Children's Rights in Your Pocket – Lessons Learned from a Three-Year Case Study on Participatory App Design with Children

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ABSTRACT

Prior research on participatory design of digital artefacts with children has been criticizing the often restricted scope of children's involvement. Studies on comprehensive long-term participation and thus corresponding knowledge on the setup, organization, and overall success factors of participatory design projects with children are scarce. To address this gap, we present the case study of a nationwide three-year participatory app project on children's rights in Switzerland. With overall more than 170 children involved in 18 different workshop formats, the project plays a pioneering role in continuous long-term participatory app design with children. Having analyzed various approaches and decisions in setting up the project, coordinating participants, planning and running workshops, etc., we were able to derive a set of recommendations for related project endeavors. Core success factors (and challenges) turned out to include building a basis of trust, achieving genuine participation, considering children's diversity, and ensuring continuous communication with children involved.

CCS CONCEPTS

• **Human-centered computing** → **Participatory design**; *Empirical studies in interaction design.*

KEYWORDS

Participatory design, design workshops, human-centered design

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1 INTRODUCTION

Participatory design has become a popular approach in the field of human-computer interaction (HCI) that emphasizes involving end-users in the design process of interactive technologies. This approach aims to ensure that the resulting technology meets the needs and preferences of the intended users. Participatory design has been applied in various contexts, including healthcare, education, and entertainment. In recent years, there has been a growing interest in the child-computer interaction (CCI) field in involving children in the participatory design of technology, particularly mobile apps.

Participatory design with children involves empowering them to take an active role in the design process, by allowing them to share their ideas, preferences, and feedback. This approach recognizes that children are not just passive users of technology but also have valuable insights and perspectives that can inform the design process. Over recent years, participatory design of technology with children has been attracting increasing interest from academia with a steadily increasing body of corresponding scientific literature.

Recent surveys examined the many methods applied in participatory design studies with children and provided systematic mappings of methods [27] or explored the interplay of the roles of children and adults across different methods [14], for example. While prior work has a focus on adapting, applying, and evaluating particular participatory design methods for children, often with a preference

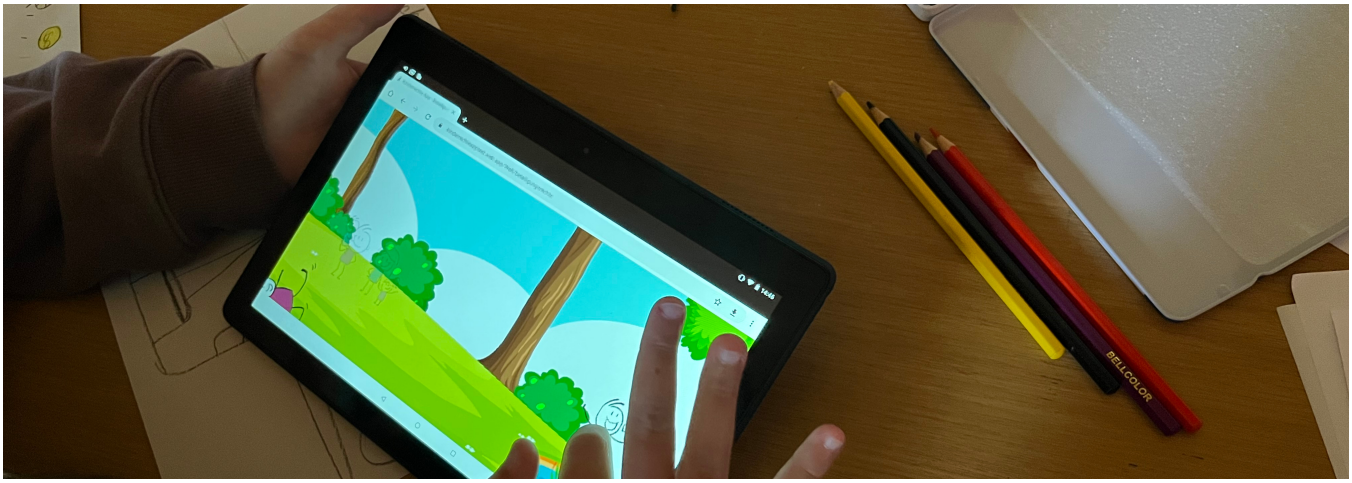

Figure 1: More than 170 children were involved in 18 workshops throughout the project. At later project stages, participants were asked to evaluate functional prototypes and contributed to the iterative refinement and improvement of the app.

for evaluating interactive artifacts at a single point in time, long-term multi-method participatory app design projects with children and corresponding experiences are scarce.

To address this gap, this paper presents insights from a case study of a three-year nationwide participatory app project with children. Goal of the project was the development of an age-appropriate and appealing app on children's rights which informs children about their rights and raises awareness.

The resulting application *KIDIMO* was only recently released in the form of a Web app (https://kidimo.app). The project was carried out by an interdisciplinary research team from OST - Eastern Switzerland University of Applied Sciences and Luzern University of Teacher Education and a large network of children's rights organizations. It involved more than 150 children in 18 different workshops at different project stages using a variety of methods. In contrast to previous work, this paper does not focus on methodological insights from short-term experiments or concrete resulting design artifacts. Instead, we focus on general success factors for a large-scale participatory app design project with children.

