Children's roles in Participatory Design processes: making the role of process designer 'work'.

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Abstract. Recent academic debates have urged us to rethink children's roles in Participatory Design (PD). In this article, we feed this discussion by putting the role of process designer into practice, allowing children to define a PD process and methods. We report on a case study in which we involved children (aged 10 – 12) to generate ideas about the 'Stiemerbeek' valley (Genk, Belgium). Applying the concept of '*Handlungsspielraum'* as analytical lens, the role of process designer was put into practice in five ways: through creating a research plan, defining events, engaging in play, field explorations and taking design decisions. Whereas the first three ways departed from the *children's* perspectives, the latter related to *adults* facilitating the role. These findings provide handles to adopt the role of process designer in real-life contexts and extend the debate on children's roles in PD, e.g. by reflecting on adult roles.

Keywords: Process designer; Roles; Children; Participatory Design; Interaction Design and Children.

1   Introduction: children's roles in design processes

Participants are at the heart of Participatory Design (PD): a set of theories and practices related to the concept of involving end-users in the design process [1], [2]. Despite different strands in PD, the core characteristics have always been to involve users as equal participants in design processes, improve their quality of life, engage them in mutual learning, and give them a voice in decision-making [3], [4]. Since the 1990s, an increasing amount of attention has been paid to children as participants in design processes [5] and the methods to achieve this [6], [7], [8]. However, current research on involving children in PD processes is often criticised for being 'fast and furious' or 'reduced PD', since child-participants are oftentimes only engaged in isolated, short-termed design sessions while being left out of the decision-making process [9]. In a study of 137 full papers on design with children, Yarosh et al [10] have concluded that the majority of the processes described in the papers (59%) involved children as testers; whereas only 31% of the papers reported on design practices with children as design partners. Similarly, Landoni et al [11] have emphasized that children are often invited into the early ideation phases of design, but rarely admitted to other phases of the design process. Read et al [12] have critically referred to this trend as the 'crowdsourcing of ideas', as children do not necessarily influence the outcome of the process or benefit from it.

  Therefore, an ongoing discussion within the Interaction Design and Children (IDC) community entails understanding how children can participate in PD processes. Druin [8] was one of the first authors to categorise children's roles in design processes and has argued that children can contribute as users, testers, informants and design partners. When children take on the role of users, their interaction with an existing

technology is being studied to discover design aspects that can be improved. As testers, children test prototypes of a technology before it is released onto the market. As informants, children contribute to the design process, based on when researchers believe they can provide valuable input to feed the design process. Finally, as design partners, children are considered to be equal stakeholders in the process. For over 15 years, Druin's framework has had a positive impact on researchers' awareness of children's involvement in design processes, resulting in practices in PD and IDC research that rely heavily on this categorisation [13].

Recently, the discussion in IDC research on children's roles in design processes has been revived, with contributions from e.g. Barendregt et al [13], Landoni et al [11], Van Doorn et al's [14] investigations into child co-researchers, Salian et al's [15] explorations of children as heuristic evaluators, Schepers et al's [16] role of process designer, and Iversen et al's [9] role as protagonist. Moreover, frameworks such as the role definition matrix [13] and the bonded design approach [17] have been developed to provide a more detailed categorization of children's roles in design processes. In this article, we build further on the research on the role of process designer [16] by putting its underlying principles into practice.

2   The role of process designer

The role of process designer departs from the stipulation that there is a lack of research on the roles of children in *defining* the design process and the methods used in it. This seems odd, as both the PD and IDC communities have always put great emphasis on its processes and the supporting methods. Halskov and Hansen's [18] review of ten years (2002 - 2012) of Participatory Design Conference research papers has shown that PD researchers remain preoccupied with research into methods. The same goes for IDC; this field values explicit discussion and improvement of its methods, as Yarosh et al [10] have illustrated: "*the more papers published about design techniques and methods with children, from researchers working with children in a variety of ways, the better*" (pp. 137-138).

In design processes involving children, methods are usually selected or designed by adult researchers beforehand. Researchers typically define the project goals, choose the activities (e.g. 'design sessions' or 'workshops') and guide the design sessions in certain directions according to their own agendas and language. The involvement of children in design processes thus often takes place via a predetermined set of variables [19]. This implies that researchers are more likely to benefit from the design process than the participants, as in many cases participants do not see any tangible outcomes. For instance, the results may be only academic papers that are not interesting for participants [20]. And although the creation or development of new design methods should imply empowerment, democratization and giving agency to (previously) unheard users, methods used in design processes involving children tend to be most appropriated by those whose voices are likely to be heard: adults [19]. Moreover, when children are not invited to participate in the design phase, the researchers' preconceptions about the design activities can dominate the course of the design method and activity [21].

Hence, the role of the child as process designer entails providing child-participants with opportunities to (co-)define the PD process and its methods, besides merely taking part in it. This role precedes the actual involvement of the child in the PD process and entails the collaboration with children to design the process itself. We refer to Vaajakallio [21] who, in relation to design games, has discussed how the design of methods is also part of co-design. She has reported that even a minor involvement in adjusting the method has proven to increase the participants' feelings of empowerment [21]. In this sense, the role of process designer is thought to

facilitate genuine forms of participation, allowing children to have a significant influence on process decisions and outcomes. Through enabling their voices to be heard, impacting decision-making and empowering them, genuine participation stands in contrast with the 'fast and furious' or 'reduced' ways of involving children in PD processes [9], [12] [20], [22], [23].

2.1 Framing: the concept of a *'Handlungsspielraum'*

To frame the role as process designer, we refer to Makhaeva et al's [24] concept of a *'Handlungsspielraum'*. Originating from the field of PD, a *'Handlungsspielraum'* is a conceptual creative space in which participants and designers collaborate and creatively think about the design at hand by exploring unique pathways through balancing structure and freedom. On the one hand, structures aim to provide safe spaces in which participants feel comfortable and stimulated. Makheava et al [24] refer to different kinds of structures. Social structures encompass the roles and relations of all involved human actors, whereas physical structures include the physical spaces in which the design session takes place or the materials made available to the participants. Mental structures are the interests, thought patterns or habits of the participants whereas the methodological structures refer to the methods that are applied in the process. On the other hand, creative freedom can be achieved by deliberately deciding to omit or limit different kinds of structures (e.g. by reducing the specificity of the design task at hand), by introducing structures as opportunity spaces (e.g. by diversifying materials) or through facilitating certain attitudes (e.g. positively enforcing explorative behaviours) [24]. In this sense, we interpret the role of the process designer as a way to balance given structures and provide the child-participants with creative freedom to define the design process and its methods.

