Exploring Challenging Group Dynamics in Participatory Design with Children

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ABSTRACT
This paper presents a structured way to evaluate challenging group or 'co-design dynamics' in participatory design processes with children. In the form of a critical reflection on a project in which 103 children were involved as design partners, we describe the most prevalent co-design dynamics. For example, some groups rush too quickly towards consensus to safeguard group cohesiveness instead of examining other choice alternatives (i.e., groupthink). Besides 'groupthink' we describe five more challenging co-design dynamics: 'laughing out loud', 'free riding', 'unequal power', 'apart together' and 'destructive conflict'. We argue that balancing these dynamics has a positive impact on the dialectic process of developing values and ideas in participatory design, as well as on children's motivation. Therefore, the CCI community could benefit from our in-depth exploration and categorization of challenging group dynamics when co-designing technology with children.

Categories and Subject Descriptors
H.5.2 User Interfaces, Theory and methods, User-centered design

General Terms
Design; Performance

Keywords
CCI; Co-design; Group dynamics; Values; Participatory design

1. INTRODUCTION
Participatory design has urged us to consider 'users' as co-designers of their technology and of the practices that may be reified in that technology. Within the area of Child Computer Interaction (CCI) children have participated in the design of technology for over two decades using a variety of established methods [3][12]. These methods typically involve children in dyads or groups, rather than individually. The use of groups in participatory design reflects a theoretical commitment to the notion that meanings are socially and collectively produced [1].

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1.1 Negotiating values
Recently, attempts have been made to rekindle values in what is called a more authentic approach towards participatory design [10]. During design activities, children's values may be implicitly expressed as something they care about and find important. Values do not progress stepwise in one direction. Rather they emerge, develop and ground recursively and dialogically over the course of the design process [10]. The way we work with values in participatory design with children is centered on dialogue. Therefore, one of our core tasks as researchers is to orchestrate this dialogue with and among children and to make sure value conflicts are transcended and translated into meaningful design concepts. Special attention should thereby be given to group dynamics that may impact this dialogical process.

1.2 Group dynamics
Within the area of CCI, authors have only recently started to acknowledge the importance of facilitating group dynamics in co-design with children, e.g. [17]. Focusing on group dynamics is believed to have a positive impact on children's motivation as well as on the development of creative solutions [2]. Nevertheless, the concept 'group dynamics' remains generally poorly defined within the field, and little solutions to overcome challenging group dynamics have been suggested. Also, the majority of CCI authors tends to focus primarily on remediating asymmetrical power relationships between adults and children, e.g. [4][7][12]. Therefore, the CCI community would benefit from an in-depth exploration and categorization of challenging group dynamics when co-designing technology with children.

The term group dynamics was first coined by social psychologist 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 children sharing a common design goal.

In the form of a critical reflection, this paper presents a structured way to account for challenging co-design dynamics within groups of children. In section 2 we describe a project in which children were involved as design partners. In section 3 we reflect upon these co-design activities, presenting the most prevalent dynamics we encountered during the project, and in section 4 we discuss our

categorization of challenging co-design dynamics and touch upon topics for further research.

2. CASE STUDY

The study took place in three schools in Flanders, Belgium. All children were in the fourth grade of elementary school, aged 9 to 10. Each class, ranging from 19 to 30 children, was divided in a morning- and afternoon group. In sum, 103 children were involved. At the beginning of each co-design session, these morning- and afternoon groups were split up in two to three gender-mixed subgroups of four to six boys and girls. Literature has shown this to be the most optimal group size [9]. Also, many authors suggest that heterogeneous groups are more capable of coming up with diverse ideas [4][14]. Therefore, with the help of the children's teachers, these subgroups were formed heterogeneously, based on criteria such as intelligence, communication skills, gender and creative abilities.

Over a period of two months, four co-design sessions were organized in each school on the theme of arts and culture education. We thereby divided our general design theme 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 to assist schoolchildren on a museum visit.

2.1 General procedure

We used a blend of two different approaches to co-design: 'Cooperative Inquiry' [4] and the 'Contextmapping' procedure as described by [15]. The goal of Cooperative Inquiry is to support intergenerational design teams in understanding what children as technology users do now, what they might do tomorrow and what they envision for the future [4]. Contextmapping on the other hand is a systematic approach to elicit contextual information of product use. Generative techniques are often used in Contextmapping. The basic principle thereby is to let people make designerly artifacts and tell a story about what they have made [13][14].

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:

2.1.1 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 ahead of each session, we introduced an assignment in the children's classrooms. They then continued working 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. Through this 'warm-up', children were better able to access their experiences and values and to express their ideas regarding the co-design session's topics. This is in line with [15] to whom we refer for more detailed information on sensitizing.

2.1.2 Introduction and warm up

The session took place in an available (class-)room in the school. First, the children were divided into two to three teams of four to six 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', and 'you may walk around but stick to your team'. The latter activities 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 preceding sensitizing assignment. During these discussions, children's values were implicitly expressed as something they care about and find important. This way, a problem space was identified that children felt is worth tackling.

