“It has to be a group work!” - Co-design with Children

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ABSTRACT
Design researchers are increasingly interested in techniques that support creative teams in various design processes. The methods developed for sharing knowledge and generating solutions are mostly focusing on adults. Creative collaboration with and among children have a specific set of challenges to be considered. In this paper, we describe two design experiments that were conducted with children aged 7 to 9, to explore the applications of co-design methods with children. In those experiments, we observed that children are capable of utilizing *make tools* but have challenges in group dynamics and reflecting everyday experiences into design ideas.

Keywords
Children, design games, make tools, co-design

INTRODUCTION
Co-design aims to set the stage for useful and inspiring dialogues among different stakeholders in the design process. In co-design, people are encouraged to express their experiences and desires with generative tools such as visual collages or simple mock-ups. *Make tools*, introduced by Sanders [5], is one of the methods developed to amplify people’s creativity and support their ideation in co-design. Our previous experiences from co-design [6], and in line with e.g. Brandt [1], point out that when people build design artefacts together, ideation, negotiation and justification take place during the process. We consider that this dialogue can be even more important for guiding the design than the created artefacts. Based on this perspective, we regard co-design in this paper as a collaborative generative activity that aims at gaining information and inspiration about people, contexts and design possibilities.

Today children grow surrounded by technology. Co-design with children is expected to bring insights from children’s perspectives on technology. Because children have differing abilities to express their ideas and to follow structured tasks, the methods for collecting information and generating solutions should be sensitive to their skills. Interested in these issues, two design experiments were conducted to study how co-design methods should be adjusted for children. These experiments were part of an on-going research on studying and developing co-design methods and design games in particular.

In 2007 and 2008, we were invited to a primary school in Espoo, Finland. We took this opportunity to experiment co-design with children. Both of the experiments were conducted in the classroom environment and the children worked in groups. The first experiment applied Make Tools [5]. Then, guided by the observations on the first experiment, the second experiment followed the Design Games [2] approach. This paper reports the experiments.

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THE FIRST EXPERIMENT: MAKE TOOLS
The first experiment was conducted with 23 children aged 7 to 8 years from one class. Our main interest was to gain experiences of applications of Make Tools with children. Make tools can be blocks with various shapes and sizes which can be easily attached and detached. Those blocks can represent forms, buttons or displays and can be easily reconfigured into new combinations by potential users.

Procedure
Our main interest was methodological and we did not have a specific design objective. Thus, we invented an artificial design task: to create an intelligent interactive device that supports learning and collaboration in teams. To set an easy starting point for ideation, we took an example from a school book familiar to the children. In the book ‘Pikkukone (i.e. ‘small machine’) creates words from letters that are fed into it. Our design brief for the children was to design ‘a cousin of Pikkukone’, a learning buddy.

Before starting the design phase, we discussed with the class situations in which learning and team collaboration support could be useful and fun. Then, the children were asked to think in teams what kind of a learning buddy they would like to have; what would help groups in learning; what they could do with it and how it would function. To benefit from the learning context we encouraged them to consider surrounding artefacts, such as tables and books, and other equipments in the classroom as triggers for ideas while designing their learning buddy.

Make tools kit included various sized blocks, ready-cut pieces of cardboard and buttons that have symbols such as question marks, snowflakes and words including 'help'or 'error'. With these materials, the children started building rather robot-like creatures with imaginative functionalities such as wings for flying and "a spelling corrector" (figure 1). Finally, in the end of the experiment the designs were introduced and their functionalities were explained to all.

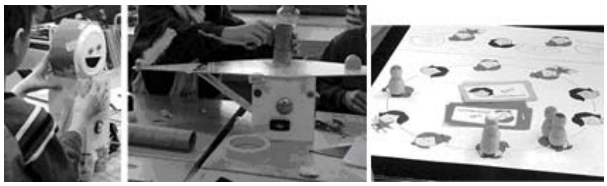

Figure 1. Left: The learning buddies looked like robots that had faces or even wings. Right: The scenario building game

Observations: the First Experiment

In the first experiment, the following topics were observed:

Classroom rules

The experiment was conducted in the classroom and the design task was connected to the learning practices and the surrounding environment. However, it seemed that the class room practices did not really inspire the children.

We assume that the rules in the classroom prevented children in having a collaborative atmosphere as also noted by others [3, 4]. In normal learning situations, children should not talk freely and walk around without permission. Also, in the classroom setting the children were sitting too far away from each other for easy collaboration. Because of this, it took some time to warm them up for the team work. As the children started to move and come closer to each other the collaboration became more active.

Challenges in Group Collaboration

The children's abilities are highly dependent on the age. Participants in this experiment were 7 to 8 year olds who had not yet used to team work at school according to the teacher. They had challenges in participating equally in the group work and seemed to follow quite openly their personalities and roles: the active ones seemed to dominate the team activity while the shy ones remained more passive.

