Inclusive or Inflexible - a Critical Analysis of the School Context in Supporting Children's Genuine Participation

Netta Iivari & Marianne Kinnula
INTERACT Research Unit, University of Oulu
Oulu, Finland
firstname.lastname@oulu.fi

ABSTRACT

Relatively little attention has been paid to discussing what it means when children's participation in technology design is genuine, even though the importance of their participation is emphasized in the literature. School as a context presents multiple challenges but also numerous benefits for working with children. We examine five projects carried out with children in the school context, and critically consider in which respects this context supports genuine participation of children, in which respects it poses challenges for it, and what this implies for technology design with children. We maintain that researchers need to critically examine the goals set for children's participation: whether they are learning- or material outcome-oriented. This significantly affects the choice of the context for projects.

Author Keywords
Children, school, teacher, genuine participation.

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
The importance of user participation in technology design is one of the core values of the discipline of Human Computer Interaction (HCI). Interaction Design and Children (IDC) research community has emphasized this particularly related to children. Within this community a lot of attention has been devoted to enabling and supporting children's participation. The school context is also familiar to the IDC community: a lot of studies have been conducted in the school setting, especially related to design and evaluation of educational technology. On the other hand, the school context as a site for children's participation has also been criticized. Many school characteristics have been argued to hinder children's participation and optimal design and evaluation sessions. Instead, e.g. lab has been suggested as a more suitable place.

We see the school context as having several drawbacks as well as numerous benefits as a site for children's participation. This paper, inspired by Iivari and colleagues' [11] work, approaches these drawbacks and opportunities through utilizing a theoretical lens on children's genuine participation introduced by Chawla and Heft [2]. This lens guides us to appreciate children's genuine participation as a significant goal to be strived for, also in design projects with children. Relatively little attention has been paid in the research community to discussing what it means when children's participation is genuine, although various roles for children in the technology design process have been identified, ranging from users to active and influential design partners [4] and recently there has been an increasing interest in foregrounding the values driving IDC research [11, 12, 24, 32].

On the other hand, children's genuine participation is a topic that has been considered within other disciplines already for decades. In these studies, children have been involved e.g. in local environment planning and design projects, which has been seen to result in better decisions and services for children [1]. However, in this literature there is a variety in the views on what constitutes genuine participation: it has been defined based on the process [9] or the outcomes [10]. Generally, it is still agreed that children's participation may be merely tokenistic or decorative, while genuine participation allows children to have a real influence on decisions and outcomes [2, 9, 10]. The outcomes include both material outcomes and children's learning and competence development [2]. In this paper, we examine five of our projects carried out with children in the school context following Chawla's and Hefts' [2] criteria. As our research question, we ask *in which respects school context supports genuine participation of children and in which respects it poses challenges for it, and what this implies for technology design with children*. The projects have been carried out in Finnish comprehensive schools with 12-15-year-old children.

Next, we introduce related IDC research on the school context as well as research on genuine participation of children carried out within a variety of disciplines. Then, we discuss the research design and the empirical results, ending with implications and conclusion of the paper.

RELATED RESEARCH

Children's Participation and the School context
In research on children and technology, the school context has played a prominent role. During early days, such studies

focused particularly on learning technologies and their impacts on the learner [4]. Also today, a lot of educational technology is being designed and tested together with children, taking often place in the school context that is considered a very valuable context for such kind of studies (e.g. [7, 19, 20, 26]). A review of the existing IDC research reveals that researchers have discussed how their work fits with the school curriculum or the existing infrastructure of the classroom, some also discussing working with teachers in the design process [32]. Design approaches such as learner-centered design [29], informant design [28], and curriculum focused design [27] align well with these perspectives.

Overall, school is in children's lives a very significant context. In addition, the importance of teachers as 'significant adults' in children's lives has been emphasized [4, 21]: "children are dependent on their parents and teachers for everything from food and shelter, to educational experiences" [4: 1]. Especially teachers' role in the design sessions with children has aroused lively discussion in IDC research. Teachers can be considered essential in defining the learning goals and in evaluating the achievement of those as regards learning technologies [28]. Teachers are needed even for allowing the design sessions in their class. Teachers need to be willing to make changes to the school day to integrate the design activities. [6] This may require teachers changing their teaching plans, which today may be a lot to be asked as national curricula and mandated tests are widely in use. Thus, in the school context, a significant issue is fitting the design work with the existing curriculum and learning goals. [4, 7, 18] Essential is to invite teachers to defining the learning goals and the pedagogical paradigms to be relied on [7]. Moreover, especially in countries where the school system is very curriculum focused, it is wise to integrate design activities very well with the existing curriculum in order to be able to show what children have learned during the design activities and justify the classroom time. Overall, one needs to adapt to the administrative and regulatory framework of the school. [27]

Teachers have also been successfully included in design sessions carried out with children. Teachers have, for example, been invited for commenting on design activities and language used to ensure that they are appropriate, interesting, and understandable for children [16, 20, 25, 27]. Teachers may be involved also in many practical arrangements, e.g. forming groups of pupils for design activities, assuring order, helping pupils become engaged in the tasks, and acting as translators of children's ideas as well as liaisons between children and designers [16, 17, 19, 23]. They can also be invited to help in research data collection in the classroom [5] or to evaluate the project afterwards [17].