2.1.3 Ideation and selection

The facilitator handed out post-its and markers and explained the rules for ideation (i.e. defer judgment, encourage wild ideas, build on the ideas of others and go for quantity) [16]. The children were then encouraged to brainstorm, writing down as many ideas as possible on post-its. Although brainstorming's effectiveness has been questioned, the technique should not be evaluated in isolation here, since we combined it with individual reflection (cf. sensitizing) and low-tech prototyping (cf. elaboration) [16]. Each design team had five minutes to brainstorm ideas. Then they were asked to group similar ideas together. Finally, each team member could vote for his or her favorite ideas by means of three little stickers (i.e., sticky dot voting) [6]. Only one vote could be given to one of their own ideas. The most popular ideas were taken to the next stage for further development.

2.1.4 Elaboration through making

In this phase, children elaborated hands-on on the selected ideas. The facilitator explicitly asked the teams to mix the three previously selected ideas into one 'big idea' [7]. They could either visualize their big idea through a collage or make a paper prototype out of it. For this purpose, each team had a generative toolkit [13] at their disposal made up of two-dimensional components ranging from figurative to abstract (e.g. paper shapes, stickers and color photographs). The teams had about 45 to 55 minutes to visualize or prototype their big idea. Again, since space is limited, we refer to [15] for a more detailed description on the use of generative toolkits.

2.1.5 Presentation and discussion

In approximately five minutes, the teams prepared a presentation about their design. When one team was presenting their collage or prototype and the ideas and values embedded in it, the other teams functioned as a jury. After the presentation, the jury could ask critical questions about the design. We stressed that the jury should focus on the design's quality rather than on the form of the presentation. The facilitator moderated this dialogue between jury and design teams and asked some additional open-ended 'why' questions inspired by UX laddering as described by [18]. Thereby, the deep reasons and values behind certain design decisions were revealed. After each team had presented and discussed their collage or prototype, a short wrap-up followed and the session ended. Presentation and discussion took about 15 minutes per team.

2.2 Analysis

We qualitatively analyzed the data by means of open and axial coding. The raw data consisted of observation notes, reports written after the sessions, co-design artifacts, video footage and transcripts from the presentations and discussions.

3. CO-DESIGN DYNAMICS

The framework presented below is not exhaustive and although some of these challenging dynamics may not seem novel at first sight, they have rarely been addressed explicitly in CCI and in literature on co-design methods.

3.1 Unequal power

Some co-design groups quite openly followed the opinions and ideas of the most dominant or charismatic team member. These children were enjoying a higher status and had a tremendous impact on the group process, either positively or negatively. They might for example capitalize on the situation to force their ideas and values on the group and undermine team effectiveness. A co-design dynamic that we label as 'unequal power' in analogy with social psychologist [5]. This makes it difficult for children with a lower status to voice their opinions, limiting their influence in the group. Many times, these children appeared to be rather shy in contrast to the more dominant, high-power children. Thus, group members with more power than others have a higher likelihood of swaying any final decision by direct or indirect pressure as well as through the time they are allotted for discussion.

3.2 Free riding

The results showed that some children took advantage of the work of others in the team. These children may have felt less accountable to contribute, so they devoted less effort. A dynamic that we label as 'free riding' in analogy with a particular kind of social loafing described by social psychologists [16] as *"the reduced social motivation that occurs when certain members decide to let the others contribute and choose not to fully participate"*. Free riding may easily manifest itself during co-design activities. For example, one particular child took a free ride almost every co-design session, no matter what group he was in. He hardly did anything and sometimes he was even counterproductive by making jokes about the others who became visibly agitated. Surprisingly, he tried to take credit for the ideas during presentation by intervening repeatedly when someone else was talking. Although this was a rather extreme and rare case of free riding, milder forms were very common.

3.3 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. In such groups, the atmosphere was rather disruptive instead of constructive. This may be due to a lack of intrinsic motivation and problem ownership. When team members do not gradually uncover and identify their values, it may become problematic to identify a problem space they feel is worth tackling as a group.

Sometimes, this tendency towards an unserious atmosphere was a gradually evolving process. At the start of one particular co-design session, only two out of five group members were giggling while coming up with rather silly and irrelevant ideas. After a while, this behavior affected the other children in the group and once the session was half way, their priorities as a group had shifted from finding a design solution to having a good time.

3.4 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 and only in the end they combined the individual designs quite literally. In one such example, each of the group's members invented a piece of 'magical technology' to guide schoolchildren during a museum visit. By drawing ropes between them, they combined these individual designs afterwards. Among the individual designs were a 'minimize device' to make souvenirs from artworks and historical buildings, 'holographic video glasses' that could project a virtual guide in front of you and an 'electronic notebook' with an integrated 'ask a question' dice game. When presenting, it became clear they had not negotiated their personal values and ideas profoundly**.** As a consequence their final design lacked an overall design vision. Children from other teams confirmed this after the presentation. They literally questioned the feasibility of the idea, already anticipating that all these components together would weight a lot so that it would be impossible to carry it while walking in the museum. Different and contradictory answers followed. It was obvious the team members had not thought profoundly about this matter. This may be due to a lack of communication within the team, but it may also depend largely on the developmental characteristics of child participants this age.

