Co-design revisited: exploring problematic co-design dynamics in kids

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Abstract
This paper explores problematic co-design dynamics in children, which are defined as a system of intragroup dynamics occurring within a group of at random or purposefully selected children sharing a common design goal. These dynamics impact children's development of creative solutions in co-design, but have rarely been addressed in literature. Therefore, we set out a multiple case study with 9- to 10-year olds in three elementary schools. Although not an exhaustive list, our in-depth exploration resulted in the following problematic co-design dynamics: the *apart together* phenomenon, *free riding, status inequality,* the *laughing out loud* phenomenon, the *greatest common divisor* effect and *polarization.* In further research, we will investigate how to remediate these dynamics into positive forces.

Author Keywords
Children; Co-design; Participatory Design; Group Dynamics; Co-design Dynamics; Design Process

ACM Classification Keywords
H.5.2 User Interfaces, Methodology, User-centered design

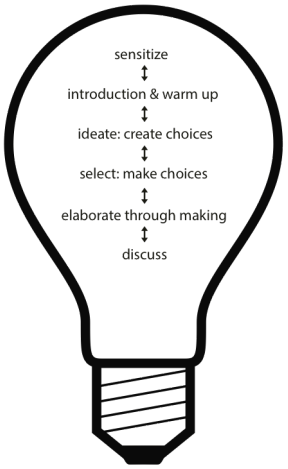

Figure 1. The general procedure of the co-design sessions

Introduction

New co-design methods for designing technology for children have emerged over the last decade, e.g. [1][6][16]. These methods typically involve children in dyads or groups, rather than individually. However, group dynamics that may impact children's development of creative solutions have rarely been addressed in the elaboration of these methods.

The term group dynamics was first coined by Kurt Lewin (1945) and refers to a system of behaviors and psychological processes occurring within a social group (i.e. intragroup dynamics), or between social groups (i.e. intergroup dynamics) [5]. In this paper, we refer to 'co-design dynamics' as a system of intragroup dynamics occurring within a group of at random or purposefully selected children sharing a common design goal.

In co-design research with children, authors have only recently started to acknowledge the importance of facilitating group dynamics, e.g. [9][15]. However, the concept 'group dynamics' remains generally poorly defined and little solutions to overcome these issues have been suggested. Also, the majority of authors tend to focus primarily on remediating asymmetrical power relationships between adults and children, e.g. [2][3][7][8].

Therefore, the Child-Computer Interaction community would benefit from our in-depth exploration of problematic co-design dynamics and their influence on the generated designs.

In order to research co-design dynamics in children in more depth, we set out a study. In what follows, the method of this study will be highlighted. Then, we will present a short description of some prevalent problematic co-design dynamics and finally, we will touch upon topics for further research.

Method

Three schools (i.e. cases) in Flanders, Belgium, were involved in an explorative multiple case study. In total, four co-design sessions were organized in each school. Although our main interest was methodological (i.e. exploring co-design dynamics in children), we had a specific design theme: to discover new opportunities and ideas for media technologies that aim at arts and culture education for children. However, for our ongoing research, the designs and requirements that came out of the co-design sessions are of secondary importance.

Our general design theme was divided into subtopics, one for each co-design session:

- Session 1: organizing a fun and engaging class excursion
- Session 2: making schoolwork both fun and engaging
- Session 3: designing a fun and engaging website for learning
- Session 4: inventing magical technology assisting schoolchildren on a museum visit

School 1		
	AM	PM
Session 1	4B 5G	5B 5G
Session 2	5B 3G	3B 6G
Session 3	6B 3G	3B 6G
Session 4	5B 4G	4B 5G
School 2		
	AM	PM
Session 1	8B 8G	6B 8G
Session 2	8B 8G	6B 7G
Session 3	8B 8G	6B 7G
Session 4	8B 8G	6B 7G

Table 1. The sessions
B = boys, G = girls
AM = forenoon, PM = afternoon

Participants

Three schools participated. One school was located in an urban region and two schools in suburban regions in Flanders, Belgium. All children were in the fourth grade of elementary school and were 9 to 10 years old. Each class, ranging from 19 to 30 children, was divided in a fore- and afternoon group (see Table 1 and 2). At the beginning of each co-design session, these fore- and afternoon groups were split up in two to three subgroups of four to six boys and girls. Literature has shown this to be the most optimal group size [4]. Also, many authors suggest that heterogeneous groups are more capable of coming up with diverse ideas [2][12]. Therefore, these subgroups were heterogeneously based on criteria such as intelligence, communication skills, gender and creative abilities.

