play, and the simplicity, familiarity, and ease of use speak for cubes as play(ful) objects that stimulate creativity and co-creation (Antle et al. 2011). This tangible format invites touch, and according to earlier research, supports peer collaboration and facilitates communication (Ullmer & Ishii 2011).

Blocks have been with us for a long time and alongside construction sets they offer enduring open-ended play and learning opportunities (Hewitt 2001). Blocks provide endless opportunities for both toying and constructing in terms of spatial play. Similarly, they offer possibilities for object play of various kinds; they may be rotated and inspected from many angles promoting multisensorial play. Moreover, cardboard cubes as a variation of blocks offer a pleasant surface to touch and can be drawn on and colored using them as a tool for creative play, unlike another block type familiar from many studies exploring playful engagement of children, LEGOs. There are many possibilities to present information in many ways on the cube, including the use of images, words, numbers, and combinations thereof; and, if necessary, even a hybrid, technologically enhanced information layer. As previously described, the inviting, play(ful) qualities of the cardboard cubes present a simple, customizable interface and a never-ending potential to be enhanced with different elements both material and digital (Heljakka & Ihamäki 2016; 2017).

In earlier work with cardboard cubes used for conceptual design in prototyping workshops, we have discovered the intergenerational play potential of this tangible device. Furthermore, the familiarity of the cube that stems from its geometrical shape and many games, both physical and digital, makes it a useful tool for enhancing interaction with children, highlighting and valuing the communicative aspects of children's play and agency, for example, through drawings (Zlateva 2019). These ideas led us to think if a physical object could be used to increase and enhance engagement and interaction with the physical and narrative space of a children's museum context, shifting the focus from the personal mobile

device to an intergenerationally shared physical object. Therefore, we propose that to ensure rich and multisensory experiences, it is in place to turn to material play: To enrich possibilities to engage with physical objects within the museum environment in a non-digital way, we designed a study around a new type of surveying tool intended for audience research, the SurveyCube. What interested us was to investigate how audience research could be enhanced in a playful way in the context of a children's museum, and which kind of results the use of an innovative and toy-like surveying tool would offer, when presented to groups like families as museum visitors.

2 Method

The central challenge for surveys remains to be the lack of motivation to participate. In this light, we propose an alternative method using playful surveys, which offer engaging activities for groups of children and adults. Such surveys include playful elements that resemble simple game-mechanics or visual storytelling to attract participants that are motivated to contribute because filling the survey is presented in a fun and engaging way.

The aim of our research was to design a new and engaging way to do audience research with groups of families including children and adults. Contextual inquiry is a well-known ethnographic method (Druin 1999), where children (as well as adults) are being observed and asked questions while doing survey. Documentation techniques such as children's pictures and notes aim at discovering aspects of the topic area that can be of interest for children. Art-based methods similar to the method used in our study usually consist in hands-on activities and are used for creation of mock-ups and low-tech prototypes. They provide a means for children to concretize their ideas and discuss solutions. Techniques range from the use of tangible objects (Vaajakallio et al. 2010) to the creation of drawings and picture-based storyboards (Moraveji et al. 2007). In addition, game-like methods or playful methods (Brandt & Messeter 2004) can be used to engage children in fun and collaborative ways to create and explore user experiences. The study presented in this paper built on a combination of the aforementioned ideas.

Our study began with a consultation: The museum we collaborated with wanted to know which area of their museum is of most interest to the visitors and how much time they spend at the museum. They also wanted to give their visitors something to do together during their visit. The staff at the museum had noticed that parents are mostly sitting and looking at their phones while their children are playing alone or with other children. The museum aims to be a place where people are actively involved together as families or groups of friends, and they also strive to bring something new to their customers every year. Based on this information, we designed a playful surveying tool and planned the pilot phase of a study. In this pilot study, we examined participants experiences of joining the survey, along with co-playing with the SurveyCube at the children's museum, and their evaluation of the five different areas of the museum through simultaneous interaction with the physical and narrative space and the cube. The SurveyCube measures the favorite exhibition space, the

favorite activity in the space and on the cardboard cube and aims to collect background information about the museum visit, such as the composition of the visiting group—the age of the visitors, and the duration of the museum visit.

2.1 Presenting the Playful Surveying Tool

Co-design researchers are generally concerned with techniques that enhance children's participation and creativity in a collaborative setting (Moraveji et al. 2007; Brandt & Messeter 2004), and less with measuring children's involvement and performance from a developmental perspective (Markopoulos & Bekker 2003). The Comicubes tool, which inspired us to design the SurveyCube, is a tangible physical object that allows three-dimensional manipulation. The tool affords various forms of interaction, depending on its users' age and skills (Heljakka & Ihamäki 2017). In previous work, Comicubes have been used in workshops with children, youngsters, and adults in the contexts of early education, art, design, and higher education, in which we have observed its capacity to prompt creative thinking and playful actions. In the workshops, the prototyping tool has, for example, been described as "a lubricant for creativity" (Ihamäki & Heljakka 2020).

