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A comparative study into how pupils can play different roles in co-design activities

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ABSTRACT

We explore the roles children play in the design and evaluation of technological tools in a formal educational environment. In order to do so, we describe two separate projects set in a formal educational context: primary schools, with children aged 8–10, in Switzerland (called PADS), and with older students, 11–12, in Scotland (called CHIS). In the first case the teacher and pupils were co-designing a novel application to support the creation of multimedia fairy tales, where in the second, students and teachers worked towards the definition of new tools to assist them in searching for information. The tasks were different but comparable in terms of complexity and level of interest expressed by children. Researchers followed a similar approach in order to interact with the stakeholders. We here describe the different attitudes and assumptions of the adults involved. In the Scottish study these encouraged students to make choices, propose solutions and work independently. In the Swiss study these aimed at supporting children use of digital media and artefacts for the creation of a digital fairy tale. Our investigation aims at getting a better understanding of the kind of roles and contributions young users could bring to collaborative design and how to better engage and motivate them.

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1. Introduction

There is a rich literature discussing why and describing how involving children in collaborative design is beneficial for all stakeholders. Here we want to explore the many nuances of this involvement and the implications in terms of roles and assumptions made about children's ability to contribute to design, and what form this contribution can take. Specifically, we target scenarios where activities are set directly by teachers in a formal educational environment as part of the school curriculum.

In this pilot study we set out to explore what are the conditions that impact on children's levels of participation in co-design activities, as well as on the roles that children play within the co-design process.

We approach this exploration by collecting and analysing data from two case studies that differ in the main research question but converge on the approach used for involving young users in terms of: types of activity, methods, quality of participation, contribution and overall significance of data gathered. The two case studies ran in different European countries: Scotland and Switzerland. In the Scottish study, students were asked to engage with search-related activities according to their teachers' instructions. The focus of the project was on *gathering a rich corpus of data about how students choose their search strategies and how influenced they are by many factors* (including: available technology/resources and familiarity with these, guidance from teachers and peers, complexity of task and overall intrinsic and extrinsic motivations). Thus, it concentrates on a specific aspect of designing with children, that of gathering effective user requirements. Children were observed over several months in order to understand their practices and were mainly acting as informants, not only by being involved in interviews and focus groups, but most crucially, by naturally taking control of the assigned task and performing it from beginning to end in a critical fashion.

The Swiss project aimed at *exploring the extent to which digital technology can support primary school curriculum enactment and investigated how to introduce it into existing practices.* One of the outcomes was the design of a novel application for the creation of multimedia fairy tales in school. We here describe how children were involved in its collaborative design and specifically focus on their role as evaluators.

In both projects the teachers and children had an important role in defining and performing the tasks. By looking at the evidence that emerged from the data of the two projects we explore the different roles that children of similar age played in the co-design

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process [1]. With the understanding of the two projects' diverse aims and purposes, we bring some light to the many factors to be considered by researchers when designing with and for children in a formal educational context.

We start with our literature review describing co-design projects involving children and more specifically those taking place in a formal school context. We will focus on studies defining conditions and principles for ensuring children's participation and engagement. We will use these to describe the two projects and the influence that teachers had on the roles that children played in each of them. From the analysis of the data produced by the projects we will interpret how children's participation and engagement varied according to the way in which teachers instructed them, and finally we will discuss how our findings can help to inform future research.

2. Literature review

The role of children and their engagement in the design process has been a key issue in the Children–Computer Interaction (CCI) community. For instance, in 1999 Druin in her seminal work [2] discussed the potential roles of children in the design process following a co-design perspective. Indeed, pupils in co-design are often included as part of the team with adults. The Cooperative Inquiry method defines well the roles that children can play in the different phases of the process [2] in an intergenerational team. Druin originally defined four different roles: user, tester, informant and design partners. However, even if this framework is extremely valid from a theoretical as well as a practical point of view, the boundaries between the roles are blurred [3]. By reflecting on the political value of the design process as a means to empower its actors, Iversen et al. [4] provide an interesting insight into how to make children truly protagonists in the process.