Even though each group ended up with one design solution, the final solutions were not all based on very constructive negotiations. The decision making process was not clear and included poor arguments. Also, in one of groups, team members did not share the overall vision of their design but made different things separately and only in the end put them together for the final outcome.

Gap between Real Life and Design Ideas

To warm up for the design phase, we asked the children to suggest activities and needs related to their learning practices. We expected that this discussion would help them to apply real life situations when designing. However, based on the feedback given by the teacher and children, we realized that children had difficulties in making connections with the discussed activities and the design ideas. The feedback also suggests that the discussion might have been too abstract for the children. Thus, the warming up discussion was not well presented in the designs.

In the design phase, the familiar starting point, 'a cousin of Pikkukone', helped to motivate children in the beginning but it seemed also to constrain their ideas. Most of outcomes resembled Pikkukone to some extent. In addition, we observed that children enjoyed putting more effort in its outlook such as colour and shape, than its functionalities.

Materials for Making

M*ake tools* provided an engaging stage for building the designs. The symbols and ready made items were a good starting point for ideation and the children started to generate ideas through building. The buttons with different symbols evoked associations and were designed into new features of the device. For instance, one of the groups explained that "when the picture of a gift box is pushed, the device says comforting words, and when the picture of snow flake is pushed, it tells information about northern pole". Children also reshaped given materials and crafted those into shapes as they needed.

To our surprise the children were upset of us collecting the design outcomes. Jones et al [4] had also observed that children were so proud of their contributions that they wanted to show those to their parents. Children's strong emotional attachment to their design outcomes could thus be applied for motivating them. One time use of the make tools kits for children is not a problem but has to be considered when planning the procedure.

Refining Research Questions

The first experiment guided us to focus on the facilitation of group collaboration and on the documentation of children's ideation process. Earlier studies [e.g. 3,4] suggest that a lot of resources including many adult facilitators, recording devices and time to review documents are needed when working with children. Based on this notion, we posed new challenging questions for the new experiment: How can we better facilitate equal participation in children's collaborative design? Could a game-like structure support collaboration and reduce the need of many adult facilitators in co-design with children?

THE SECOND EXPERIMENT: DESIGN GAME

The second experiment was conducted in spring 2008.

Design Game

Design games have been discussed in the context of co-designing with adults, and they have proved to be useful frameworks for facilitating the exploring of design opportunities together [e.g. 2]. During the first experiment we observed that children had difficulties in group collaboration and in conducting constructive discussions in

the co-design process. To the second experiment we applied a design game approach to investigate if a game-like structure with turn takings and rules can solve some of those challenges and support more equal participation. Also, we wanted to experiment with conducting generative sessions with only a couple of facilitators.

Procedure

The same class participated in the second experiment. Like in the first one, we invented an artificial design task for the experiment. During that time, the school had a specific theme of environmental awareness in their program, so we applied the theme for the design task. Since children had already had some exercises related to this topic, we also expected they were to some degree sensitized with this topic before the actual co-design session.

We already knew that the classroom environment constrained kids' physical and free collaboration due to its spatial arrangement and rules. Nevertheless, we could not let kids out of the classroom. Instead, we tried to overcome the constraints by facilitating other aspects in co-design activities. We expected that the game structure and role playing can support children into more open collaboration. In following, the three steps of the second experiment are described.

First Step: Diving into the Topic

The structure of the session influences the ability of reaching a creative mood and generating design ideas. Sanders [5] have suggested an evolving structure which starts with an easy sensitizing pre-task. As a sensitizing stage we showed children a two-minute clip from *The Simpsons movie* in which Lisa convinces the city of Springfield to protect the nature. The aim was to create a framework for following activities, and after the movie we told children that their task is to help Lisa to save the planet.

Second Step: Scenario Building Game

The next task was to build scenarios of every day life by playing an 'eco-game'. The 'eco-game' material consisted of a game board, game pieces, a dice, task cards, a scenario board and scenario cartoon cards (see figure 1).

The first objective of the game was to observe how the game structure can encourage children's discussion without adult facilitators. By letting children play this game, we also wanted to facilitate children's equal participation. We expected that the turn-taking rules could lead to a situation in which each member of a team could equally participate in the scenario building. The third aim of this scenario building game was to have documentation of children's discussions. We also expected that having the visual scenario created by children would help them to reflect their experiences when generating design ideas.