The goal of our study was to develop techniques which encourage children and adults to participate collaboratively in playing in the museum context. Our aim was to test the capacity, functionality and efficiency of the SurveyCube as a surveying interface with a resemblance to children's activity books that affords drawing, coloring, a word puzzle, and other simple combinatory tasks linking the tool with the different spaces in the museum. The SurveyCube follows the participant before-during-and after the visit: There are two sides to the SurveyCube: the A-side, which includes questions related to the participants and the time they spend at the museum, and the B-side, which represent the five exhibitions in the museum space and present two questions regarding the play activities in the museum (see Figure 1. and Figure 2.). To exemplify, on the A-side of the SurveyCube we ask the participants;

- to fill in the number of participating children and adults by coloring the figures ("Who is involved in the visit, mark the number of children and adults in numbers in circles")
- to mark the region of the country they are visiting from on the map of the cube
- to mark the time spent by making a mark on the image of the clock provided in the cube ("When did you arrive at the museum and for how long did you visit the museum?")
- to give their vote for their favorite place in the museum, namely: 1) Home of Mr. Clutterbuck 2) Knights of King Arthur, 3) The Space of all time, 4) The Children of Koiramäki, and 5) the car park
- to answer the open-ended question: "Which task on the SurveyCube was your favorite?"

- to answer the semi-structured questions: “What did your group like to do most with the cube?”, “The greatest thing was ….”, and “I found… difficult to do with the cube”.

The tasks presented on the B-side of the SurveyCube ask the participants;

- to indicate which objects were played with during the museum visit by marking the dedicated pictures of objects
- to connect the names of the characters sitting around the table in the museum depicted in a photograph
- to find words of things, which could be found in the ‘Children of Koiramäki’ exhibition room, hidden in a crossword puzzle
- to draw the route, they drove with the pedal cars in car park (structured)
- to mark or draw how they played in the space-themed exhibition room in the museum on the images illustrating a character jumping, running, and resting, including a blank section to draw on (structured)
- to draw a hint about the group’s most preferred activity in the museum (open-ended)

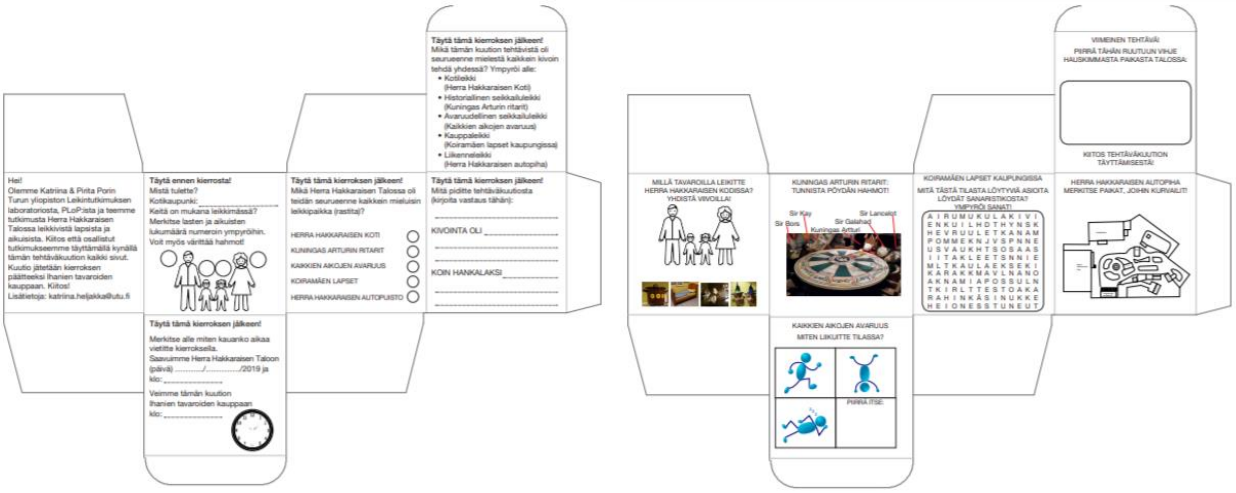

Figure 1 and Figure 2: The SurveyCube—a physical, playful and participatory survey tool: The A-side (left) collects background information, the B-side (right) includes playful activities for children and adults to do together.

During the first day of the pilot (June 2019), the two researchers responsible for the design of the SurveyCube and the study, joined an event in the museum, during which they walked around and presented visitors the opportunity to join the study. The participants were not guided on how to fill the SurveyCube, but given a precut and unfolded cube to each group together with a pen. After this, the activity was self-directed, following ideas of play being a voluntary, self-directed and creative activity.