On the other hand, especially Druin and her research group have been critical towards the school context. They, as well as other researchers, point out the lack of flexibility and the highly restrictive nature that characterize the school context [5, 27]. Druin and her colleagues have in particular criticized the traditional power structures inherent in the school context. They maintain that adults and children should be seen as equal partners in the design team. The teacher-pupil paradigm, however, easily influences in the background, making children to behave in a manner that they are used to in a school environment, which may prohibit their participation as equal design partners (e.g. [3, 4, 5, 8]). Many small things in the design session may cause problems in this respect. For example, note-taking by adult participants might resemble school setting and make children fear they are tested by a teacher for right or wrong answers [5]. One adult together with several children in a design team may also remind too much of a school setting, with a teacher leading the class [5]. It might also be a challenge for adults in the design team not to steer children like a teacher would [3, 4].

Another challenge related to teachers is that they may lack knowledge and skills in technology design and use [13, 26, 27]. On the other hand, this may reduce the power difference between teachers and pupils as pupils may be teaching teachers about technology [19]. Moreover, it has been emphasized that teachers need to be properly trained as regards technology to create ownership, engagement, and commitment in teachers as well as to offer them the needed skills and confidence [26]. It might also be a good choice not to include teachers and pupils from the same school to reduce the teacher-pupil paradigm. Placing the design activities outside school environment might also help. In addition, integrating teachers later into the design team so that teachers need to learn from children, not the other way around, may help to equalize the footing between these participant groups. [6]

Genuine Participation of Children
A lot of effort has been put into developing methods that enable children's participation in technology design, starting from the 1980s [4]. Participation of children has been examined through the different roles of children in the design process [4], the role of a design partner aiming for equality between the adult and child designers [4], although with some reservations in some methods [14], while still implying the intention for genuine participation of children. There have also been calls for researchers for foregrounding their values when working with children [11, 12, 32]. Yarosh and colleagues [32] have identified children's learning as well as social, intellectual, and creative growth to be among the core values of the IDC community. Iversen and Smith [12] further this by bringing in the Scandinavian values of participatory design (PD), and discussing the deeper intention of PD in the form of empowering children to see beyond a single design project. Van Mechelen and colleagues [31] present an ethical tool for reflecting and negotiating values of both adult designers and children. Read and colleagues suggest two checklists to push for honesty and better communication with children in projects [24] and transparency in eliciting design ideas from children [22]. However, a broader reflection on what genuineness of children's participation means in technology design with children is still lacking.

Conditions of Convergence
Whenever possible, the project builds on existing community organizations and structures that support children's participation.
As much as possible, project activities make children's participation appear to be a natural part of the setting.
The project is based on children's own issues and interests.

Conditions of Entry
Participants are fairly selected.
Children and their families give informed consent.
Children can freely choose to participate or decline.
The project is accessible in scheduling and location.

Conditions of Social Support
Children are respected as human beings with essential worth and dignity.
There is mutual respect among participants.
Children support and encourage each other.

Conditions for Competence
Children have real responsibility and influence.
Children understand and have a part in defining the goals of the activity.
Children play a role in decision-making and accomplishing goals, with access to the information they need to make informed decisions.
Children are helped to construct and express their views.
There is a fair sharing of opportunities to contribute and be heard.
The project creates occasions for the graduated development of competence.
The project sets up processes to support children's engagement in issues they initiate themselves.
The project results in tangible outcomes.

Conditions for Reflection
There is transparency at all stages of decision-making.
Children understand the reasons for outcomes.
There are opportunities for critical reflection.
There are opportunities for evaluation at both group and individual levels.
Participants deliberately negotiate differences in power.