Considering specific projects in the field of writing and reading Summers et al. [5] engaged children as "research partners" for the design of a digital library for kids. They became members of the research team and performed inquiries with their peers in order to gather a consistent understanding of reading activities for children aged 9–14. The engagement of children within the design and the research had definite positive aspects. However, as researchers it is fundamental to take into consideration children's rights and their need to understand how their ideas are used in the process. Indeed, the research community has been paying more and more attention to the ethical aspects of including pupils equally in a design process mainly driven by adults [6]. The value of stakeholders' participation in the process is extremely relevant. This issue is pretty urgent in the formal educational context since this context has specific requirements that must be taken into account by the research team. In this perspective the CARSS model [7] brings all stakeholders' perspectives together by providing a framework for designing and conducting co-design activities in a formal learning environment. CARSS stands for Context, Activities, Roles, Stakeholders and Skills. This model considers children as subjects who are in the process of learning a specific concept as well as learning to use the introduced technology. Where Druin's framework helps to stimulate pupils to co-design and to imagine something that does not exist already, CARSS considers also the pedagogical aspects and other practical issues specific to being in a school. Moreover, Dodero [8] showed how in this context it is critical to find a good balance between stimulating engagement of children and teachers in the co-design process and respecting the school environment and curriculum. Mazzone et al. [9] developed a framework for meaningful design activities based on a study carried out for the design of a music device for children by involving researchers from different disciplines and children from different schools. They reflected on what happened during the design activities and the materials produced therein and aimed to understand how these activities contributed to the design and whether these had involved children in the process in a suitable way. The framework that emerged recommended: involving the teacher/education expert before and during the session to assure the suitability of the tasks for children and to better ensure that activities would be done in a controlled way. They further suggested using props to get children started on an activity and the use of different media to encourage imaginative results. In addition, they recommended varying communication channels and using expressive tools familiar to children such as drawing or storytelling, to make children more at ease when creating and communicating ideas. They advised also that the progress of the activity as well as the end results be recorded in order to aid analysis and enhance understanding of outputs from the activity. Finally, they proposed using experts from different disciplines to analyse the results in order to better assess the relevance of the outputs to the design goal. While in their study they paid some attention to the effects of the procedure and methods used, they argue also that the management of activities in co-design sessions deserves to be studied further. Here is situated the work of Ivari and Kinnula [10] who focused on understanding the genuine participation of children in research projects in school, how the context poses challenges for this, and what this implies for designing with children. Their key recommendation was that researchers must critically examine the goals set for children's participation in design and think carefully about whether these goals are learning-oriented or material outcome-oriented. Ivari and Kinnula [10] suggest taking the research they have conducted further by introducing greater variety e.g., by working with younger children, several teachers and classes, or with even more thoroughly implemented criteria of genuine participation and perhaps to examine gender and cultural aspects of this participation. In particular they discuss using the criteria extracted by Chawla and Heft [11] to assess how genuine participation of children in co-design activities in a school context is:

1. **Conditions of Convergence**: describes how the project should converge in as many aspects as possible to the existing school ethos and curricular activities but also focus on children's genuine interests.
2. **Conditions of Entry**: is about making sure recruiting and involving children in the project happens via informed consent from them and their families. Entry can also be managed directly by the school for projects that totally overlap with the existing curriculum.
3. **Conditions of Social Support**: deals with support and encouragement among participants in the co-design activity.
4. **Conditions for Competence**: where children have a real opportunity to develop new competences, take responsibility for their decisions and see their contribution making a difference, possibly in terms of a physical outcome.
5. **Conditions for Reflection**: enables children to reflect on the overall experience and understand how decisions were taken and outcomes produced. Children can also take part in evaluation exercises in order to assess how an activity (or even the full project) was run by groups or individual participants.

These conditions were originally devised to support children's participation when planning project phases in community settings and were successfully used by Ivari and Kinnula [10] to describe genuine participation in a number of co-design projects in the school context. Furthermore, these are pretty much in line with the principles of a framework designed by Engle and Conant [12] for promoting *productive disciplinary engagement* in the same formal context. Productive disciplinary engagement refers explicitly to

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