Some of the participants were asked for permission to be photographed during this activity, and we used these photographs as illustrations of this paper to demonstrate the activity (see Figures 3, 4 and 5).

Figure 3, Figure 4 and Figure 5: Participants fill the Survey Cube.

After finishing filling their SurveyCube, the groups were asked to return them to the reception desk in the museum. During the first phase of data collection, which was continued after the launch day event and carried out during June-July 2019, the second data collection with the SurveyCubes was conducted during August-September 2019. The two consecutive data collection phases resulted in altogether 66 (properly) filled SurveyCubes folded into cubes by the participants. Afterwards, the SurveyCubes were unfolded and scanned by the researchers in preparation for analysis.

2.2 Participants

The participation in the survey was offered as a completely voluntary activity, which the museum visitors could join at their own pace. It is of importance to note that the data collected is completely anonymous, as not even pseudonyms were asked for. A total of 66 families or other groups of children and adults fully completed the SurveyCube[1], which of 134 were children, and 109 adults. The participants came from 36 different cities.

2.2.1 Selection and Participation of Children

The participation in the study was presented as a voluntary activity. After the launch, the museum staff introduced the SurveyCube and explained that the idea is to fill the survey together with the group of visitors and at the same time invite the participants to engage with the museum exhibits together. The participants were informed of the tasks they were asked

[1] The total amount of SurveyCubes collected was 73, but some of the cubes were only partly filled and were not included in the analysis.

to complete, but their use of the SurveyCube was not guided apart from the introduction. In this study, the SurveyCube aimed not to collect any individual or personal information of children, but to collect information of engagement with the museum exhibits and family/group members together. In the SurveyCube, we asked how many adults and children participated and information about their hometown, when they visited the museum (date) and how long their visit in the museum was. Moreover, the SurveyCube measured how many children participated in each group. With the SurveyCube, we also asked about the favorite place in the museum and which task on the SurveyCube was considered the favorite one.

2.2.2 Analysis

The first day of the pilot study was documented through photographs to demonstrate participants engagement with the SurveyCube (see Figures 3, 4, and 5). Researchers photographed those participants who voluntarily agreed to appear in pictures and were then depicted using the SurveyCube. Observational notes were taken during the first day of the pilot focusing on participants interaction with the SurveyCube. Initial categories emerged out of the analysis of the photos, brief conversations with the participants, and finally, the information collected on the SurveyCubes. In the analysis, we identified recurrent patterns and defined categories that were grounded in the available data. We then systematically compared, refined and coded the data available from the pilot, and identified a final array of categorical information: (a) the expressions of the favorite places in the museum (in drawing/writing), (b) the detailed performance of drawings, and (c) the hints given related to the favorite activity on the SurveyCube, or places in the museum (in drawing/writing).

3 Results

In our study, 66 groups of participants provided information about their visit in the children's museum. The SurveyCube collects information through different modalities—the visual, (drawings) and the verbal (written text). On the two sides of the SurveyCube, the participants answered questions related to background information and the time they spent at the museum, and performed tasks in relation to the play activities in the museum. Our analysis revealed, how interaction with the SurveyCube became visible through the completion of the tasks on both sides of the cube. This means that participants had actively engaged with both the museum exhibits and the SurveyCube itself, as the tasks were tied to the storytelling in each museum exhibit—the objects, the characters, and the forms of play accentuated in each exhibit, such as playing house, physical and mobile play, adventure play, etc.

First, we asked about the time they spent at the museum. The average was 2 hours and 36 minutes. Second, we inquired the participants about their favorite place in the museum: The traffic park was voted the most favorite museum exhibit with 33% of the votes. Third, we invited the participants to interaction with the cube through various playful tasks, such as

drawing and searching for words in a word puzzle. The searching for words generated most activity with the SurveyCube (of the 66 SurveyCubes, 48 included at least partly completed word puzzles). The tasks that generated second most engagement from the participants, were the drawings (of the 66 SurveyCubes, 45 included drawings made by the participants). In the analysis, we found that children mostly liked the drawing and coloring activities, while adults liked the word puzzle. Our analysis prompted three key areas worth of further attention: (a) the expressions of the favorite places in the museum (in drawing/writing), (b) the detailed performance of drawings, and (c) the hints given related to the favorite activity on the SurveyCube, or places in the museum (in drawing/writing), see Figures 6, 7, 8, and 9 below. While this study only presents the pilot phase of research conducted with the SurveyCube, we nevertheless find the results promising in pointing towards the fun and gratification experienced as the participants filled in the survey during their museum visit. To support this observation, we turn to three participating groups, who commented: "It was fun to fill this cube", "It was fun to take part in the study", and finally, "The idea of the cube was fun."