Table 1: Characteristics of effective projects for children's participation [2: 204]

In many disciplines, however, children's participation has been studied more broadly [15], and it has been found that children's participation in decisions that are related to their life-world leads to better decisions and services for children [1] and enhances their personal and social skills, thus giving them skills for acting as full society members [30]. Genuineness of children's participation has also been examined in order to understand different forms of participation more deeply, to evaluate them, and to make them more visible. A well-known and often cited model for participation is Hart's "ladder of participation" [9], distinguishing non-participation and participation, and differentiating participation by children's possibility to affect the decisions: being just an informant in the process [28] or sharing decision-making with adults [4, 14]. Numerous other models can also be found. A framework collaboratively created by researchers interested in children's participation in community settings, presented by Chawla and Heft [2], has been developed for project planning phase, to take into account different aspects of children's participation. This framework [2] identifies criteria

for children's effective participation (Table 1) categorized into five areas: conditions of convergence (project establishment related issues); conditions of entry (who will be involved in the project and how); conditions of social support (making children to feel valued, accepted, and respected); conditions for competence (fostering competence and giving genuine possibilities to contribute to the outcome); conditions for reflection (discussing the decision-making mechanisms and power, and reflecting what happened during the project and why). We feel the framework [2] offers a good starting point also for considering the relevant aspects to be catered for when planning and evaluating technology design projects, striving for children's genuine participation.

RESEARCH DESIGN

The context of this study is a long-term research programme, started in 2012 in Finland and conducted in school context, to find ways to encourage children to develop their literacy skills. Later on, the focus has been broadened to concern education and empowerment of children in relation to participation, design, and game development. The researchers involved in this study have also had as their overall long-term goal enabling genuine participation of children. Finnish school as a context supports this goal with its objective for the compulsory basic education: "*to support pupils' growth towards humanity and ethically responsible membership of society and to provide them with the knowledge and skills needed in life*". Finnish National Board of Education determines the national core curriculum for all Finnish schools. The central values in the school system are equity in education, education system based on trust and responsibility, life-long learning, and high teacher education. One motivating factor for our study has been a new curriculum for compulsory basic education (grades 1-9, ages 7-15) that will be taken into use in Finland in fall 2016. As regards our projects, there are many interesting issues included, such as: working across school subjects; pupils planning themselves studies related to their interests; and, cross curricular teaching of programming on all grades. In Finnish school system teachers have pedagogic independency: they follow the curriculum in their teaching but can freely choose to work with children as they see the best. (www.oph.fi) We cooperated with teachers quite extensively in the latest four of our projects.

Project A, spring 2013. Examining the hobbies, literacy skills, and mobile device use with 6th, 7th, 8th and 9th graders (12-16 yrs.) in a comprehensive school. The work was not integrated with any specific lessons or teachers. The children took part through a survey, interviews, and user evaluation of mobile reading devices. The interviewees and the participants for the evaluations were selected based on the survey answers. The project was researcher-led. Data: survey answers, video data of interviews and evaluations, project management data, results reports.

Project B, fall 2013. Developing an adventure game to promote literacy skills of children, in cooperation with 7th graders (12-13 yrs.) in two comprehensive schools, with Finnish

language teachers, during their lessons. One class took part in a game concept evaluation workshop and 8 children took part in usability testing with interviews and adjective selections. The project was researcher-led, teachers with their classes were asked to join in. Game theme was chosen by the researchers; children were allowed to vote for the game concept to be implemented. Data: multimodal data of the workshop, video data of the usability testing and associated interviews, adjective selections, game development related data, project management data, results reports.

Project C, spring 2014. Continuing the adventure game development of Project B and adding an editor to the game to make it possible for children to create new games, with 7th graders (13-14 yrs.) in a comprehensive school with a Finnish language teacher, who took part also in the previous project, the work combining art and Finnish language lessons. One class of children took part in workshops on game ideation, design and evaluation as well as editor evaluation. The project was researcher-led, the teacher volunteered. Game theme was chosen by children. Data: multimodal data of workshops with children, video data of editor evaluations, game development related data, project management data, results reports, a teacher interview, pupil interviews.

Project D, fall 2015. Development of a quiz game with 8th graders (13-14 yrs.), with 7th graders (12-13 yrs.) as testers of the game, in a comprehensive school, with an English, a Finnish and a history teacher, during their subject matter lessons. 8th graders designing and coding the game, using the game editor, 7th graders testing the game, 8th graders arranging the tests. This was a teacher-led project, researchers were involved. Game topic was selected by the teacher. Data: project management data, results reports, teacher interviews.

Project E, fall 2015. Continuing the adventure game development of Project B with 9th graders (14-15 yrs.), with 8th graders (13-14 yrs.) as testers of game, in a comprehensive school, with a Finnish language teacher, during Finnish language lessons. 9th graders designed and evaluated the game, 8th graders tested the game, 9th graders arranged the tests. The project was teacher-led, researchers were involved. Game topic was selected by the teacher. Data: project management data, results reports, teacher interviews.

When analyzing the data, the authors went through the documentation produced in the five projects. The Chawla and Heft's criteria [2] were used as a sensitizing device, with a focus on locating evidence on the fulfillment or the lack thereof of each criterion in the projects. First an analysis was carried out on each project separately, after which the data was combined to form an overall understanding. The data was abstracted to a table form for comparison. During this phase, the data was extensively discussed among the authors to ensure that they agree with the interpretations.