The contribution of this paper is threefold. We (1) provide insights into the setup and implementation of a complex nationwide participatory mobile app project with children, (2) summarize lessons learned from this multiyear participatory project, and (3) derive recommendations for related app projects.

We consider the results relevant for both researchers in the CCI field and user experience professionals co-designing with children for the longer term.

2 FOUNDATIONS AND RELATED WORK

In this section, we summarize the foundational previous work for our research. In particular, we elaborate on reasons for participatory design with children, differences to projects with adults, and different roles of children within participatory projects.

2.1 Reasons for participatory design with children

Druin was among the first to suggest that adult designers and children have an equal partnership and that children were "equal stakeholders" or could have an "equal voice" in the design process [3]. Children have their own likes, dislikes, curiosities, and needs that do not align with those of adults. As obvious as this may seem, designers of new technologies for children sometimes forget that children are a completely different user population with their own norms and complexities [6]. Nevertheless, for a long time mainly adults have been asked what they think children may need, rather than the children themselves [6]. Hourcade [9] emphasizes that knowledge about children's development and knowledge about possible risks in this area, is not enough to develop technologies for this population. Furthermore, adults often underestimate a child's ability to provide relevant input in decision making and research [9]. As a further reason for conducting participatory design with children, Cahyanti et al. [4] mention children's different levels of cognitive development with regard to adults.

Several researchers emphasize the importance of considering children's cognitive development in participatory design studies (cf. [4, 16]). Children's perceptions and representations of the world are constantly evolving and differ greatly from those of adults. Furthermore, today's young people are more familiar with technologies and have different abilities to express their ideas and follow structured tasks. Which is why the gathering of information as well as the generation of new digital applications should take place directly with the target group [14].

Childhood has certainly changed and will continue to change. Designers of new digital applications can only keep up if children are involved in design processes. Through participatory design with children, more diverse ideas and technologies can be developed. Children provide honest feedback, and thus ideas and new technology directions that adults would not have thought about on their own [25].

The participatory movement supports children's voice, which should also be expanded to include the development of new technologies by giving children a voice in the design of their technologies [25]. Through participatory design with children, researchers gain insight into the world of children and thereby come closer to their perspective, which should support minimizing the skill and knowledge gaps between designers and users and finally lead to an improved acceptance of the final product [16].

2.2 Differences in participatory design between adults and children

Developmental differences between children and adults require different design methods when working with children. Due to developmental differences, children need different assistance to be able to carry out participatory design activities than adults [27]. For example, children have different cognitive, motor, social, emotional and communicative abilities than adults. The difference in each of these areas must be taken into account when conducting participatory design with children. A child's cognitive level may mean that abstract concepts need to be explained more concretely, for example. A child's motor development may mean working with an adult design partner to complete a low-tech prototype. Emotionally, children may need support to understand that their ideas may not be immediately visible in a final product, for example, but they still contributed to the design of a product of which they can be proud. Similarly, children might need support in communication, for example, having an adult help them present design ideas [25].

The attention span of children is shorter than that of adults, so adults must ensure that adequate breaks are provided for children to relax. Likewise, children can become agitated or tired more easily during a design session, and this should be carefully monitored by adults. In addition, certain design methods, such as brainstorming, must be explained to children as they are not familiar with such concepts. Another difference is that children need repeated social and emotional reinforcement, for example, by receiving positive feedback, which in turn motivates them to continue the work. In summary, the adaptations required for participatory design with children exist largely on the developmental level as well as the social structures of the children (cf. [7, 16, 25]). Furthermore, according to Tsvyatkova and Storni [27] and Mazzone [16], age and also the physical environment in which the design sessions are performed are crucial elements to consider.

2.3 Roles of children and critical reflection

Druin [6] identified and described four roles that children can take in participatory technology development: user, tester, informant, and design partner. At different stages of a product development cycle, participatory design with children may use a combination of these roles [18]. The child's participation differs between these different roles. In each successive role, children have more influence on the design process (cf. [11]). Choosing the type of role for the children involved can depend on the research and development goals, resources, time frame, and philosophy of the researchers. Each of these roles both supersedes and includes the following: All testers are users, all informants are also testers, and all design partners are also informants (cf. [8]).

Several researchers discussed these traditional roles of children in design processes and proposed additional ones. Examples include the contributions of Barendregt et al. [2], Landoni et al. [13], and Van Doorn et al. [5], who explored the role of a child as a co-researcher. Furthermore, for example, Schepers et al. [23] evaluated the role of the child as process designer and Iversen et al. [10] explored the role of the child as protagonist. Furthermore, frameworks such as the "role definition matrix" have been developed to provide a more detailed categorization of the children's roles in design processes [24]. Likewise, Schepers et. al. [23] and Barendregt et al. [2] mention that recent academic debates have urged a rethinking of traditional roles to seek genuine forms of participation. Researchers identified the need for additional roles in order to use the roles in different ways and allow children switching between roles during a project [2].

However, Schepers et al. [23] criticize that in practice children are mainly involved in limited roles and at times when adults consider their contribution necessary. Similar, Landoni et al. [13] found that children are still predominantly seen as users, but rarely evaluate technology. Furthermore, it is not a matter of course to involve children in a process that extends over time [23]. Having analyzed 137 articles on participatory design, Yarosh et al. [29] concluded that most of the evaluated articles involved children only as testers, while only 31% of the articles reported design practices with children as design partners.