3 Research aim

This article contributes to the discussion on children's roles in design processes by exploring the role of process designer. In previous work (see: [16]), we have argued for extending the range of children's roles identified so far – including Druin's [8] framework – with this additional role. Herein, we have laid the first conceptual foundations for elucidating what this role entails (i.e. "what *is* the role of process designer?"). In this article, we build further on our work and report on how we put the role of process designer into practice (i.e. "how do we make this role '*work*'?"). Herein, we thus describe a first, practical exploration of how the role of process designer is applied. Reflecting on the opportunities and barriers of this role, we discuss how the participating children gave form to the role of process designer and how adults facilitated this. We describe a particular exploratory case study, wherein we applied the concept of a *'Handlungsspielraum'* [24] as analytical lens. In the case study, different kinds of structures were already in place beforehand. For instance, we collaborated in an existing design process, devised and set up by the city of Genk (Belgium), as opposed to initiating one ourselves. Yet, throughout the process we attempted to provide the child-participants with the freedom to shape the design process and the methods. We pinpoint five ways in which adults and children in the case study gave form to the role of process designer in the preparation of and during a specific PD process. We argue to translate these five ways into handles for adopting the role in similar and potentially also other contexts. The contribution of this article particularly lies in providing handles for designers, researchers and practitioners to engage children in designing the PD process, through adopting the role of process designer.

4   Case study: 'Junior Team 2018 – Stiemerbeek valley'

To elucidate how we put the role of the child as process designer into practice, we report on the 'Junior Team 2018 - Stiemerbeek valley' case study (from now on referred to as 'JT2018'). Stimulating children's participation in Genk, the city's Youth Department yearly gathers a team of local children of 10 to 12 years old. For three months, this 'Junior Team' collaborates around a certain theme, relevant for and determined by the city (e.g. organizing child-friendly cultural activities in the city). In this process, the children - via interactive design sessions - work towards policy recommendations accompanied by prototypes.

In 2018, the children explored and generated ideas about the 'Stiemerbeek' valley: a creek that runs through the city of Genk. It connects different neighbourhoods and passes through important sites (e.g. a former mining site turned into a hotspot for energy and innovation). The valley surrounding the creek can function as a long-distance road, but also contains a wealth of nature. To further develop the area's potential, the city presented a master plan for the 'Stiemerbeek' valley in the spring of 2018. In this master plan, the people from Genk were involved through different initiatives, of which 'JT2018' is one.
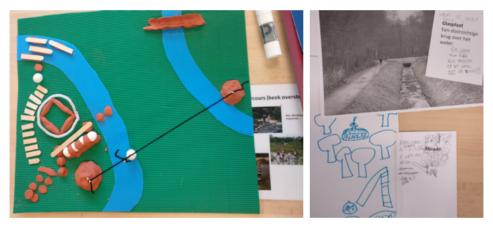

Fig. 1. Two prototypes resulting from 'JT2018': a model of the hiking parkours (left) and a paper prototype of the glass bridge (right).

The children were invited to investigate how they currently interact with the 'Stiemerbeek' valley and how they wish to do so in the future. The children participated in 11 design sessions organised on a weekly basis (see: Table 1 for an overview of the process). Eight design ideas – materialized via prototypes – and policy recommendations for the city of Genk were generated. These included: (1) a series of rafts to (playfully) cross the 'Stiemerbeek'; (2) the decoration of different bridges crossing the creek; (3) a hiking parkours, including a barefoot walking trail; (4) birdhouses; (5) the construction of one or more treehouses alongside the creek; (6) the placement of picnic spots; (7) a large-scale cleaning intervention; and (8) a glass bridge to cross the creek (see: Fig. 1). The children presented their ideas to other children, their parents, the mayor, the alderwomen of youth and the local press during a closing event on 16th of May 2018.

Table 1. Schematic overview of the process.

Design Session + date	Design activities	Participants	Documentation by the researchers
#1, 21st of February 2018	**Getting acquainted with the 'Stiemerbeek' valley;** getting to know each other, introduction to the theme, meeting the mayor and the alderwoman of youth, deciding on the team shirts.	10 children (3 girls, 7 boys), 2 youth workers, 2 design researchers	Logbook (written field notes); Photographs (by the design researchers).
#2, 28th of February 2018	**Making a research plan and brainstorming;** setting up a research plan, introduction to the four themes central to rethinking the 'Stiemerbeek' valley, first idea generation.	10 children (3 girls, 7 boys), 2 youth workers, 1 design researcher	Logbook (written field notes); Photographs and video recordings (by the design researcher).
#3, 7th of March 2018	**Field exploration (by bike);** visit of the 'Stiemerbeek' valley (by bike), guided by an employee of the city's Environmental Department.	9 children (2 girls, 7 boys), 2 youth workers, 2 design researchers, 1 employee of the Environmental Department.	Logbook (written field notes); Photographs and video recordings (by the design researchers).
#4, 14th of March 2018	**Reflecting, revising research plans and brainstorming;** reflecting on the field exploration, adjusting the research plans where needed, brainstorming about ideas (generated two weeks ago).	9 children (2 girls, 7 boys), 2 youth workers, 1 design researcher	Logbook (written field notes); Photographs (by the design researcher).
#5, 21st of March 2018	**Brainstorming and prototyping ideas;** further working on ideas, prototyping ideas, testing prototypes, taking a group picture.	9 children (3 girls, 6 boys), 2 youth workers, 1 design researcher	Logbook (written field notes); Photographs (by the design researcher).
#6, 28th of March 2018	**Preparing the 'play-outside-day';** preparing how the ideas are to be tested.	9 children (2 girls, 7 boys), 1 youth worker, 1 design researcher	Logbook (written field notes); Photographs and video recordings (by the design researcher).
#7, 19th of April 2018	**Testing ideas on national 'play-outside-day';** testing ideas (with an audience of adults, children, alder(wo)men, …), via a game and interviewing.	9 children (2 girls, 7 boys), 2 youth workers, 2 design researchers	Logbook (written field notes); Photographs and video recordings (by the design researchers); Semi-structured interviews by the children (documented via video recordings).
#8, 26th of April 2018	**Selecting, iterating and prototyping ideas;** reflecting on the field 'play-outside-day', selecting ideas (considering the testing), further working on ideas, prototyping ideas, testing prototypes.	7 children (7 boys), 2 youth workers, 1 design researcher	Logbook (written field notes); Photographs and video recordings (by the design researcher).
#9, 2nd of May 2018	**Concretization and field exploration (by car);** concretizing ideas, visit of the 'Stiemerbeek' valley (by car).	9 children (2 girls, 7 boys), 2 youth workers, 1 design researcher	Logbook (written field notes); Photographs and video recordings (by the design researcher).
#10, 9th of May 2018	**Finalizing ideas and preparing the closing event;** finalizing ideas (considering the car tour), preparing the closing event, semi-structured (group)interviews.	8 children (2 girls, 6 boys), 2 youth worker, 2 design researchers	Logbook (written field notes); Semi-structured (group)interviews, documented through audio- and video recordings; Photographs and video recordings (by the design researchers).
#11, 16th of May 2018	**Closing event;** setting up for the closing event, preparing presentations, going into discussion with the mayor and alderwoman of youth, press moment and reception.	9 children (2 girls, 7 boys), 2 youth workers, 2 design researchers	Logbook (written field notes); Photographs and video recordings (by the design researchers); Documentation generated by the press.