RESULTS
In the following, the criteria of Chawla and Heft [2] (see Table 1) are used to discuss the benefits and drawbacks of the school context in supporting children's genuine participation, both in a general sense regarding school context as well as based on our empirical findings.

Conditions of Convergence
Building on existing community organizations and structures that support children's participation. Schools in Finland are a natural setting for children to take part in design projects. Children's participation, active citizenship, civic engagement as well as computer education are all part of the national curriculum for comprehensive school education. Hence, for schools it is very natural to support this kind of cooperation. Schools also offer a setting where one can easily reach multiple age groups (from 7 to 15 in Finland). Hence, if the aim is to offer useful skills and competencies for a broad range of children, schools in Finland are a particularly suitable place to enter into. In our projects, this advantage has realized. In the first project we worked with 4 different age groups (from 6th graders to 9th graders) and with multiple classes. The latter projects have instead focused on specific classes, while we have still been able to reach a good number of pupils. In all the projects it was easy to gain access to the schools through some existing contacts. In the last two projects, which were initiated and led by teachers themselves instead of us, however, the teachers indicated that this type of work necessitates extra work from them, due to which teachers need to have a genuine will and interest to take part. They have had such a will and interest, luckily. Additionally, they indicated that there may be problems in scheduling, planning the school work, and in initiating collaboration inside the school, between teachers and subject matters, related to this type of projects. Hence, in an ideal world the cooperation with schools should have been organized earlier and more systematically than what we did.

Making children's participation appear to be a natural part of the setting. Participation, civic engagement, and active citizenship are themes that Finnish schools need to address in the education. Hence, allowing and supporting children's participation is a natural part of this setting. In our initial projects (A and B), children's participation was not among the aims, however. In the latter projects it was a central goal driving the whole project. Both the involved teachers and researchers emphasized this thorough the projects.

Basing on children's own issues and interests. Currently, the schoolwork in Finland is supposed to rely on and take advantage of children's own interests and issues and in the new curriculum this is emphasized even more. Hence, one can say that Finnish school again should offer a suitable setting for children's genuine participation. In our projects, the involved teachers indicated that this is also done in the actual teaching work, although in our projects this varied to a great extent. In the initial projects (A and B) we tried to locate schoolchildren that had a genuine interest in the topic of the project in question and succeeded quite well in this. In project C, moreover, the pupils were allowed to select the theme for the game that was developed; hence this criterion was

truly emphasized. In projects D and E, on the other hand, the teachers selected the theme for the games in question and there was no particular interest in basing the project on children's issues and interests. In the school context, the curriculum and its learning goals set some boundaries as well.

Conditions of Entry

Fair selection of participants. Schools in general offer a setting within which it is relatively easy to reach a broad range of children. Learning wise, it is also necessary to involve all: if we consider offering valuable education for children and want to behave ethically, we need to offer this in as an inclusive way as possible. Schools indeed provide opportunities for this, although obviously nobody can work with all classes in all the schools around the globe. In all our projects, we cooperated with one or two particular comprehensive schools in our local area. The schools were selected for various reasons. Either teachers from these schools volunteered or we had some existing contacts to these schools otherwise. In the initial projects (A and B) we contacted the schools and the teachers and they agreed to take part and identified the pupils and classes to work with. In the latter projects, the teachers volunteered and identified the class with which to work. All pupils from these classes were initially involved. However, all our projects included also activities in which not all pupils were able to take part. For example, different kinds of evaluation sessions included only a small subset of all pupils and some projects even reported that they were not able to involve all eager pupils, which is disappointing. Another problematic issue is that the involved teachers indicated that there were pupils who were not that interested in participating, but they were forced to do so, as schoolwork is compulsory for them. It is a bit unclear how we should deal with such pupils: do we consider this type of education so important that we do not consider children's willingness and interest but require them all to take part?

Informed consent from children and their families. Ethical issues need to be comprehensively considered especially when one is doing research with children. Schools and teachers, in general, can be considered as being well in line with this. However, noteworthy is that informed consent is not asked from children or their families for taking part in schoolwork. If children are to take part in research activities, this is needed. In our projects, informed consent was asked in the projects A, B, C, and E, within which research data from children was collected. Children had a possibility to withdraw from the study in any phase and also to inform us during or after the project that they do not wish the data of them to be used for research purposes.

Freely choosing to participate or decline. This is a bit problematic issue: in schoolwork, children cannot freely choose to participate or decline. Teachers decide what will happen during the lessons and children do not have a choice. In our projects, only in the first project the opportunity to decline was offered to children as the activities were not connected with any lessons. In the latter projects, the design work took place during lessons that the teacher had decided to offer to the pupils and considered important learning wise. The school context is somewhat problematic from this perspective: it forces children to take part and does not respect children's free will. If children's free will to take part is a central philosophy, another kind of setting might be more appropriate for children's participation.