Further criticism refers to "fast and furious" or "reduced" participatory design practices, in which children are included only in isolated, short-term design sessions but are excluded from the more important decision-making process [19]. Read et al. [20] critically referred to this trend as "crowd-sourcing of ideas" because children do not necessarily benefit from the outcome of the process.

3 CASE STUDY: CHILDREN'S RIGHTS IN YOUR POCKET

In this section, we introduce the participatory app design project *"Children's Rights in Your Pocket"* as a long-term case study. We elaborate on the motivation and goals of the app to be designed, describe the consortium and project management, and present the project phases.

3.1 Motivation and Goals

Children's rights, as outlined in the *"Convention on the Rights of the Child"* [28], constitute a distinct subset of human rights, emphasizing special protections and care specifically designed for minors. For example, these include the right to association with both parents, human identity as well as the basic needs for physical protection, food, universal state-paid education, health care, etc. Still, not all children are familiar with their rights yet. Attempts to explain children's rights in school still rely on individual initiatives and do not follow a comprehensive strategy. Additionally, information on the topic is often targeted at adults (who deal with children professionally or privately) and is mostly conveyed through print media, although children and young people increasingly seek information through digital means.

According to the MIKE study 2021 [26], smartphones are the favorite medium of primary school children in Switzerland. Two

out of five primary school children own their own phone. 87% of children use the Internet at least occasionally. According to the most recent JAMES study [12], 99% of Swiss adolescents own a mobile phone. At the same time, the number of children and young people who obtain information through print media has been declining for years.

Initiated by two Swiss universities and important institutions in the domain of child protection and children's rights, the project *"Children's Rights in Your Pocket"* aims to fill this gap. The goal of the project is to teach children about their rights through an app. In order to create a product that is appropriate for the target audience, which informs interactively about children's rights and supports children in exercising their rights, the target audience has been involved in a comprehensive participatory approach. The app contributes to inform children about their rights and aligns with their media usage habits. Additionally, the app's development process serves as an example of a development that complies with children and young people's right to participate.

3.2 Project Consortium and Management

The project has been carried out by an interdisciplinary team consisting of researchers from four institutes of two universities. This core team comprised 10 experts from education science, social work, media studies, human rights, software engineering, and user experience design.

Two senior researchers co-led the project following agile project management principles. Based on the overall project plan, tasks were managed on a digital board and processed by thematic subgroups within four-week sprints. Each sprint was concluded with a review at the end of the month, in which the entire team met online to synchronize current tasks and overview the upcoming ones.

Besides this core team, the project featured a comprehensive partner network. This network comprised central institutions active in the domain of child protection and children's rights: national of subsidiaries of three international child welfare organizations (UNICEF Schweiz und Liechtenstein, Pro Juventute, Terre des Hommes Suisse), three associations for social and special education for children (Integras, Procap, Pro Infirmis), one association for foster and adopted children (PACH Pflege- und Adoptivkinder Schweiz), one national competence and service center for education (éducation21), and one legal advice center for children (Ombudsstelle Kinderrechte Schweiz).

These network partners were invited to join the project to bring in their expertise and specialist knowledge during the design of the app, to act as its trustworthy co-publishers, and, as multipliers, to help promoting and distributing the app to the target groups. Representatives of these network partners met with the project's leading team every six months in dedicated network meetings.

In addition, the project was accompanied by a sounding board acting as an external control and advisory body. The goal of the sounding board was to complement the partner network's expertise by additional competences. Five experts formed the sounding board: two professionals working directly with children (one from open youth work, one teacher), an expert for children participation, a media ethics researcher, and a university HCI lecturer.

As the target group's counterpart to the adult sounding board, a children's advisory board was established to accompany the project continuously. We describe the children advisory board, as a central participatory element of the project in Section 4.3 in detail.

3.3 Project Phases

The project was planned for a duration of three years, divided into three subsequent project phases. Phase 1 contained comprehensive research and analysis to categorize the existing body of (educational) material on children's rights in Switzerland and its neighboring countries. The goal was to identify materials that could be reused and/or digitized for an interactive app while avoiding to recreate existing content. In addition to the development of this catalog, we sought the opinions and requirements of adult professionals regarding a children's rights app during this phase. Having identified key people directly working in different contexts with and for children in Switzerland in form of a comprehensive network list, we invited selected ones to half-day requirements workshops (conducted online via Zoom due to the COVID-19 pandemic). Each workshop comprised three tasks on collaborative Miroboards:

- *Futurama:* What will have changed in 2030 when the app is widely used?
- *Persona:* According to your professional experience, who could be typical users of the app?
- *Usage scenario:* How would you as an adult professional use such an app in your work with children and what are the corresponding requirements?

Overall, we were able to collect the feedback from 50 adult experts in three workshops.

Phase 2 set the project focus on children as the target user group of the app. During this phase, we were conducting five on-site requirements and design workshops with children aged between 7 and 12 years. Details of these workshops can be found in Section 4.1. Based on the children's manifold inputs, enriched by feedback of the adult experts, a basic concept for the app was derived.

Finally, phase 3 consisted of iterative refinement, development, and evaluation of the app with children. Section 4.2 reports on the corresponding workshops in detail. Additionally, in this phase researchers with expertise in children's rights and media education created support material for various settings where children use the app accompanied by adults (e.g., in school lessons or open child and youth work).