The case study entailed a collaboration between the Youth Department of the city of Genk, its Environmental Department and research group Social Spaces (LUCA School of Arts), specialized in participatory art and design research. The Youth Department was responsible for recruiting the participants and (practically) organising 'JT2018'. The Environmental Department provided the children with valuable insights into the 'Stiemerbeek' and its surroundings. Two researchers of Social Spaces, the first two authors of this article, co-organized the case study,

accommodated the design sessions and facilitated the role of the child as process designer.

4.1 Participants and selection

A total of 10 - 12 children living in Genk and attending the sixth grade (11 - 12 years old) participated. During most activities, the 'Junior Team' consisted of three girls and seven to nine boys. As participation in the team was free and voluntary, the composition of the group changed weekly. Children could leave at any time, without any consequences. A core group of seven participants took part in all activities. Adult participants in the case study included two youth workers from the Youth Department, one employee of the Environmental Department and two researchers.

The recruitment of the child-participants was carried out via elementary schools in Genk. All sixth-grade children and their parents were informed about the research, through informational flyers and home visits. Based on this information, the children could register for 'JT2018' via an e-mail written by their parents. After registration, the parents provided consent for their children and the children were asked whether they consented to participate. Prior to the case study, ethical approval was obtained from KU Leuven's Social and Societal Ethics Committee. In this article, pseudonyms are used to ensure the privacy of each participant (both children and adults).

The children's reasons for participation ranged from "to make the city of Genk more fun, for children and adults alike" (Yusef, boy, interview 09/05/2018) to putting their skills in expressing their opinions and speaking in front of an audience to good use (Safet and Selim, boys, interviews 09/05/2018). One of the children indicated she wanted to become a politician and thought participating in the 'Junior Team' would be a great start to achieve this (Meryem, girl, interview 09/05/2018). Cetin explained that he was part of his school's student council last year, and he felt that participating in the 'Junior Team' would provide a similar experience but with a potential larger outreach (boy, interview 09/05/2018). Additionally, Selim expressed his appreciation for being involved in decision-making in Genk via his participation in the 'Junior Team' (boy, interview 09/05/2018). Finally, Safet explained that he liked seeing his ideas being realized in the city (boy, interview 09/05/2018). Because of the out-spoken and empowering characters of the involved children as well as their motivations for participation fitting the characteristics of genuine participation [20], [22], [23], we deemed the application of the role of process designer particularly suitable for the selected child-participants and the case study at hand.

4.2 Methodology

This study relied on a case study in line with Yin's [25] notion of "*an empirical inquiry that investigates a contemporary phenomenon within its real-life context*" (p. 13). Our case study involved a specific group of participants (i.e. 10- to 12-year-olds, youth workers, researchers, etc.) and unfolded in a specific context (i.e. the city of Genk). Hence its findings will not yield general conclusions that can necessarily be transferred to other groups of participants or contexts.

The 'JT2018' case study was documented through a logbook that contained information on the different activities throughout the process. It focused on instances through which the role of process designer was put into practice. After each design session, the activities were described as detailed as possible, considering the course of the activities, the setting, descriptions of the (involvement of the) child-participants, researchers and youth workers as well as the roles they undertook, and the impact that the observer may have had on the environment. In this sense, the logbook functioned

as a way of recording descriptive field notes gathered from design activities [26]. Additionally, the researchers also documented their reflections and thoughts about the process as well as their motivations for certain decisions during the organisation of the case study, before and after the design sessions.

We asked children to reflect on their experiences as process designers at the end of the 'JT2018' process during the final session before the closing event (cf. Table 1). The choice to use interviews, together with observations, is common in PD involving children. Previous research has shown that it is an appropriate way for providing children the opportunity to be heard [27]. Although children's competence to participate in research and express their opinions has been doubted for a long time [27], several studies have also shown that young children are reliable informants, give valuable and useful information and are able to speak for themselves (see e.g.: [28], [29]). Children could choose whether they wanted to participate in a one-to-one interview or in a dyadic interview. Based on their preferences, two interviews in dyads and two individual interviews were administered. We questioned the children about the roles they (and the adults) took on during the process, their experiences as process designers and what they had gained from their participation in 'JT2018'. Additionally, based on previous work (see: [16], [30]), we believed that 'play' was a relevant topic to address as well. This resulted in the following topic guide for the interviews:

Table 2. Schematic overview of the topic guide.

Topics	Questions
Overall assessment of participation in the PD process.	- Why did you participate in the Junior Team? - Do you feel that the reason you initially decided to participate in the Junior Team has been achieved? - How do you feel now - almost at the end of the project - about your participation in the Junior Team?
Most satisfying experiences.	- What did you like the most about your work in the Junior Team? And why?
Most frustrating experiences.	- What did you like the least about your work with the Junior Team? And why?

User gains; new areas of competence / new skills acquired.	- Do you think you learned new skills?
	    - If so, which ones?
	- Or have you been able to further strengthen certain skills?
	    - If so, which ones?

User gains; new possibilities discovered / more influence on (...) conditions.	- What skills or knowledge do you have now that you did not possess before participating in the Junior Team? - Have you discovered certain things that you did not know or experienced before?
User gains; shifts in career or choice of education, owing to the project.	- Do you consider things differently because of your participation in the Junior Team? - E.g. the city of Genk, your teammates of the Junior Team, the 'Stiemerbeek' valley, your own possibilities or role in the process?
User gains; new outlook on technology of personal practices.	- Are you going to do things differently because of your participation in the Junior Team? - E.g. at school or with your friends and family?