Accessibility in scheduling and location. This is again one of the strengths of the school context: it is accessible for children in scheduling and location. In our projects there were no problems related to this as regards the children. However, for subject matter teachers, i.e. teachers who do not teach their own class related to all subjects, but instead only their own subject for many classes, scheduling in this kind of project might be challenging. Here, negotiation and collaboration with other teachers may be needed and the involved teachers indicated that their whole schools should actually be involved in this kind of projects to alleviate these challenges. They also pointed out that the planning of this kind of projects should be started several months in advance so that meaningful arrangements can be made in the school.

Conditions of Social Support

Respecting children as human beings with essential worth and dignity. This should be an essential starting point for all work with children, in schools as well as elsewhere. However, our project data does not offer any particular insights related to this. On the other hand, teachers were in the classroom during our sessions and they should be well equipped for catering for this type of issues. However, we still acknowledge that problems related to these types of matters (e.g. bullying) exist in school.

Mutual respect among participants. This is a related issue that we hope has realized in our projects; at least our data does not offer any other evidence.

Support and encouragement among children. Again, this is something that teachers and schools should be catering for, while we acknowledge that bullying is taking place in schools and it is challenging to eliminate it. Naturally, teachers and researchers should keep their eyes open to ensure that this criterion realizes in all design projects. This issue, again, does not show very clearly in our data. In project D there was an initial worry about bullying, but it did not realize in the project. In project E, on the other hand, there was discussion about the good group spirit in the class due to the joint design project, which indicates that this criterion probably realized.

Conditions for Competence

Children having real responsibility and influence. In school work, children should have responsibility and influence to a certain extent, especially taking responsibility of their own work and learning, while usually they do not have that much influence on other issues in the school context. On the other hand, schools should be teaching active citizenship related matters to children, and in Finland they have imple-

mented means such as student bodies and feedback mechanisms through which children can voice their opinions and try to influence things more broadly. Overall, schools can be considered as quite suitable settings related to this criterion. In our projects this has varied quite a lot. In project A, children only filled in a questionnaire and took part in an interview and an evaluation study. In project B, children were invited to choose the game concept that became implemented, and in the end to take part in usability testing of the game. Project C placed the children into the most prominent role of all the projects: children got to ideate the game, to design it, and to test it, truly having responsibility and influence. In projects D and E, the teachers ideated the game, while children designed and tested it; in project D some children were also involved in coding it. Worth noticing is that in projects C, D and E the teachers were in very influential roles as they were in the projects' steering groups making decisions on them. Some children could have been invited there, too, but this option was not considered in these projects.

Children understanding and having a part in defining the goals of the activity. In the school context, goals of activities are not usually defined by children. The goals tend to be learning goals and children's opinions are not typically asked related to those. It is also an open question how well children understand those goals, i.e. whether they are informed about their learning goals or not. Hence, schools overall do not support this particularly well. In our projects, however, a lot of emphasis has been placed at least on making the goals understandable for children: in the initial projects, the researchers explained the goals to the children, while in the latter projects also teachers reported of having taken the responsibility of this. However, only in project C the children were really involved in setting the goals for the project. In the other ones, the researchers or teachers were responsible of this. The teachers were also in a very significant role learning wise: in addition to our goal of educating the children, they identified learning goals that fitted with the existing curriculum for the projects. This is also an important issue to be taken care of if working in the school context.

Children making decisions and accomplishing goals, with access to the information they need to make informed decisions. In schools, children are making decisions and accomplishing goals during their own learning activities, but more broadly they do not normally have much authority. In our projects, however, quite a lot of effort was placed on informing pupils so that they can make informed decisions; on the other hand, they were not allowed to make that many or that significant decisions, except in project C in which the children acted as decision-makers of the game. In projects B, D, and E, children acted as designers and design always involves decision-making, but at a different level.

Children helped to construct and express their views. Finnish teacher education places a lot of emphasis on this type of matters; hence, schools can be considered excelling in this. This is also something for which IDC research offers

a lot of useful tools and means. In our projects one can also say that a lot of effort was spent on this: the activities with children were carefully planned and executed so that children would be well equipped to ideate and express themselves. Two projects (C and E) also pointed out that teachers were very useful in helping in this: they ideated new ways of how to inspire and involve the children, e.g. also the quiet and reserved ones. We consider this to be something that the research community should take advantage of even more fully.