In the eco-game, children were told to throw a dice and move their game pieces on the board turn by turn. The board had faces on it and when a kid's game piece stopped on the faces, she was supposed to flip one of cards over. The cards had instructions for the discussions and building scenarios. For example, one card asked to pick a scenario card and tell experiences related to the environmental issues in situations of the cards. The scenario cards had different images representing children's daily lives such as going to school or washing teeth. The cards also had blank bubbles; children could write quotes and create stories based on them. After telling their stories to other members, they placed that scenario card to the scenario board. When children finished building the scenarios, they could earn a key to open the *make tools* box and move on to next step, the make session.

Last Step: Make Session

In make session, children were asked to design a magic tool or a secret weapon to save the earth by using *make tools*. In the first experiment, we learned that crafting work took quite a long time. Thus, we collected materials that were easy for the children to work with. This time the make tools kits contained disposable materials such as cardboard boxes, plastic or glass bottles that they could keep. In addition, various kinds of symbol stickers including "smileys" and numbers were also provided.

We told children to consider what they had discussed while building a scenario so that they could reflect their everyday life experiences in their design. After the make session, each group presented their design outcomes to other groups and questioning and answering followed.

Observations: The second experiment

Children's Abilities to Play the Design Game

In the scenario building game, we realized that children did not clearly understand all the instructions and tasks of the game. It seems that the game had too many rules and tasks. Thus, the 'over-designed' games did not really succeed in facilitating group dynamics as we had hoped for. In some groups the more dominant kids kept throwing the dice and taking the scenario cards without waiting for their turns. In the later part of the game, some groups skipped throwing a dice and just focused on filling the scenario board.

In most groups, children actually discussed various situations relevant to the topic while playing and those were then documented on scenario cards. However, some other children just added text and stickers to make images more fun and nicer.

Earning a key to open the make tools box motivated the children to finish the scenario building task and getting them excited to move to the make session. However, because children got quite excited to open the box, we observed some groups trying to fill in the scenario board as soon as possible without focus on the discussion.

Playing with Kids' Rules

The game-like construction did not fully remove the team collaboration challenges identified earlier. For example, one

of child preferred staying under the table for most of the time. We also saw children dominating the procedure, e.g. one girl took the make tools kit under her arms and allocated the materials according to her rules. Such details demand great flexibility from the methods and the researchers.

While making a magic tool, some of the teams were not able to collaborate in deciding the functions and appearance of their designs. Instead, one or a couple of children separately made different parts and later they put those parts together to make their design look like an outcome of group work emphasising the brief as pointed out by one of the students: "Attach that thing to this device…this is group work…it has to be part of the group work."

Creative Corners

Even though the setting in a classroom remained the same during the whole event, the way children used it changed when they moved from the game to the designing phase. During the game, they mostly sat as they usually do in normal class. However, the situation changed when children were provided with the tangible materials for designing. All group members became more active to better access the materials by being closer to each other in one corner of the table. Although this being a rather obvious observation, we want to emphasise that enabling children to move their positions and being closer to each other can better support creative and generative thinking also in class.

DISCUSSION

The two described co-design experiments gave us hands-on experiences on application of co-design methods with children. The experiments are part of an on-going research on studying and developing co-design methods. Thus in the following, are our early findings from method perspectives.

Adults as Facilitators

Regardless of the challenges we found during the first experiment, we especially wanted to investigate if the game structure could facilitate group dynamics without adult facilitators. However, as discussed earlier, the game format somewhat supported the collaboration but was not enough. More active participation by adults could have been needed to guide children's dialogues and focus on the design theme.

We also observed that children could not really connect their everyday life to design ideas. Although in both experiment we tried to set the stage by discussions they were not well-linked to their designs. This connection could have been better supported with an adult facilitator who asked questions about children's everyday life and its connection to their design outcomes during the ideation.

Make tools for Children

Children were motivated or even enthusiastic with the Make tools. Easy configurations and ambiguous shapes that enable various interpretations are the strengths of the make tools. Even though children were slow at building, they did not hesitate in transforming make tools for their own purposes. Make tools did not seem to restrict them and provided an easy starting point for the idea generation.

As mentioned earlier one of the important aims of co-designing is to enable people to think aloud, negotiate with team members and justify different solutions. This reasoning behind is important for the researchers because it reveals people's attitudes, needs and desires. Therefore, when co-designing with children, their discussions should be well documented.

Considerations for further studies

The design experiments lead us to pose new considerations: We emphasized equal participation in children's collaboration. Could the observations be applicable for adults as well. And could we instead nurture the power relationships for a more effective team work?

In this work, we experimented with artificial design tasks. If we had "a real world" design task the observations could have been different. Without an actual design project it is challenging to measure if the applied methods were successful for feeding the design or not.

As well as practical lessons learned, the design experiments with children gave us sensitivity to perceive children as co-designers. This sensitivity should be the base when exploring new research questions in further studies and also conducting design projects for and with children.

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