The role of play.	- What did you really enjoy during the process?
	- Do you feel that you have been able to play during your work with the Junior Team?
	    - If so, what did you like the most?
	    - If not, what prevented you from doing so? And/or, perhaps, enjoying it?

The role of process designer.	- How did you feel about being a process designer yourself? - How did you feel about deciding what we were going to do (via the research plan)? - What were your experiences with making the research plan yourself? - Do you feel that you have been able to take on the role of process designer? Why? Or why not? - Did you see limitations or possibilities? - Did you see ways you wanted to do it differently?

As part of the findings, we will provide more details about the method, revealing how the role of process designer was made to 'work' by children and adult stakeholders who designed the PD process.

4.2.1 Analysis

The analysis focused on several types of data, including the photo and video material of the different design sessions and the field notes as documented in the logbook. Additionally, we included the 'thank you booklet', created by the involved youth workers. This booklet was one of the outcomes of 'JT2018': it visualised the process in a childlike way, through pictures and short texts. To thank them for their participation, each 'Junior Team' child-participant received a copy of this booklet as a gift from the Youth Department of the city of Genk. Finally, we also analysed the transcriptions and written memos that we made from the audio-visual recordings of the semi-structured interviews.

The analysis phase can be typified as a qualitative content analysis [31]. The first two authors were involved in the data collection as well as all three data analysis phases; the third co-author was involved in the third data analysis phase.

The first data exploration departed from instances through which the role of process designer was put into practice. We focused on the activities that children and adults undertook in relation to the roles they took on at that time, using the concept of a *'Handlungsspielraum'* [24] as an analytical lens. We distinguished between activities that were the result of given structures (e.g. the already planned meeting with the mayor and the alderwoman of youth during the first design session) versus instances of creative freedom (e.g. the children choosing to work alone or in group). For pinpointing roles other than the process designer, we used the existing spectrum of children's roles in PD processes (as discussed above).

The second coding iteration focused specifically on *who* put the role of the process designer into practice. Design activities were coded based on who instigated them (the children; adults via decisions, tools or other triggers; or the adults alone). We distinguished between how the *adults* (being the researchers, youth workers and other involved adults) facilitated the role of process designer and how the *children* themselves gave form to this role.

During the final coding iteration, we fleshed out the outcomes from the second coding into subcategories. Three subcategories emerged from the data, illustrating the ways children made the role of process designer 'work'; two subcategories were defined to illustrate how the adults facilitated the role of process designer. We first discuss how the children made the role of process designer 'work' (see '5'). Next, we pinpoint the ways in which adults facilitated this role (see '6').

5   Case findings: how children made the role of process designer 'work'

Our findings showed that the child-participants took up the role of process designer through (1) creating and revising a research plan, (2) defining the 'play-outside-day' and closing event, and (3) engaging in play.

5.1 Creating a research plan

As a specific way of putting the role of process designer into practice, the children were invited to collaborate in small groups and create a research plan. We were hoping that a research plan could provide an open structure inviting the children to reflect on their role and ways of involvement in the process. As part of the briefing and instructions to this exercise, Maria – one of the researchers and authors of this

article – told the children about her job as a researcher. It was explained that researchers make a research plan to prepare for and guide their research; the children were then asked to do the same. Because the Youth Department had to consider some mandatory events (e.g. the closing event), we asked the children to incorporate these in their research plans. Furthermore, we instructed children that we would like them to present the research plan to each other and to us at the end of the second design session day (cf. Table 1). Finally, they were informed about the national 'play-outside-day' in Belgium on which people gather in parks and playgrounds to celebrate outside play; the seventh session of the 'JT2018' trajectory (cf. Table 1) would take place on that date.

We provided the children with paper cards (A6 size). There were two types of cards. Firstly, there were pre-printed cards, representing activities to consider as part of a research process such as 'a field study', 'presentation', 'testing' and ways of documenting such as 'videos', 'photos', and 'notes'. Furthermore, there were cards presenting more abstract research modalities and situational demands like 'going by bike', 'going on foot', 'listening', 'tasting', 'observing', 'air', 'animals', 'water' and experiences like 'having fun', 'collaborating' or 'learning'. The last type of pre-printed cards depicted stakeholders including 'adults', 'children', and the 'mayor and alder(wo)men'. The information was conveyed textually but also through icons (see: Fig. 2, top for an example of the pre-printed cards). Secondly, the children also received blank cards and were encouraged to use their own materials. To facilitate the card-based exercise, children were provided with arts and crafts materials such as scissors, tape, paper, glue, pens, and crayons. The children were asked to create a research plan by placing the cards in the order they deemed appropriate, by sticking them on a large sheet of paper or directly to the wall (using tape).

Some groups solely relied on the pre-printed cards, whereas others created their own research plan without using any of the offered tools. This resulted in the plans taking on different forms, such as a timeline or a mapping. Throughout the process, there were several moments to reconsider and adapt the research plan whenever the children felt it was needed. In this way, it continuously functioned as a guideline for the children to design their process.