Fair sharing of opportunities to contribute and be heard. This is again something that schools and teachers should be taking care of, albeit it is a question mark how well they succeed in this. In our projects, the children had varying opportunities to contribute and to be heard: as informants, designers, evaluators, and decision-makers. On one hand, whole classes were included in these activities. On the other hand, there were some activities into which all pupils could not be included. Moreover, some pupils were more eager to take part than others but in some projects special effort was placed on involving all. On a general level this criterion realized quite well, while on a detailed level during the activities this is an open question. Interestingly, one teacher indicated that she would have liked to be more involved in game design. Maybe in the future also teachers' opportunities to contribute and to be heard should be considered more.

Occasions for graduated development of competence. Development of competence is something that schools truly strive for. We also assume that all involved pupils learned something valuable in our projects. In project A, they discussed their reading habits, hobbies, and mobile technology usage habits and were familiarized with the concepts of new- and multi-literacies. In project B they were invited to evaluate different game concepts and a finished game in the end. New and useful things were likely offered to them through these activities. In the latter projects, the children were involved thorough a game development process that we consider to be very useful for them learning wise. The involved teachers also indicated that the children learned a lot of new and valuable things through the projects, e.g. related to game design, project work, group work, goal setting, and literacy. In addition, they indicated that they themselves learned a lot, e.g. about game design, software development, project work, and new teaching and learning methods. Pupils themselves highlighted e.g. game design and coding as something they learned. In the school context, the aspect of learning is definitely important. The learning goals set by teachers are important, but we consider our learning goals related to participation and design as essential, too. This should be negotiated with the teachers and a good fit with the curriculum should be found to legitimate the research project.

Processes to support children's engagement in issues they initiate themselves. In Finnish school environment, there are means for this (e.g. student bodies). So far, unfortunately, this has not been focused upon in our projects, while it is something that should be emphasized much more. A positive

issue is that from 4 out of 5 projects, the involved teachers have wanted to continue cooperation with us and with one teacher this has already realized. In the future, we wish many more teachers initiate this type of projects with their pupils and we will also stress to the teachers our wish to work based on children's interests, within the limits set by the curriculum. We wish for children to initiate design projects in the future and think that means for that, too, should be provided.

Tangible outcomes. In schoolwork there are no specific requirements related to this. However, all our design projects (from B to E) resulted in a tangible outcome, i.e. a game and/or a game editor. In project A, the results were only reports, master's theses, and scientific publications. In project B, a game was implemented and published widely, but it is uncertain how visible this was for the involved pupils. In the latter projects, we ensured that the pupils were aware of the finished game and we consider this to be an important criterion in projects with children.

Conditions for Reflection
Transparency at all stages of decision-making. In schools, there is not necessarily that much transparency in decision-making. Thus, this is something that we need to support ourselves. In project C the pupils were in a very influential position and there probably was transparency in the project. In project A, on the other hand, not much information was given to the pupils and adults were the sole decision-makers. Project B invited the pupils to select the game concept and to evaluate the game, but otherwise the process was not transparent at all. Projects D and E gave children quite a lot of power to design the game. Some children were even involved in coding the game. However, the children were not invited as actual decision-makers into these projects. Moreover, in all these projects a lot of decision-making took place in the steering group level and it was not made visible for the children. This could and should have been done, though.

Children understanding the reasons for outcomes. In schools, it depends on the outcome in question whether this is the case. Grading, for example, should be explained to pupils, while the learning goals and the decisions made in the level of curriculum are not necessarily that well explained. In our projects, the children were involved in certain activities and, based on those, had some understanding of the reasons for the outcomes. But children were also left out of some arenas of decision-making and due to that, reasons for some outcomes probably were not clear to them.

Opportunities for critical reflection. Critical reflection is something that schools and teachers should be encouraging in children and they should have means and tools for that, which we researchers should try to take better advantage of. Our projects varied in this respect. In the first two projects, no reflection was initiated among the pupils, while in the latter three projects the evaluations of the games carried out probably aroused some reflection in the pupils, as well as in the teachers. However, critical reflection means much more than just organizing different kinds of user evaluations,

which we mainly did. We consider this as an issue that should be supported better thorough the process.

Opportunities for evaluation both at group and individual levels. Evaluation is an essential aspect in schoolwork. However, evaluation as used in the school system was not integrated into our projects. The teachers pointed out that they had informed the pupils that no grades are to be given on this work. However, all our projects included evaluation of some sort. In project A, the pupils evaluated mobile reading devices, in B the game concepts and the game developed, in C the game and the editor developed, and in D and E again the game itself. In projects D and E, the testers were pupils outside the involved classes and children who had designed the game were invited to act as test organizers and facilitators together with the researchers. Moreover, teachers and children were invited to evaluate the process in projects C, D and E: the teachers were interviewed and the pupils were invited to evaluate the process through interviews or essay writing. Hence, evaluation has been an essential part of the projects, while we think that evaluating the process itself could have been even more systematically organized.