In the remainder of this work, we particularly focus on the second and the third project phase where children were intensively involved in iterative design, implementation, and evaluation tasks.

4 PARTICIPATORY ELEMENTS

The project contained a set of participatory elements to involve children at different project stages and in different formats. These included requirements and design workshops, evaluation workshops, and a children advisory board.

4.1 Requirements and Design Workshops

In this section, we describe the requirements and design workshops with children which were the main content of the second project phase.

Figure 2: Methods applied in the design workshops with children: LEGO Serious Play (a), brainwriting (b), scribbling to describe favorite apps (c) and develop ideas for the children's rights app (d), and sticker voting (e).

4.1.1 Objectives and motivation. The objectives of these workshops were twofold: First, we wanted to learn about the children's media behavior, in particular regarding the usage of mobile devices and apps. In contrast to several recent quantitative studies on children's media consumption (e.g., [12, 26]), we aimed not only at learning about frequently used apps but also at understanding the features that make them interesting and motivating for children. Second, we aimed at obtaining advise and recommendations on the design of an app on children's rights from the target group. This includes both relevant content (e.g., rights the children consider important in their daily life) and presentation (e.g., interactive elements).

Based on discussions within the interdisciplinary research team, we followed several guiding principles when setting up and preparing these workshops. A main objective was to reach and involve children with diverse social, cultural, and educational backgrounds. Thus, we decided to run workshops in different parts of the country to consider possible regional differences (both cultural/language-related and urban/rural).

Additionally, we planned to pay special attention to vulnerable groups of children, since they probably would benefit from such an app most. The term "vulnerable children" generally refers to children who are at an increased risk of harm or adverse outcomes due to various factors such as their health, living conditions, or social and economic circumstances (e.g., children from low socioeconomic families, with disabilities, with refugee experiences, or living in foster care, etc.; cf. [1]).

Furthermore, we agreed to conduct the workshops in different settings, that is, highly structured school settings with students in class and less structured gatherings in youth work settings.

4.1.2 Preparations. For the preparation and implementation of the workshops, the cooperation with experts and regional organizations on site was important. Due to existing contacts of the research team's social work experts and new contacts established during the requirements workshops with the adult experts, we were able to reach out to teachers and social workers with access to children's groups across the country. In the selection of the groups for the workshops, above-mentioned criteria such as regional distribution and characteristics and socio-economic backgrounds were considered.

To work efficiently in the workshops, we had to make sure that the participating children had some prior knowledge about children's rights. Wherever required, we arranged age-appropriate introductions to children's rights before the actual requirements and design workshops. For example, as a prologue for a workshop with a school class, the teacher held a lesson about the children's rights. In a similar vein, we made sure that the children have trusted

contacts for follow-up discussions, if questions arise after the workshops or if individual advice is desired (for example, to address reactions triggered by topics covered in the workshop).

For each workshop, we put together a facilitator group consisting of three members of the core research team and one or two reference persons known by the children (teachers, reference persons for foster children, persons responsible for the children's conference, school social workers). The roles of project team members included main moderation, small breakout group moderation, and observation (with a focus on methodological insights). Two persons were responsible for moderating the whole group as well as small groups and for documentation (field notes, transcript of the conversations, photos and audio recordings of the discussions and (interim) results). Another person took care of the supplementary data collection (participant observation (cf. [22]) with a focus on methodological findings).

When useful, available reference persons assisted in moderating breakout groups, for example. The process and results were recorded both photographically and as audio recordings. The moderators and observers took written notes which were qualitatively analyzed afterwards[15];

4.1.3 Workshop Methods and Implementation. Overall, five requirements and design workshops with various groups of children in varying settings (see Table 1 for an overview) were conducted. We selected and applied four different methods suitable for obtaining the desired input from our young target group (see Figure 2):

- *LEGO Serious Play* is a facilitated method that uses LEGO bricks and elements as tools for communication, problem-solving, and creative expression in group settings (cf. [17]). In our workshops, children were asked to build and illustrate important rights and situations and share their stories with the group. Typically, we split the workshop group for this method into groups of four. Adult moderators talked to children to understand their models (audio-recorded, photos of the models were taken).
- *Brainwriting* is a method of generating and sharing ideas in a group setting. Unlike traditional brainstorming where ideas are shared orally, brainwriting relies on written communication. For our project, we used large sheets of brown paper where children could independently generate ideas, write them down, and add and build upon previous ones.
- *Scribbling* refers to the process of quickly sketching rough ideas and concepts. Like LEGO Serious Play, this playful method fits well with the everyday life of children. For our purposes, we prepared simple paper templates that represented smartphones and tablets. Scribbling the content of the device screens was used for two purposes: learning about children's usage behavior ("Draw what you like doing on a smartphone or tablet!") and collecting children's ideas of an app on children's rights ("How could an app about children's rights look like and which features are important for you?").
- *Sticker voting* is a simple and effective way to prioritize or vote on a list of items or ideas. The process involves each child in the group being given a certain number of dot stickers and then placing them next to the items or ideas they want to vote for. After all the stickers have been placed, the items with the most stickers are considered the most popular ones and can be discussed in group afterwards. We used this method in later workshops to prioritize app mockups.