As an example of a research plan that departed from the provided tools, we refer to Cetin, Asil, Melanie and Kerem. This group mainly used the pre-printed cards to create a timeline, divided into 12 phases (see: Fig. 2, top). The first phase consisted of idea generation; Cetin explained that they wanted to think of new ideas, *"as many and as good as possible"* (boy, video-taped presentation, 28/02/2018). Next, they included written documentation of their process, using pen and paper. The next four phases offered a description of the field exploration of the 'Stiemerbeek' valley, highlighting different aspects of it (e.g. natural environment, water and pollution). They planned on documenting their field explorations through gathering things (cups of water, rocks, leaves) from the 'Stiemerbeek' valley. In the seventh phase, working out the generated ideas would be central. The group indicated they would like to document their ideas via a documentary, which they would like to place online (via YouTube). The eighth phase consisted of sitting down together, discussing and listening to one another's generated ideas. The following card on their timeline, referring to phase nine, consisted of explaining their ideas and asking other people's opinions about those ideas. In the tenth phase, they expected to concretize and work out their ideas even further by making them *"as nice as possible"* (Cetin, boy, video-taped presentation, 28/02/2018). Next, they anticipated to present their end-results via a map of the 'Stiemerbeek' valley (eleventh phase) and via a final moment (twelfth phase), during which they planned to show their documentary.
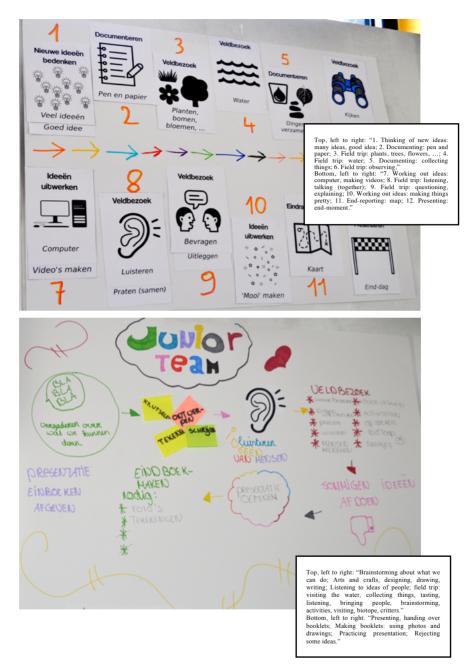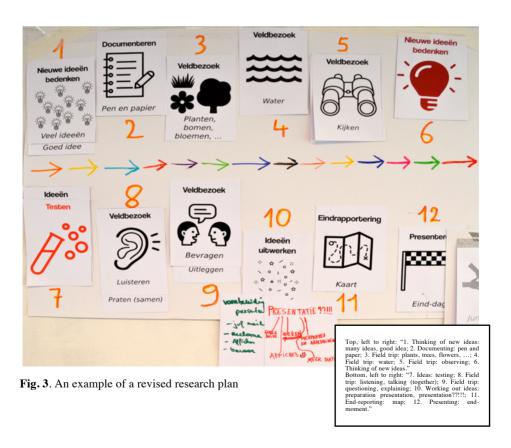
Top, left to right: "1. Thinking of new ideas: many ideas, good idea; 2. Documenting: pen and paper; 3. Field trip: plants, trees, flowers, …; 4. Field trip: water; 5. Documenting: collecting things; 6. Field trip: observing."
Bottom, left to right: "7. Working out ideas: computer, making videos; 8. Field trip: listening, talking (together); 9. Field trip: questioning, explaining; 10. Working out ideas: making things pretty; 11. End-reporting: map; 12. Presenting: end-moment."

Top, left to right: "Brainstorming about what we can do; Arts and crafts, designing, drawing, writing; Listening to ideas of people; field trip: visiting the water, collecting things, tasting, listening, bringing people, brainstorming, activities, visiting, biotope, critters."
Bottom, left to right: "Presenting, handing over booklets; Making booklets: using photos and drawings; Practicing presentation; Rejecting some ideas."

Fig. 2. Two examples of the research plans the children created.

Safet's actions provide an example of creating a research plan without any of the offered tools. Safet initially participated in a group consisting of two girls and two boys. However, he did not agree with how his group was giving form to the research

plan, so he decided halfway through the process to create his own, in the form of a mind map (see: Fig. 2, below). He used arrows to illustrate the order of the different elements on his map. The first element on the map was a circle with 'bla bla bla' written in it; this pointed towards the initial phase in the process in which the members of the 'Junior Team' would meet up and discuss potential actions. An arrow pointed from this element towards a collection of post-its which he used to describe how Safet – together with the participating children – would think about what they could design for the 'Stiemerbeek' valley together. Next, Safet indicated the members of the 'Junior Team' would talk about and listen to each other's ideas and to ideas that other people might have on the topic. After that, Safet foresaw field explorations, which he referred to with the following keywords: 'visiting the water', 'collecting things', 'tasting' 'listening', 'bringing people', 'discussing, 'activities', 'researching', 'biotope' and 'animals'. The dismissal of ideas that would be bad or too expensive to realize was the next element on his map, followed by practicing the final presentation. The final two phases in Safet's research plan included the making of the 'thank you booklets' (using photos and drawings) and the final presentation of the generated ideas.

The children worked on their research plans for about 1,5 hours, before presenting them to each other. After finishing their research plans and presenting them, we asked whether and how they would merge their research plans into a central one that could function as a guideline for the entire group. However, the children indicated that they were satisfied with having different research plans, believing there was overlap between them. Therefore, we decided to leave the research plans as they were.

Fig. 3. An example of a revised research plan

Top, left to right: "1. Thinking of new ideas: many ideas, good idea; 2. Documenting: pen and paper; 3. Field trip: plants, trees, flowers, …; 4. Field trip: water; 5. Field trip: observing; 6. Thinking of new ideas."
Bottom, left to right: "7. Ideas: testing; 8. Field trip: listening, talking (together); 9. Field trip: questioning, explaining; 10. Working out ideas: preparation presentation, presentation??!!!; 11. End-reporting: map; 12. Presenting: end-moment."

5.1.1 Revising the research plans

In the fourth design session (cf. Table 1), the children reflected on their research plans. After forming the same groups in which they initially created the research plans, they adjusted them where necessary. Youth worker Simone also specifically invited them to brainstorm about the 'play-outside-day' and the closing event. Although the 'play-outside-day' day was pinpointed by the city's Youth Department beforehand, during the creation of the research plans the children indicated that it would form an opportunity to test out their ideas with passers-by. Similarly, the children informed us that they would like to present the outcomes of the 'JT2018' trajectory during a closing event to other children, their parents, the mayor, alderwomen of youth and the press.

Revising their research plan, the first group (being Cetin, Asil and Kerem; Melanie was absent during this design session) took out the card that they used to indicate the project documentation (through collecting things). They added a card that visualized the generation of new ideas. They also changed the seventh phase in their research plan from 'working out ideas' - via making a documentary - to testing out ideas. They explained that this would take place during the 'play-outside-day'. To thoroughly prepare the presentation, they added a card that showed the significance of advertising the event, for instance via their teachers and flyers (see: Fig. 3).

5.2 Defining the 'play-outside-day' and closing event

A second way of how the children gave form to the role of process designer related to them defining the 'play-outside-day' and the closing event. This had mainly to do with the child-participants of the 'Junior Team' determining the methods used to test out their ideas, deciding on what - and how - to present themselves and having control over how the two moments would be organised and prepared. For instance, for the closing event the children worked out a way to present their ideas in the form of a 'clothesline'. The children envisioned the line rotating, somewhat like a non-digital or real-life slideshow presentation. They also decided who was going to present what idea, worked out the content that they were going to present and practiced their lines beforehand (on their own initiative).