3.5 Deconstructive conflict

We noticed that some children had a difficult time letting go of their initially chosen ideas. This complicated negotiating ideas with other team members during the selection phase. Children were not always capable of managing such conflict or differing voices productively, leading to a polarization within the team. Such negative or competitive behaviors between team members may reduce trust and it is being known in other fields such as social psychology and cooperative learning that the lack of trust reduces group cooperation [5] [11]. Based on our observations, this also holds true for co-design activities with children. Although conflict may be an essential process to move teams towards necessary change and creative breakthroughs, it must be managed. If not, conflict easily becomes destructive, causing defensive behavior, inflexibility, contempt and an unwillingness to work together.

3.6 Groupthink

The dynamic of groupthink occurred in some teams with high group cohesiveness. Psychologist Irving Janis coined the term 'groupthink' to describe a phenomenon in which "*the group ends up being dumber than its individual members"* [14]. In our study, groupthink happened when children were reluctant to criticize each other's ideas. They then kept on adding functionalities to please everyone and eventually ended up with a design featuring too much functionality. Although a strong, overall design vision was lacking, this was not the result of any problems in the collaboration process as for instance was the case in the Apart Together dynamic.

A technology-enriched fur coat, designed by one of the teams is a striking example. At first sight, the children collaborated successfully and no tensions were observed. However, during prototyping they kept on adding overlapping functionalities to their technology-enriched fur coat. It seems like they wanted to please every team member to safeguard the positive atmosphere in the group. In doing so, they got more and more off track and they gradually lost sight of the design goal, ending up with a design doing too many things at once. This was made explicit by the opening sentence of their presentation, in which they announced their design as the *"Everything Fur Coat"*. This emphasis on concurrence seeking instead of fully surveying choice alternatives subsequently increases the possibility of poor decision-making, as confirmed by social psychologists [5]. Value conflicts in such groups are often neglected rather then negotiated and transcended, which makes it less likely for creative breakthroughs to emerge.

4. DISCUSSION AND FUTURE WORK

The goal of this paper was to present a structured way to evaluate six challenging co-design dynamics that may occur in participatory design practices with children. The categorization is not exhaustive and only includes the most prevalent challenging dynamics encountered so far. We believe that balancing these dynamics has a positive impact on the dialectic process of developing values and ideas in participatory design, as well as on children's motivation. The CCI community could thus benefit from our in-depth exploration and categorization of challenging group dynamics when co-designing technology with children.

These dynamics may be closely linked. For example, a group may fall into the 'groupthink trap' because the viewpoints of a dominant and charismatic child (cf. unequal power) are agreed upon too soon without critical examination of other alternatives. Groups rushing too quickly towards consensus and agreement could actually benefit from a mild form of conflict. Although conflict is often perceived as a negative force while cooperation is at the other end of the continuum, their impact on group performance is more nuanced than that. In fact, conflict can be a positive force because it can create energy around sharing diverse information and viewpoints. The challenge is to avoid groups moving from constructive to dysfunctional and destructive conflicts [5]. In future work, we will further investigate these complex interrelationships.

Currently, we are looking more deeply into other fields such as educational pedagogy and in particular conceptual approaches to Cooperative Learning have gained our interest, e.g. [11]. We have been translating solutions from an educational into a co-design context. For instance, by having children take on different roles as 'timekeeper', 'inspiration general', 'material guard', and so on, positive interdependence will be enhanced. The idea is that if children value their group members as a result of cohesiveness-building activities and are dependent on one another, they are likely to encourage and help one another to succeed, because they perceive that their effort is important for the entire group [11]. In future work, we will further translate solutions from an educational into a co-design context and validate promising solutions rigorously.

5. CONCLUSIONS

In this paper, we have defined 'co-design dynamics' as a system of intragroup dynamics occurring within groups of children sharing a common design goal. These dynamics clearly impact the dialectic process of developing values and ideas in participatory design. These challenges, however, have rarely been addressed in the field of CCI and in the literature on co-design methods.

The dynamics encountered in our study are the 'apart together' phenomenon (i.e., working individually and only combining results quite literally in the end), 'free riding' (i.e., reduced effort by some individuals when working in a co-design team and taking advantage of the others), 'unequal power' (i.e., some children come to the co-design tasks with higher status than others and vice versa), the 'laughing out loud' phenomenon (i.e., an unwillingness to take the task at hand serious as a group), 'destructive conflict' (i.e., escalating disagreements about which ideas too work on further) and 'groupthink' (i.e., rushing too quickly towards consensus neglecting choice alternatives). We strongly believe that focusing on these dynamics is essential to better engage with values in participatory design [10]. Therefore, the CCI community could benefit from our in-depth exploration and categorization when co-designing technology with children. In future work, we will further investigate how these challenging co-design dynamics are interrelated and how they can be balanced and remediated into positive forces.

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