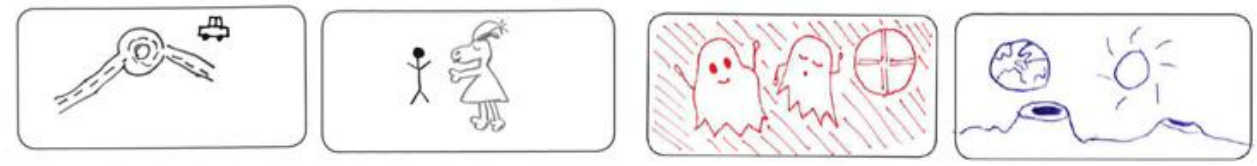

Figure 6, Figure 7, Figure 8, and Figure 9: SurveyCube—drawings of "hints" for favorite places in the museum.

4 Conclusion

Hewitt notes; "Although many theorists study the play behavior of children, only a few go on to design play/learning material and to write passionately about its use" (Hewitt 2001, p. 9). In our research, we have attempted to challenge this idea by developing a three-dimensional, physical, playful, and participatory surveying tool that promotes intergenerational connections through activities conceptualized in this paper as co-playing between children and adults. We have learnt that "manipulatives encourage free play and exploration" (Hewitt 2001). In our study, we have leaned on this idea of play and described early efforts to develop and validate the use of SurveyCube, a three-dimensional and manipulable surveying tool, in the context of a children's museum. Co-playing with the SurveyCube has an impact on engaging participants especially in terms of activating whole groups to experience the museum together. With the proposed surveying tool, the motivation for engagement is intrinsic, as the researchers are not present in the data collection situation. By filling the SurveyCube, the participants themselves become active agents in forming

their playful experiences by utilizing the tasks as prompts for play that are envisioned as group activities between children and adults.

Our findings implicate that the playfulness embedded in the SurveyCube's form and functions draws and fascinates the intergenerational groups of participants because it is first, presented as a voluntary, but novel and therefore curious activity, and second, it is structured by rules that the participants themselves have invented or accepted (Gray 2008, p. 5). The exhibits focus visitors' attention on phenomena in museums. Oftentimes, these constraints will come in the form of a challenge, which helps motivate visitors by giving them something to work toward (Perry 1993). Simultaneously, the visitor groups document their own experiences of the engagement in the museum as participants who do not just passively collect information from the environment, reflexively respond to stimuli, or behave automatically in accordance with the habit (Gray 2008).

Leading researchers agree that play entails dynamic, attention absorbing, and persistent activity (Allen et al. 1996). Play researchers also emphasize that goals in playful activity are typically achievable and do not engender stress (Gray 2008). That's why the survey followed a simple design in terms of its form and content, as participants were asked to choose their favorite space in the museum, describe the duration of their visit in the children museum, and evaluate their favorite task on the SurveyCube itself.

The limitations of the study are mainly in that the SurveyCubes was piloted in one children's museum context only, and the parts of the survey were exclusively designed to fit the museum in question. Also, the sample is still relatively small so that generalizations could be made about visitor behavior in this particular museum. What is further missing from the pilot are interviews with visitors who participated. Nevertheless, we find the results promising as they point towards the fun and gratification experienced, while the participants filled in the survey together during their museum visit.

Potential avenues for future work include bringing the SurveyCubes to new museums with intergenerational audiences as visitors and personalizing the playful tasks accordingly. To explore the full capacity of the cube format as a toy-like research tool accustomed for interactive, collaborative, and co-playable audience research including children as participants, another idea is to invite children to co-design workshops in order to find out about their ideas and opinions regarding innovative approaches to the cube format. Furthermore, it is possible to envision, how the multiple sides of the cardboard cube could be used in designing e.g., escape room types of challenges to solve, while in the museum, in parallel to collecting data from visitors regarding the most intriguing exhibits and spaces.

To conclude, museums benefit from research and while studying audiences, they must consider specific incentives: "Mapping and measuring the audience—with traditional as well as innovative qualitative and quantitative methods—matters, because it acts to justify the museum's ongoing existence and why it needs support and funding." (Anderson 2019, p. 91). Contemporary forms of audience research tend to lean on digital means of measuring. Therefore, it is in place to consider how innovations could be made in paper-based tools, targeted especially to intergenerational groups of museum visitors including children, who come as visitors joined by their parents or other adults. Finally, when considering children as museum visitors, we should be able to offer them suitable and fitting tools to communicate about their experiences in a playful way and, at the same time, to promote their social and emotional wellbeing through connectedness and co-playing with their family members or other adults. The pilot study described in this paper has suggested a playful avenue to realize this.

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