4.2 Evaluation Workshops

Third project phase was concerned with the iterative development and participatory evaluation of the app.

4.2.1 Objectives and motivation. The evaluation workshops with children (see Table 2 for an overview) had multiple objectives. Main goal was the iterative assessment of the app prototype with regard to its usability and age-appropriateness. In particular, we were interested to know whether children could operate the app themselves. Furthermore, it was also important to study whether the app content was understood and absorbed by the children. Finally, we aimed at learning about the app's entertainment value for children which we considered a main criterion for everyday use of the app and its spread. Following an iterative design and development process, we intended to incorporate children's feedback from one workshop into the next prototype improvement. Similar to the design workshops, we decided to involve children with diverse backgrounds from different regions. Again, vulnerable groups of children were also considered.

4.2.2 Preparations. When preparing the evaluation workshops, we took several factors into account to achieve comprehensible results and at the same time create a playful atmosphere for the children. Not only was the initial target group of the app very broad, ranging from 6-12 years old, but also children differed in their reading and writing skills as well as in their use of mobile devices and apps. Furthermore, it was important to introduce the workshop goals to the children. We emphasized that every feedback is important for the project team and helps improving the app; we stressed the kids' role as experts while the adults of the project team are the executors. Some children groups had already participated in the design workshops and knew the project, others had no touch points yet and needed to be picked up well at the beginning. The children were guided through the workshops and supported where necessary.

When choosing children groups and settings for the evaluation workshops, we ensured that these can take place in spaces the children are familiar with and that the children's usual caregivers are present. Since younger children cannot simply put their experiences and feedback in writing, we decided to conduct participatory observations and, if necessary, ask questions to understand what they are doing and why, documenting evaluation results during the workshops. The team was aware that child-friendly language has to be used, i.e., language that is specifically tailored to be easily understood and engaging for children. It involves using words, phrases, and sentence structures that are appropriate for a child's age and developmental stage. Child-friendly language is clear, simple and free of jargon or complex vocabulary that might confuse or overwhelm children.

The functional evolutionary prototype was implemented as a progressive Web app with React. Before each evaluation workshop, the latest version was installed on five tablets. We decided to provide the hardware and pre-install the app to eliminate technical issues

Table 1: Participatory requirements and design workshops conducted within the project.

Nr	Setting	#Child.	Age	Dur.	Methods	Remarks
1	Elementary school class, urban	19	8-9	3h	Lego Serious Play, scribbles	Groups of four; different socio-economic backgrounds; children's rights were introduced in previous lesson
2	Vacation camp, foster children	23	8-17	2h	Lego Serious Play, scribbles	Brief introduction on children's rights; four with mild cognitive impairments; split up in primary-school pupils and older ones
3	Children's conference	10	10-12	1.5h	Scribbles	Children from different regions; split into two groups
4	Children's conference	17	10-12	3h	Flipchart, scribbles, sticker voting on children's app ideas from previous workshops	Introduction on children's rights in morning session; children from different regions; split into two groups
5	Elementary school class, rural	20	10-11	2h	Lego Serious Play, scribbles	Different socio-economic backgrounds; class had talked about children's rights before

Table 2: Participatory evaluation workshops conducted within the project.

Nr	Setting	#Child.	Age	Dur.	Methods	Remarks
1	Vacation camp, rural	15	7-12	1.5h	Usability evaluation, scribbling, sticker voting	Children and youths were split up in three separate groups.
2	Open youth work, urban	10	7-12	2h	Usability evaluation, scribbling, printout discussion, sticker voting	Children were allowed to move around the house and garden independently and participate in the test setting and leave as they like.
3	Special-needs school, rural	7	7-12	1.5h	Usability evaluation, scribbling, printout discussion, sticker voting	Children with different cognitive and physical impairments; moderators were assisted by three caregivers from school; one of the app developers was present.
4	Elementary school class, urban	20	10-11	2h	Usability evaluation, scribbling, discussion of printouts, sticker voting	One external expert in children participation took part; carried out during school lessons.
5	Special-needs school, urban	7	8-11	2h	Usability evaluation, scribbling, discussion of printouts, sticker voting	With two caregivers from school.
6	Elementary school class, urban	18	8-9	1.5h	Usability evaluation, scribbling, discussion of printouts, sticker voting	Split up in three groups; incorporated in school lessons.
7	Open youth work, rural	13	8-11	1.5h	Usability evaluation, scribbling, printout discussion, sticker voting	Children were allowed to move around the house independently and participate in the test setting and leave as they like.

(such as presentation problems on different devices or connectivity issues) as best as possible.

4.2.3 Methods and meetings. Core of each workshop was the explorative evaluation of the recent app prototype. The children were asked to use the app on a tablet and were observed (see Figure 1), interviewed, and, if necessary, supported by a person in a one on one situation. Since this personal observation and assistance is resource intensive, we made use of a mix of methods for larger groups. To keep all children busy and to avoid restlessness or boredom, additional self-explanatory methods without a device were applied.

- *Scribbles* were used similarly to the design workshops. Children were asked to provide the project team with more inspiration for the presentation of the app's worlds. Again, we brought paper templates with device frames to draw on them.