Participants deliberately negotiating differences in power. This is something that has been criticized in previous research as a limitation of the school context: teachers are in the position of power and it is not negotiated, which may negatively impact the design sessions. In the Finnish school system teachers are not necessarily that big authority figures anymore, but definitely (and luckily) they still have some authority in the classroom. In our projects the handling of this issue varied. In projects A, D, and E this was not addressed, while in projects B and C researchers tried hard to reduce the power difference among them and the pupils, following the advice given in the IDC literature. The design work, however, took place in a classroom and teachers were present; hence, some existing power dynamics very likely influenced the workings of these projects, too. This issue should be discussed explicitly with teachers and its impact on the design process should be collaboratively considered.

DISCUSSION
Next, we will discuss the implications of our results.

Foregrounding Values and Goals
We have pointed out that schools are a particularly suitable site for researchers interested in technology design with children to enter into, in certain occasions. In line with the existing literature [11, 12, 32], we suggest, however, that researchers first of all examine their own values regarding children's participation. Based on that, they can determine whether they see some value in supporting genuine participation of children and in using e.g. criteria presented by Chawla and Heft [2]. Here, important is to consider the goals set for children's participation in technology design. One way is to think of them as a continuum where in one end is the material outcome, e.g. a high-quality service or product, as an essential goal for the project, and in the other end is children's learning, valuable as such and more significant

than the material outcome [2]. If one sees more value in *learning* itself, i.e., if a researcher considers that it is most valuable that children participate in technology design to learn in the process, even when the outcome of that process is not very useful, and due to this wishes to reach a broad range of children, school is a very suitable setting. Hence, if the project goals are related to enhancing children's skills for acting as full society members [30], we recommend entering the school context. Graduated development of competence of children is something that schools strive for and thus provide a fruitful setting for researchers with interest in educating and empowering children in democratic sense. In school there are also built-in values and practices that support democratic participation of children that fit with the Scandinavian PD tradition and its values such as empowerment [12].

On the other hand, if the *material outcome* of the process is especially important, e.g. if there is a need and interest in a company to collaborate with children to create a high-quality new product fitting children's lifeworld and inspiring them, school may be a somewhat problematic context, as it is not very flexible and fast reacting environment and within which projects often should be planned well beforehand and integrated well with the curriculum [4, 27]. Moreover, in schools it is typical to work with whole classes, and this may lead to including unmotivated participants who do not necessarily take the process seriously and can even give wrong information [11], resulting in wrong decisions regarding the product. Overall, for a high-quality product it might be necessary to educate and cooperate with a more limited number of child participants for an extended period of time, gradually offering them skills to contribute as true design partners [4, 5, 8]. While working modes that support commercial interests can be created also for the school context, if all parties see value in them and are able to find a fit in their interests, for material outcome related goals school may not be an ideal context. Then again, important is also to acknowledge that learning and material outcome are only the far ends of the continuum and different kinds of combinations can and do exist between them. Chawla and Heft's [2] criteria can act as a discussion base for examining projects' values and goals, but the genuineness of children's participation is not dependent on in which spot of the continuum the goals are positioned.

Striving towards More Genuine Participation

We maintain that in school context as well as elsewhere, we should act as the advocates for children's genuine participation. In the school context and classroom, there are several hindering factors present despite all the benefits mentioned. In schools there isn't a strong tradition of inviting children to act as actual decision-makers in issues concerning their life. We should thus support this, e.g. by inviting children into the steering groups of these projects in a similar manner than teachers have been invited. Children should be invited to make decisions on the goals of the projects and we should support children better to initiate issues, themselves. Power relations between children and teachers (e.g. [4, 5]) should be carefully considered and a culturally appropriate way to

address them should be found. We should also encourage children in critical reflection thorough the process as well as offer them possibilities to evaluate both the process and the product. They should be considered as important evaluators of the overall success of a project. We should also develop means and tools with which to address the power dynamics in the classroom, but do it in close cooperation with teachers. Teachers, at least in Finland, seem to be eager to take part in this kind of projects, because of the ongoing curriculum reform. It seems that cooperation with us on game design is an attractive opportunity for teachers to take care of their new programming related teaching duties.

Open Questions

Our five projects in the school context enable us to point out some challenges and considerations for the research community to ponder. Among those is the question of who should be involved in this kind of projects in the school context: when the selection is fair, should all be included or only the eager ones (cf. [11])? If the topic is considered very valuable learning wise, is it legitimate to forcefully include all in such a case? Another challenge concerns some design and evaluation sessions, in which it has not been possible to include everybody due to practical reasons. Should we try to include all and just organize things in a less optimal way due to this? If we consider the topic to be significant learning wise, we probably should. Another question concerns the integration of children's own issues and interests: how far should we go (cf. [11])? Children's own issues and interests may be quite far away from the issues and interests of teachers and researchers. Teachers have their own issues and interests, too, and definitely those cannot be neglected, if one wishes to work in the school context. There needs to be some balancing between these different issues and interests to serve the different stakeholders. Although children's genuine participation is aimed at, it cannot be accomplished in a vacuum.