General procedure

Two researchers were involved in each co-design session: one facilitator who interacted with the children and one fly-on-the-wall observer making notes. In addition, the whole session was recorded on video and a report was written immediately afterwards. Each session lasted for about 150 minutes and typically consisted of the following stages (see Figure 1):

- Sensitizing

By means of an individual assignment we triggered children's reflection in a playful and creative way before the actual co-design session. Approximately one week before each session, we introduced an assignment in the children's classrooms. They then worked on it at home. In one such assignment, Future Classroom, we asked the children to draw or prototype their ideal classroom of the future. In the co-design session that followed (i.e. session 2: making schoolwork both fun and engaging), the children discussed their drawings or paper prototypes for the first 10 to 15 minutes. Our aim was to warm up the children so they would be better able to access their experiences and to express their ideas regarding the co-design session's topics. This is in line with [13] to whom we refer for more detailed information on sensitizing.

- Introduction and warm up

The session took place in an available (class)room in the school. First, the children were divided into 2 to 3 teams of 4 to 6 boys and girls depending on the class size. Then, the adult facilitator explained the co-design session's topic as well as the rules such as 'listen to each other', 'there are no bad ideas', 'be quiet when asked' and 'you may walk around but stick to your team'. Dividing the groups and explaining the topic and rules took about 10 to 15 minutes. Next, the facilitator warmed up the children for another 10 to 15 minutes by discussing the results of the sensitizing assignment.

- Ideation and selection

The facilitator handed out post-its and markers and explained the brainstorm rules for ideation (i.e. defer judgment, encourage wild ideas, build on the ideas of others and go for quantity) [14]. The children then brainstormed with these rules in mind and wrote down as many ideas as possible on post-its (see Figure 3). They only got five minutes for brainstorming ideas. Each team was then asked to group similar ideas together. Finally, each team member could vote for his or her favorite ideas by means of three little stickers. The three most popular ideas were taken to the next stage for further development. For grouping and

School 3 Class A		
	AM	PM
Session 1	7B 7G	7B 6G
Session 2	7B 7G	7B 7G
Session 3	7B 6G	8B 5G
Session 4	8B 6G	6B 7G
School 3 Class B		
	AM	PM
Session 1	8B 5G	6B 8G
Session 2	8B 5G	8B 5G
Session 3	8B 8G	8B 5G
Session 4	8B 5G	8B 5G

Table 2. The sessions
B = boys, G = girls
AM = forenoon, PM = afternoon

selecting ideas, the children got another 10 to 15 minutes.

- Elaboration through making

In the next stage, children elaborated on the selected ideas in a hands-on way by making collages or building paper prototypes. The facilitator explicitly asked the teams to mix the three previously selected ideas into one 'big idea'. They could either visualize their big idea with a collage or make a paper prototype out of it. For this purpose, each team had a generative toolkit [11] at their disposal made up of two-dimensional components ranging from figurative to abstract (e.g. paper shapes, stickers and color photographs) (see Figure 4). The teams had about 45 to 55 minutes to visualize or prototype their big idea. Again, since space is limited here, we refer to [13] for a more detailed description on the use of generative toolkits.

- Presentation and discussion

In approximately five minutes, the teams prepared a presentation about their 'big idea'. When one team was presenting their collage or paper prototype and the ideas and experiences embedded in it, the other teams functioned as a jury. After the presentation the jury could ask critical questions about the design. The facilitator moderated the discussion and asked some additional open-ended questions as well. After each team had presented and discussed their design, a short wrap-up followed and the session ended. Presentation and discussion took about 15 minutes per team.

Analysis

For translating the children's 'big ideas' into concrete design ideas and requirements, we used a grounded theory based approach. Since our main concern here is methodological, we refer to [13] for more detailed information.