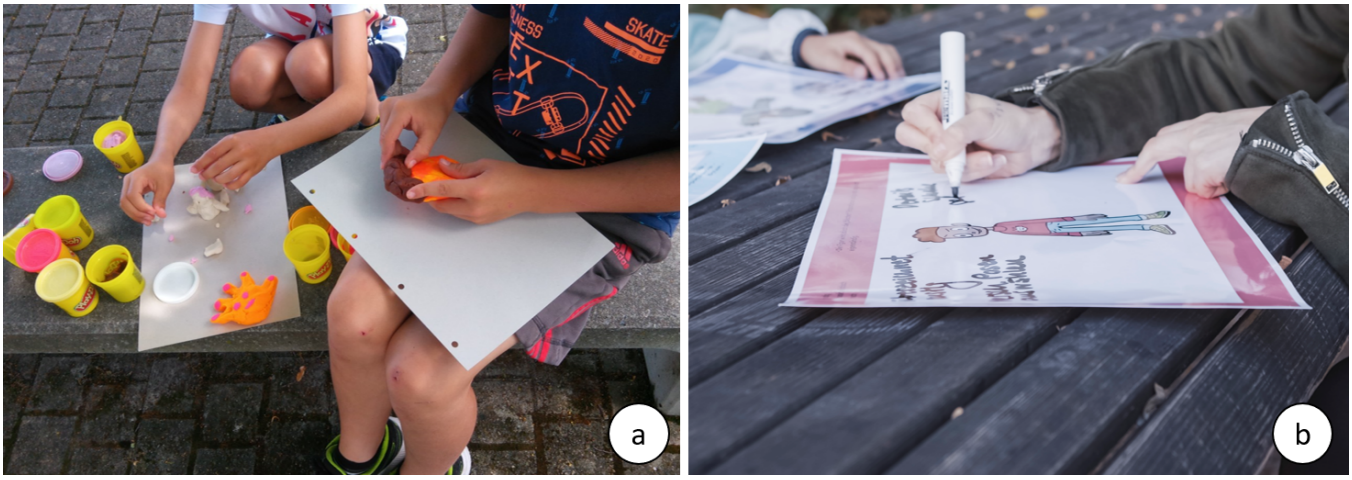

Figure 3: Members of the children advisory board modelling everyday situations to be covered in the app in the second meeting (a) and providing written feedback on avatar designs in the third meeting (b).

- *Printouts* of the scenes, which depicted different children's rights within the app, were provided. The moderator discussed those with the children to learn whether they were understood by the children or needed to be modified.
- *Sticker voting* was slightly adapted to obtain an overall app assessment per participant. Each child received a sticker dot that they could stick on a prepared poster (unobserved by the moderators). The scale was represented with three smileys (good/neutral/bad).

After each subgroup had taken part in all workshop parts, the workshop was concluded in plenary. The moderators thanked the children for their participation and contribution and explained the further steps of the projects.

4.3 Children Advisory Board

This section describes the children advisory board, a panel of children who supported the project on an ongoing basis.

4.3.1 Objectives and motivation. In the beginning of the project, we set up two committees with adult experts to accompany the project: the partner network with representatives of children's rights institutions and the sounding board with academics and professionals with complementary expertise. However, during the first project phase, we recognized the importance of not only selectively asking children about their opinions and experiences in the context of requirements and evaluation workshops, but also to include them in the overall project in the form of a further accompanying committee with a say.

This gave rise to the idea of setting up a children's advisory board - along the lines of project advisory boards with adults - which is to play an important advisory role in the second and third stages of the project. We aimed at continuously involving a group of children for discussing major developments of the project and giving advise to the project team regarding crucial decisions during the design and development of the application.

4.3.2 Preparations. When we started to establish the children advisory board, several Covid-19 measures were in place in Switzerland. Therefore, the conditions to promote the advisory board and recruit children were difficult, since many opportunities for cooperation partners that would otherwise have been available were eliminated. However, to reach interested children, we took a variety of approaches. On the one hand, we asked within our partner network who maintains contacts with interested children. On the other hand, we also approached those contacts with whom we had already had contact from the first workshops with children.

In addition, an information film was created, and flyers were distributed to places and known channels. Furthermore, children in the project group environment were asked to participate. To avoid long travel times for children (and their parents), we focused our search on children who live in the nearby region of the university.

Finally, the children advisory group consisted of six children aged between 8 and 12 years. According to them, their reasons for participation in the advisory board were varied: Some were interested in the subject of children's rights; others were more technically interested and enthusiastic about contributing to the design and development of an app.

4.3.3 Methods and meetings. Overall, the children advisory board met a total of seven times throughout the project between January 2022 and September 2023 (see Table 3). The meetings were coordinated and moderated by two members of the core search team, social work experts with a pedagogical background and long-standing experience working directly with children. Again, different methods were applied and combined to provide a playful experience (see Figure 3). The meetings took place physically, but (at the request of the participating children) at different locations in the canton of St.Gallen, Switzerland. The location of the upcoming meetings was defined by the children in negotiation processes in the group.

Table 3: Meetings of the children advisory board.