CONCLUSION

In this paper we critically considered, following the lens discussed by Chawla and Heft [2], in which respects school context supports genuine participation of children in technology design and in which respects it poses challenges for it. We can conclude that there are definite challenges regarding participation ideals when working with children in the school context as well as obvious benefits that the school context offers. Next, we discuss some implications for designers having interest in advocating genuine participation of children.

School context supporting genuine participation. For designers emphasizing genuine participation of children, school is definitely a suitable place to enter into. Particularly suitable it is for design projects focusing more on learning goals than high quality material outcomes. Schools aim at enhancing children's skills for acting as full society members. Graduated development of competence of children is the schools' principal task. Schools also often have existing structures and practices supporting children's participation and a recommendation to integrate children's own issues and

interests into teaching. Schools and teachers should be interested in offering children possibilities to take responsibility and have influence on various kinds of issues. Therefore, schools and teachers should be welcoming designers advocating genuine participation of children. In addition, critical reflection and evaluation are integrated into the school system in various ways from which we should learn. Teachers should also be well equipped to ensure that children are treated with respect and dignity, to help children to express and construct their views, and to explain things in an understandable manner to children (cf. [16, 20, 25, 27]). All this forms a valuable basis for cooperation with schools. Designers entering the school context should try to take advantage of the available expertise there.

Challenges for genuine participation in school context. However, we do not recommend designers entering the school context in every situation. This context may not be an ideal setting if the project goals are very material outcome oriented. If companies are involved and the aim is to create an actual new product or service for children, working e.g. in a lab environment with a smaller group of dedicated children might be a more suitable solution. In addition, possibilities to implement some of the ideals related to genuine participation of children might be quite limited in the school context. Designers having strong will for genuine participation of children should be prepared for this. There might be a lot of limitations on what kind of issues children can have an influence. In the school context, children's empowerment to act as decision-makers in issues concerning their life realizes in quite a limited sense, which may be a reason to choose another setting for the design work. Moreover, design projects necessitate extra work from teachers who need to have a genuine will and interest to take part. Pedagogical justification for children's participation in the projects is needed. If a project is not well integrated with the existing learning goals and curriculum, working in the school context may be very difficult. Additionally, schools may be inflexible and slow partners. Scheduling, planning the work, and initiating collaboration inside school may require a lot of work (cf. [4, 18, 27]). Moreover, in the school context and during lessons children do not have the opportunity to decline taking part in the activities. If teacher has decided to offer these activities to pupils and considered them important learning wise, children do not have a choice. If this choice is considered important, the school context is not suitable. Overall, the existing power relations (cf. [4, 5]) might be quite difficult to change in the school context.

As to the limitations of the study, it has been conducted within the Finnish school system and the values dominant in other countries may be different. We argue, however, that even though some of the findings are likely to be specific to how Finnish society has set up the school system, the core value for schools all around the world is children's learning. We have tried to be as open as possible when discussing our own projects, to make it easier to have similar kind of considerations within other school systems. We also want to

point out that especially our results related to projects' goal orientation – learning vs. material outcome – are likely to be generalizable and worth examination in other countries, too.

As a limitation, we would also like to highlight that the criteria we used [2] needed a lot of interpretation when used as a sensitizing lens: the criteria include overlapping or quite vague formulations. We offer one interpretation of these criteria – their meaning in practice in technology design with children. It would be also interesting to study in the future if there are some additional or different criteria for children's genuine participation, outside of the ones we used here, that would be useful when designing technology with children.

We have examined only five projects that naturally are very specific in many respects. More variety could be included, e.g., through working with younger children, several teachers and classes, or with even more thoroughly implemented criteria of genuine participation. Gender and cultural aspects could be examined, too. The findings of this study could be considered also in out-of-school design and computing projects, which are popular nowadays around the globe and may see genuine participation of children as a valuable goal, too. This paper does not allow children themselves to voice their opinions on the matters, while this is also an interesting and significant path for future work. Our projects show that there are opportunities for the graduated development of competence for all the involved parties: children, teachers, and researchers. We don't know yet how our projects have affected the work practices at the participating schools; this needs to be found out. In the future, even more child-led projects should be experimented with, but also the inclusion and appreciation of teachers and their expertise needs future work. The impact of our findings on children's learning or their standard evaluation was not in focus in this paper; those could also be interesting future research areas.

To conclude, supporting children in their social, intellectual, and creative growth are core values among IDC researchers [32] and for them to realize, school is in many ways an appropriate, albeit somewhat challenging, context.

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