We particularly refer to the national 'play-outside-day' as an example of how the children gave form to this event. To test out their ideas with a larger audience, during the sixth design session (cf. Table 1), the children decided upon a tower building game. The ideas would be shown on a large panel and the passers-by would be asked to stack objects (e.g. cups or building blocks) in front of the idea that they like best. In the end, the idea with the tallest tower would be the best. Additionally, two of the children - Meryem and Dara - indicated that they would like to interview the passers-by, because "*that also happens in real life, on the news*" (Meryem, girl, researchers' logbook, descriptive field notes 28/05/2018). They devised questions for the interview and agreed that five was a sufficient number of questions. They figured that if the interview lasts too long, people would walk away. Safet came up with his own interview questions and asked researcher Maria if he could practice the interview on her. He used a marker as a pretend microphone and filmed the interview using Maria's smartphone. He prepared different types of questions, such as "What do you think about the 'Stiemerbeek' valley?" and "What would you like to change about our design ideas?".

During the 'play-outside-day', youth workers Simone and John had provided a table for the children with a panel, idea cards and building blocks to act out their initial ideas. Researchers Charlotte and Maria arranged cameras for Meryem, Dara and Safet for their interviews. Before heading to the 'play-outside-day' location, Meryem and Dara showed Charlotte and Maria their interview questions; they even laminated their notes and brought a clipboard to write on. While the children took

turns to man the table and ask passers-by about their ideas, Meryem, Dara and Safet went around the park to interview people. Meryem and Dara conducted seven interviews; Safet five. While being interviewed on the final session before the closing event (cf. Table 1), Safet mentioned he liked doing the interviews during the 'play-outside-day' and already did this for a local youth work organisation he was active in before joining the 'Junior Team': "*we made newspaper, and to do that we had to interview people […], the aldermen of, eh, youth […]. I thought that was cool*" (boy, interview 09/05/2018).

Fig. 4. Children initiating in different forms of play during the field exploration

5.3 Engaging in instances of play

Since the beginning of the trajectory, we pinpointed the importance of play. Based on previous work (see: [16], [30]), we believed that the context (being informal, leisure time instead of - for instance - a school context) would demand that the children experience the activities in 'JT2018' as playful or fun. This presumption was

corroborated by the case-analysis: through instigating in different forms of play the children gave form to the role of process designer.

Our case findings showed that play manifested itself organically amongst the children. Moreover, it played an important part in shaping the role of process designer via 'research through play' and 'play to relax'. 'Research through play' occurred without an explicit prompt from the researchers or youth workers. For instance, during a short break at an old ruin, Wanda – an employee of the city's Environmental Department who guided the tour – provided background information about this site. After this explanation the children initiated different forms of play (see: Fig. 4): they balanced on the remains of the walls, jumped across the dry moat surrounding the tower, took pictures, played with sticks, etc. During their play, they regularly asked Wanda for more information about the ruin site and its relation to the overall 'Stiemerbeek' valley. Another example of 'research through play' took place during the field exploration by car, during which the children closely explored the different spots through playing (e.g. a game of tag). While being interviewed on the final session before the closing event (cf. Table 1), Meryem drew the comparison between doing research and playing: "*we also play, uh, when we do research, then, we do research through playing, through arts and crafts, for instance, and I like that*" (girl, interview 09/05/2018). Selim and Cetin added that playing indeed can be a way of doing research: "*for example, uh, if you play in the forest, you automatically discover things, you discover animals, and so on*" (boys, interview 09/05/2018).

'Play to relax' encompassed moments in which children decided to play as a way of breaking up the design activities, as illustrated by Safet: "*when we are working, and someone starts talking about, let's say, YouTube, and then the other person starts to talk. They play together for a while, and then continue working*" (boy, interview 09/05/2018).

Both instances of play also allowed participation from the youth workers and researchers. We regularly partook in the play activities initiated by the children; somethings the children explicitly invited us to join. For instance, during a short break John joined the boys in a game of soccer in-between activities of the eighth design session (cf. Table 1). We noticed this impacted the way in which the child-participants viewed the involved adults. Whereas Simone usually approached the children as a typical adult – quite distantly yet warm, taking on a role as caregiver (e.g. taking the children to the toilet or cleaning up after them) and not participating in play activities – John took part in all the play activities and put himself more on the level of the children while playing. This led us to believe that play can form a way of negotiating structures in a design process, not only for children but for adults as well.

6 Case findings: how adults facilitated the role of process designer

Our findings showed two instances through which adults (researchers, youth workers and other adult stakeholders) facilitated the role of process designer throughout 'JT2018', namely via (1) field explorations and (2) design decisions.

6.1 Field explorations

On two different occasions during the 'JT2018' trajectory (cf. Table 1), we organised field explorations: together with the children, we visited several locations in the 'Stiemerbeek' valley to explore, investigate and interact with them. These two field explorations took on different forms. First, to see and experience the 'Stiemerbeek' valley, we arranged a bike tour that was guided by Wanda (cf. Table 1). We visited several locations in the valley, ranging from a water mill via rural areas to an old ruin. After almost three hours of cycling and engaging with the 'Stiemerbeek' valley, the

children indicated that they would like to return to the youth centre. In a second field exploration by minivan and car (cf. Table 1), the children - together with two youth workers and a researcher - visited six different locations in the valley. These locations were chosen by the youth workers; they were the ones that we already visited during the first field exploration and were accessible by car. The purpose of this second field exploration was to get a more concrete idea of how the children could fit their ideas into specific spots throughout the valley. For each spot we visited, the children discussed which idea would be best to realize at that location and why (see: Fig. 5). They also more closely explored the different spots by taking notes or photographs and playing (e.g. throwing clods in the creek). This field exploration lasted for an hour and a half; this was longer than foreseen, as the children decided how long they wanted to spend time at each spot.

In the interviews, the children explicitly felt that they were able to take on the role of process designer during the two field explorations: they indicated they considered themselves as "*a scientist, or researcher*" during these instances (Safet, boy, interview 09/05/2018). Cetin told us during the interview that: "*I did [feel like a process designer]. With the bike ride, because, yes, we made our way along the 'Stiemerbeek', we saw the dirt, we had to think what we were doing there, […] and yes, you had to do research for that. And I liked it*" (boy, interview 09/05/2018). Organising, enabling and participating in these field explorations thus illustrated how we, as adults, attempted to facilitate the role of process designer for the child-participants.

Fig. 5: The children discussing ideas during the field exploration by minivan and car.

However, during the interviews, we also found clear indications that the children would have done the first field explorations differently. Meryem indicated that she preferred the second field exploration over the first one: "*when we did the bike tour, we had to cycle while looking around and pausing for a while. But now that we went by car, we could really stop, see, investigate, ... That was nicer, I think*" (Meryem,

girl, interview 09/05/2018). This implies that the choice for a field exploration by bike might not have been the right one. Some of the children also indicated that the bike tour was too exhausting for them: "*it was just too tiring*" (Safet, boy, interview 09/05/201). This implies that for us, as adults, it is not always evident to gauge how to best facilitate the role of process designer throughout a design process.