Nr	Topics	Methods	Remarks
1	Topics of app's "worlds", types of mini games	Scribbling, discussions, sticker voting	Organizational topics such as communication media, date and location for next meeting
2	Illustration styles, relevant everyday situations	Stick voting, Play-Doh, discussions	The children modelled everyday situations they considered relevant to be covered in the app with Play-Doh and explained their models.
3	Avatar designs, information needs	Discussions in groups and plenum	Film crew was present to document the work of the children advisory board, declaration of consent by parents
4	App navigation, mini games, comprehensibility	Usability test with functional app prototype	One tablet computer with app prototype installed for each child
5	Mini games, comprehensibility	Usability test with functional app prototype	One tablet computer with app prototype installed for each child
6	Mini games, comprehensibility	Usability test with improved prototype	One tablet computer with app prototype installed for each child
7	App launch celebration	-	Celebration of the completion and launch of the app with members of the team and the children's parents

To meet the needs of the children, each meeting included both recent project-related topics to be discussed or creatively developed and playful elements at the request of the children such as playing tag and having an afternoon snack together. The organizers considered the children's preferences and characteristics when planning the meetings. For example, during the first meeting, it became clear that the participating children did not like to draw but rather enjoyed brainstorming and discussing.

Subsequently, the organizers focused on discussions and negotiations in which the children demonstrated their creativity and negotiation skills. Furthermore, the moderators used group works to get into the conversation with the more introverted children.

5 LESSONS LEARNED AND RECOMMENDATIONS

Having set up and coordinated this project and its boards, planned and conducted multiple workshops, and analyzed their results, the core project team gathered to collect insights across single workshops and methods. Considering the different perspectives of this interdisciplinary team, we aimed at identifying fundamental findings from this long-term participatory project, that can be transferred to related projects and inform further CCI research. While each team member collected his/her main insights on an individual basis, we also referred back to the prior qualitative analyses of all the workshops.

While conducting the qualitative content analysis [15], we applied a combination of thematic clustering methods. For example, we used Post-It notes to identify and analyze patterns within our data. The researchers individually wrote key phrases, concepts, or quotes from the data onto Post-Its. These were then affixed to a large workspace, creating a random arrangement. Through collaborative efforts, similar Post-Its were grouped together, forming clusters that represented specific themes. Discussions ensued, refining the clusters and naming the overarching themes. The visual arrangement facilitated the exploration of relationships between themes, uncovering insightful patterns and connections. This interactive and engaging approach not only organized the data effectively but also encouraged active participation, leading to a deeper understanding of the qualitative content. For each identified theme, we jointly discussed the potential factors for success and/or failure and derived corresponding recommendations.

In the following, we describe these lessons learned from our three-year project on participatory app design with children and derive recommendations for related project endeavors.

5.1 Access to children: Building a basis of trust

The participatory design with children requires a trust basis. In order for children to be willing to provide insight into their lives and concerns, they must feel safe, taken seriously, and comfortable. Building trust requires, on the one hand, a lot of time and openness regarding the needs and concerns of the children. However, it requires a high level of sensitivity with respect to the responsibility one carries when dealing with children. Safety, well-being and protection of children must be ensured at all times during the participation process.

Recommendations from the project include:

- *Spaces for children:* Familiar spaces or spaces belonging to children help them feel comfortable. These can be classrooms, extracurricular institutions spaces, or outdoor spaces for children, such as playgrounds, for example.
- *Collaboration with organizations:* To reach children, collaborating with people and organizations that are in contact with children on a daily basis is useful. These can include teachers, social workers, leaders of organizations that work with children, parent organizations, etc. Trusted individuals of the children should be involved in the participation workshops.
- *Protection:* To ensure the protection of the participating children, clear behavioral rules are necessary in the participation process. It is recommended to negotiate a code of conduct

as well as to create an information sheet on handling image, sound, and video material of children and to inform all participants accordingly.
Furthermore, a consent form signed by parents or legal guardians is required beforehand. When processing sensitive personal data, important data protection measures (e.g., anonymization) must also be taken and services that guarantee a high standard of data protection must be used.

- *Voluntariness:* For participation to be successful, children must be able to participate voluntarily and without coercion. In a longer participatory design process, they should always have the option to withdraw their participatory engagement. Based on the experiences in the project, it is recommended to clarify and formulate the rights and obligations of the participants early on.

5.2 Levels of participation: Achieve genuine participation

Involving children and granting them the necessary recognition as thinking and acting subjects in our society is one of the fundamental principles of the UN Convention on the Rights of the Child [28]. In all matters that affect the child, children should be able to freely express their views. This opinion should be given due weight according to the age and maturity of the child, as stated in article 12 of the convention. In the participation of children in long-term participatory app design processes, it is important not only to inform and involve children. In contrast to these "fake forms of participation" [21], children must be taken seriously as experts in their lifeworld and be recognized in this role to strive for higher stages of participation accordingly.

Recommendations from the project include:

- *Long-term participation:* Recognizing children as experts of their own lives requires not only involving them in a development process on a one-time basis and asking for their wishes and concerns, but also positioning them as an important part of the project structure and granting them decision-making powers. In the context of the project, a children advisory board accompanied and supported the project, making important decisions and carrying them forward. Such a board should be established at the very beginning of the project.
- *Appreciation and low hierarchy:* Children's input in the participation process must be taken seriously and appreciated. This requires an open attitude from the adults who design the participation process and interact with the children. Although adults lead participation workshops and formats, they only have the role of facilitators who support the process but never dominate it. For example, care should be taken to ensure that questions do not direct the children's answers or that children are given enough time to express themselves in their own way.
- *Participation setting:* Digital formats such as online questionnaires only work for simple evaluations. However, they have not proven effective in capturing design and content ideas from children and incorporating them into the design process. To comprehensively capture the concerns of children, on-site formats are crucial.