To address our methodological question we used open and axial coding to determine which co-design dynamics were prevalent in each of the cases (i.e. the three schools). We triangulated data from different sources: observation notes, reports written after the sessions, the co-design artifacts, raw video footage and transcripts from the presentations and discussions.

Results

The following is not intended to be an exhaustive list of possible problematic co-design dynamics. Since there is not much room, we will only provide concise descriptions with little illustrations.

Co-design dynamic 1: Apart Together

Some of the group's designs were a disconnected mix of rather individual designs lacking an overall design vision. Instead of mixing ideas and working toward one integrated design, the children followed their idiosyncratic interests. Each student visualized his or her idea and only in the end they combined the individual designs quite literally (see Figure 2).

Co-design dynamic 2: Free Riding

We noticed that some children took advantage of the work of others in the team. Obviously, these children did not feel as accountable to contribute, so they devoted less effort. This particular kind of social loafing is dubbed 'free riding'.

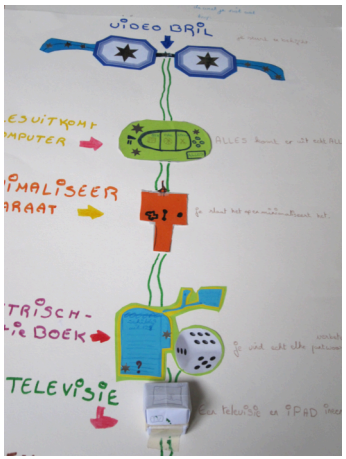

Figure 2. Effect of the 'Apart Together' phenomenon on the generated design

Figure 3. Brainstorming with post-its and markers

Co-design dynamic 3: Status Inequality
Some co-design groups quite openly followed the opinions and ideas of the most dominant or charismatic team member. It was obvious that these children were enjoying a higher status and had a tremendous impact on the group process, either positively or negatively. In contrast, children with a lower status, often the shy ones, had a more difficult time voicing their ideas and thoughts and their influence in the group was rather limited.

Co-Design dynamic 4: Laughing Out Loud
In some cases we noticed co-design groups ganging up on the task. They were having a good time, but there was an unwillingness to take the task at hand serious as a group. This may be due to a lack of intrinsic motivation and problem ownership.

Co-Design dynamic 5: Greatest Common Divisor
A few times, we saw groups ending up with a design doing too many things at once. This phenomenon is somewhat related to the 'Apart Together' phenomenon in that a strong, overall design vision was lacking. The difference being that there were no problems in the collaboration process. However, the group lost track of their initial design goal, because they kept on adding functionalities to please every team member.

Co-Design dynamic 6: Polarization
We noticed that some children had a difficult time letting go of their ideas. This obviously complicated negotiating ideas with other team members during the selection phase. Children were not always capable in managing such conflict or differing voices productively, leading to a polarization within the co-design team.

Discussion and future work

In this ongoing research, different types of problematic co-design dynamics in children and their influence on the generated designs have been investigated. In future work, we will also focus in more detail upon the interrelationship between problematic and positive co-design dynamics in children.

Perhaps the most important question to address is how to remediate these problematic co-design dynamics. Currently, we are looking at other fields, such as educational pedagogy, to address the dynamics encountered in our study. In particular, conceptual approaches to Cooperative Learning gained our interest. The main challenge will be to translate solutions from an educational into a co-design context. Since there is considered to be a shortfall in the Child-Computer Interaction community of empirical work to back up the beliefs of the researchers working in it [10], we will need to validate promising solutions rigorously. Therefore, adequate validation techniques will need to be searched for as well.

Conclusions

In this paper, we defined 'co-design dynamics' as a system of intragroup dynamics occurring within a group of at random or purposefully selected children sharing a common design goal. These dynamics impact children's development of creative solutions but are rarely addressed in the literature on co-design methods. Although not an exhaustive list, our in-depth exploration resulted in the following problematic co-design dynamics: the *apart together* phenomenon, *free riding, status inequality,* the *laughing out loud* phenomenon, the *greatest common divisor* effect and *polarization.*

Figure 4. Close-up from a collage made during the elaboration phase

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