6.2 Design decisions in supporting the role of process designer

A recurring theme in the researchers' logbook appeared to be the facilitation of the role of process designer by adults via leaving openness for the children to take design decisions on their own. We refer to three specific examples.

First, we invited the children of the 'Junior Team' to consider whether they would prefer to work together in a group or alone. Safet - for example - oftentimes mentioned his (personal) preference to work alone. During the tenth design session (cf. Table 1), many children spontaneously discussed whether they wanted to be interviewed in groups or alone.

Secondly, we encouraged the children to discuss the ideas they would like to work out during the 'JT2018' trajectory. For example, in the eighth design session (cf. Table 1), we instructed children to vote in two rounds on the ideas that they found the best, using red, yellow and green post-its. After agreeing to consider the test results of the 'play-outside-day', they collectively decided that nine ideas was a nice number to continue working on.

Third, we facilitated the children's decision-making to determine what they were going to do during the design session at hand. For instance, during the sixth design session (cf. Table 1) youth worker John asked the children whether they remembered what they were going to do during the 'play-outside-day'. Safet immediately answered that they would present their ideas to other people and ask them what they think about their ideas. As a response, John formulated a follow-up question about what they are going to do during this sixth design session. Cetin answered: "*we need to prepare and think about how we will present our ideas on that day*" (boy, researchers' logbook, descriptive field notes 28/05/2018). The design session was then arranged in such a way, that the children were able to do just that.

7   Discussion and conclusions

This article explored how the role of process designer was put into practice by involving child-participants in a PD process. The role was inspired by previous theoretical and explorative work on children's roles in PD processes and genuine forms of children's participation. Applying the concept of a '*Handlungsspielraum*' [24] as an analytical lens on the 'JT2018' case study, we reported on a case study in which we worked together with the city of Genk. Herein, we involved a total of 10 - 12 local children of 10 to 12 years old for three months. By putting the role of process designer into practice via the case study, we revealed three ways in which children were keen to make the role of process designer 'work' and two ways of facilitating the role of process designer by the adults. The child-participants took up the role of process designer through creating a research plan, defining several events and engaging in play. The involved adults facilitated the role of process designer via the organisation of field explorations and encouraging the children to make design decisions.

Based on the case findings, we are now able to formulate five handles to adopt the role in similar and potentially also other contexts. These handles can then aid designers, researchers and practitioners to engage children in designing the PD process, through adopting the role of process designer. In the next section, we discuss

(see '7.1') five handles to adopt the role in real-life contexts, (see '7.2') implications for adult roles in PD processes involving children, (see '7.3') the strengths and weaknesses of our research and (see '7.4') avenues for further research. By doing so, we concretise the role of process designer.

7.1 Handles for adopting the role of process designer

As mentioned above, in the 'JT2018' case study different kinds of structures were already in place before the PD process commenced. Therefore, engaging children as process designers in 'JT2018' was a constant search for balance between given structures and creative freedom to define the design process and the methods. For the children, this implied following, discarding or limiting structures. In this way, instances of creative freedom occurred, and new structures were defined in line with children's own perceptions, ambitions and life worlds. For the adult stakeholders, involving children as process designers meant allowing them to create a pathway for creative freedom and break through the imposed structures.

As a first way of putting the role of process designer into practice, we asked the children to give form to a research plan. To do so, we provided them with pre-printed cards, materials and certain structures, corresponding to Makhaeva et al's [24] physical and methodological structures (i.e. methods applied in a design process and the materials made available to the participants). However, we deliberately refrained from imposing the children what to do or telling them how to use the materials we had supplied. We considered this as a way of leaving openness for the children to explore what the 'JT2018' process could be, following, discarding or limiting the structures imposed on them. This way, the children were invited to develop their own ways of working as a process designer, using the research plan as a supporting tool. It resulted in some of the children specifically departing from the materials we offered them (using the pre-printed cards to create a timeline), whereas others decided to stop collaborating with the other children and create a mapping without any materials or guidance. Thus, the first handle we propose for adopting the role of process designer relates to allowing the children to take the lead of the design process. This can be done by creating a research plan in ways they find appropriate, e.g. via a timeline or mapping, using pre-printed cards and blank materials.

Second, through defining the 'play-outside-day' and closing event, the children were able to give form to the role of process designer. This implied that the methodological and physical structures that researchers usually impose on a PD process (e.g. determining the spaces in which design session takes place or deciding on the methods that are applied in the process) were opened up to the child-participants. The initiative of performing interviews during the 'play-outside-day' came entirely from the children. They put a lot of effort in coming up with and preparing questions, without steering or inference from the researchers and youth workers. Therefore, as a second handle, we put forward that children take the lead in preparing, defining and organising participatory and dissemination events, choosing the methods, deciding on what and how to present and evaluate their ideas and have control over the preparation of moments like these; even if this means that the structures already imposed on a PD process need to be omitted or limited.

A third handle relates to allowing instances of play. In 'JT2018' the element of play was a way for the children to make the role of process designer 'work'. Relating this to Makhaeva et al's '*Handlungsspielraum*' [24], play formed a way of breaking down structures that were imposed in the process, not only for the children but for adults as well. By doing so, social structures present in the process – such as roles, cf. [24] - could be renegotiated. For example, through participating in play activities together with the children, possibilities were created for the researchers and youth workers to avoid being seen as authority figures. Play also allowed children to define

new structures in the process. For instance, through engaging in 'research-through-play', the children also gained insight into the valley in ways they believed were important and fitted their needs. Leaving openness for engaging in play is thus an important aspect of this third handle.

Integrating field explorations that allow children to try out their role as a scientist or researcher forms the fourth handle. In this study, the city's Environmental Department and Youth Department's choice for the bike as means of transportation for the first field exploration turned out to be too tiring for the children. We believe that these structures – imposed by the city of Genk – did not correspond to the mental structures that were already in place, being the interests, thought patterns or habits of the participants. Hence, our recommendation for the fourth handle is to monitor that children can create opportunities to consider themselves as scientists or researchers in a way that serves their own interests and capabilities.