5.3 Diversity: Creating different approaches

Children have varying abilities and interests. Children who grow up in supportive environments and already have well-developed participation skills are often involved in participation processes. However, limiting participation to these children does not do justice to the diversity of children. The final product will primarily appeal to the "privileged" children. Therefore, it is crucial to involve children with as many backgrounds as possible in the design process, e.g., in terms of gender, cultural background, social status, language, disabilities, etc.

Recommendations from the project include:

- *Variation of workshop methods:* The workshop content and methods must be adapted to the different prerequisites that the children bring. On the one hand, there is a need for various ways to convey the workshop content. On the other hand, it is important to develop a variety of methods and corresponding freedom of choice for the participating children. For example, some children prefer to express their thoughts in the form of drawings. Others prefer to create something with toy bricks or Play-Doh. Still, others pack their ideas in stories that they tell or they write their needs, ideas, and wishes quietly.
In the project, it was found that children can talk very well about their ideas and needs during a manual activity. For example, they built a LEGO model and shared their thoughts with the workshop leaders at the same time.
- *Workshop moderators:* Workshop moderators act as coaches and facilitators. These roles require proven experience in working with children. The professionals must be able to respond to the different needs of the children and be open to adapting methods at the time of the workshop. Only in this way the needs of the children can be met in the participatory process.
- *Collaboration with partners:* To achieve the greatest possible diversity, it is recommended to work with different project partners. In the project "Children's Rights at Your Hand", for example, different school communities were involved to let children with different socioeconomic backgrounds participate in the design process.
In addition, cooperations with organizations in the field of children with disabilities were established to include concerns, ideas, and wishes of these children concerned.

5.4 Communication and expectation management: Being in dialogue with children

Children have a different perception of time than adults. A project duration of three years is a long period of time in the life of a child. This should be taken into account when communicating about the project progress. It is important that children are informed in an honest, transparent and age appropriate language, as well as through appropriate communication channels, about what happens with their contributions within what time frame and when the final result will be available. For children, the tangible result, the concrete output, is more important than the process.

In participatory development processes, not all ideas and concerns of children can be incorporated. However, a genuine culture of participation thrives on constantly checking expectations and explaining to participants why individual wishes and ideas cannot be taken into account. This helps avoid disappointments. In addition, such negotiation processes strengthen children's sense of being taken seriously and being able to participate. They learn to participate in decision-making processes and to make compromises.

Recommendations from the project include:

- *Expectation management:* To align the expectations of the participating children with the design process, it is recommended to communicate regularly and involve the children in various feedback and participation loops throughout the entire project, so they can closely follow the development of artifacts.
- *Communication forms and contents:* It is important to adapt the communication forms and contents to the target audience. Depending on the developmental stage of the participating children, it is recommended to communicate in a simple language. Furthermore, when choosing communication channels, the communication behavior of the target audience should be taken into account. Involving professionals in child-friendly communication has proven successful in this project.
- *Personal contact:* In our project, all participatory workshops were conducted by professionals with long-standing experience in working with children. However, we learned during the project that it is important for the children to also get to know the people who will actually implement their ideas and wishes, e.g., the app developers. It is recommended to occasionally enable this personal contact and consider organizing appropriate meetings.

6 CONCLUSION

Prior research on participatory design of digital artefacts with children has been criticizing the often restricted scope of children's involvement in projects and studies. Children's roles and engagement tend to be limited, often bound to isolated, short-term design sessions and experiments (cf. [13, 19, 23, 29]). Hence, knowledge on the setup, organization, and overall success factors of long-term participation is scarce.

In this paper, we reported on the case study of a nationwide three-year participatory app project with children. With more than 170 children involved in 18 different workshop formats (at the time of writing), the project plays a pioneering role in continuous long-term participatory app design with children. Due to the overall objective of the app, the communication of children's rights, diverse (partly vulnerable) children groups in various settings were invited and (partly repeatedly) took part throughout the project.

Having analyzed various approaches and decisions in setting up the project, coordinating participants, planning and running workshops, etc., we were able to derive a set of recommendations for related project endeavors. Core success factors (and challenges) turned out to include building a basis of trust, achieving genuine participation, considering children's diversity, and ensuring continuous communication with children involved.

The resulting app *KIDIMO* has recently been made available online (https://kidimo.app). It can be used independently by children, but also in accompanied settings with adult caregivers. Accompanying materials for the use of the app in school lessons as well as in out-of-school settings (e.g., in childcare facilities) are available.

Future work includes, among other things, the integration of the app into school curricula to support the teaching of knowledge about children's rights through an interactive digital media. The content of the app will also be expanded, again following principles of participatory design. The use of further participatory methods is planned, including a hackathon for teenagers, in order to involve young people even more actively in the implementation.

In general, the corresponding activities and measures to run successful long-term participatory projects are, in summation, resource intensive. For example, it takes a lot of time to build trust and truly understand the ideas and needs of diverse children groups and incorporate them into the design and development process. Furthermore, continuous sensitive and age-appropriate communication is associated with high effort, yet only through sensitive communication do children feel taken seriously in the participation process.

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