Finally, the fifth handle we suggest relates to leaving openness for children in adopting the role of process designer through making design decisions on their own, for instance by choosing to work in groups or alone. For us, this implied constantly looking for a balance between allowing the children to break through certain imposed structures and sticking to structures that we believed were needed for the design process to run properly. In hindsight, we could have encouraged children's decision-making even more. For instance, the involved youth workers felt responsible for making sure the ideas and proposals of the children were worked out prior to entering each new session, even though this was not explicitly requested by the children.

7.2 Roles of adults in design processes involving children

Putting the role of process designer into practice not only urged us to reflect on children's roles in PD processes, but on the roles of adults as well. While several typologies have been developed to discuss the roles of children and designers or design researchers in PD processes, the roles of adult stakeholders - such as teachers, parents or, in our case, youth workers – have remained underexplored [32], [33]. In the literature that does exists on adult roles in design processes involving children, the role of the adult is typically discussed in terms of facilitating the children's roles or collaborating with the child-participants in the design process [34]. Both Molin-Juustila et al [35] and Benton and Johnson [32] have acknowledged this gap in research. The latter [32] have identified five roles that adults can consider taking up when doing design with children with special educational needs, being facilitators, motivators, care-givers, proxies, and co-designers or design partners. The model of Benton and Johnson [32] has been complemented with the roles of playmate and friend [36], while Barendregt et al [33] have foregrounded the role of teaching staff when doing PD with children in special education.

Considering the role of the child as process designer thus demands a thorough reflection on the implications for the role of the adults who are involved in the design process. On multiple occasions, the Youth Department and the Environmental department of the city of Genk expressed their insecurities about working with the 'Junior Team' children in this open way. They were concerned that the child-participants would need considerable guidance and moderation in planning the activities, which resulted in more adult-imposed structures throughout the process. However, we argued that researchers – and involved adult stakeholders alike – need to stay agile in the process and deal with uncertainties by depending on their tacit knowledge (cf. Schön's [37] reflection-in-action). After all, Makheava et al [24] state that facilitating a '*Handlungsspielraum*' means staying attentive to the situation and being flexible about balancing structures and freedom.

Our findings also showed that the adults involved in 'JT2018' took on responsibilities and tasks that corresponded to roles described by existing literature.

For instance, for the first design session (cf. Table 1) the two involved youth workers prepared a game for the children to get to know each other, involving a bag of candy and a color-coded set of questions concerning hobbies, family, and other personal information. Herein, Simone and John clearly took on the roles of facilitators, as proposed by e.g. [32]. The youth workers also participated in the design process as design partners (e.g. engaging in co-design with the children to work out their ideas), care-givers (e.g. making sure the children navigated through traffic safely during the bike tour) and playmates (e.g. through joining the children in a game of soccer) [32], [36].

7.3 Strengths and weaknesses

We acknowledge that the above-mentioned reflections present some challenges. For instance, it demands time and effort to involve children as process designers in a PD process. Allowing children to design a process might also challenge researchers to incorporate unfamiliar methods. Moreover, the ways in which adults attempt to facilitate the role of process designer might not always align with the ways in which children prefer to do so, and vice versa. Finding a balance between respecting children's perceptions, ambitions and life worlds and pursuing scientific rigour [cf. 38] is particularly challenging here. Even though the five handles we propose are based on a rich case study, they have not yet been evaluated thoroughly. Thus, we invite other researchers as well as practitioners to use these handles to see whether it helps them in finding ways to put the role of process designer into practice.

Notwithstanding our intentions to embrace openness in children shaping the research process, we acknowledge that the 'JT2018' case study relied on a great number of structured activities. We recognise that most classifications of children's roles have been based upon adults' definitions rather than on children's understandings. We hypothesize that this – to some extent – is also the case for the case study at hand, centralizing the role of process designer. Previous research has warned for adult researchers predefining research activities based on an adult-centric conceptualization of how children think and behave [39]. Often, such assumptions go unnoticed because they are shared by an entire community, which pinpoints the importance of being explicit about them [40].

Despite the limitations of our study, taking the time to reflect upon children's participation in PD processes and the roles they take on while doing so is important. Relating the role of process designer to the already existing notions of children's roles in PD processes, we would argue that the role of process designer shares traits with Druin's [8] role of design partner. Similar to this role, child-participants partner up with adults (in our case, to design the PD process). It also relates to Van Doorn et al's [14] notion of the child as co-researcher, as the process designer departs from his/her own practices when designing a process. Compared to Iversen et al's [9] protagonist, the role of process designer shares the ambition to empower children. Whereas the protagonist role empowers children through co-shaping technological transformations and enabling them to critically reflect on technology in their practices, the process designer role zooms in on defining the design process and its methods to aim for empowerment. Building further on the existing spectrum, we see the role of process designer as an attempt to broaden the understanding of existing children's roles in PD processes. The main strength of our work is that it extends the spectrum of children's roles by filling in a missing role. After all, Druin [8], Van Doorn et al [14], Iversen et al [9] and others have defined notions of children's roles that come into play *during* the PD process, whereas the role of process designer can be positioned *before, after* and possibly *in-between* PD processes. We believe broadening the spectrum of children's roles is necessary to explore genuine forms of participation, in contrast to the 'fast and furious' or 'reduced' ways of involving children in PD processes [9],

[20], [22], [23]. We envision this exploration of putting the role of process designer into practice as a first step towards achieving this.

7.4 Future research

For future research, we believe it is worthwhile to research the ways in which the role of process designer empowers children. This would imply that we critically investigate what 'empowerment' in PD research involving children would mean. After all, in the IDC community 'empowerment' of children is oftentimes used in a self-explanatory way without any reflection [41]. *"There currently is a lack of awareness and critique of the various forms that empowerment of children may take in digital technology design"*, Kinnula et al [42, p. 2] state. Moreover, empowerment is a complex concept with a multitude of meanings attached to it. This means that researchers should be aware of it and make conscious choices concerning the ways in which they attempt to empower child participants [41], [42]. In future work, we aim to embrace the various facets of empowerment and investigate how they unfold in case studies in which children adopt the role of process designer.

Moreover, avenues for future research would also entail research into how adopting the role of process designer can also aid in negotiating power relations in PD processes involving children. Although the Scandinavian PD tradition has a strong normative basis, empirical accounts of how power and decision-making have been shared between researchers and participants are scarce and vague [43]. Children's participation through design partnering breaks traditional power hierarchies, which is not self-evident when children are accustomed to follow what adults say whereas adults are used to being in charge [44]. We hypothesize that the role of process designer can form a way of diminishing some of these difficulties and make power relations in PD processes involving children more explicit. Therefore, more research is needed into this as well and will be incorporated into the continuation of the research on the role of process designer.

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