Open Issues with Collaborative Design in Schools: What is in it for us?

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Abstract
The focus of our work is on how to design a user experience for children using digital artefacts in an educational environment. Specifically, in the paper we reported the outcomes of a longitudinal study in which teachers and children were involved within a co-design process. We illustrated some opportunities and constraints of designing for and with schools' stakeholders. Our contribution explores one of the workshop's challenges concerning *the confirmation bias and limited decision making* and how this affects children in their CD experiences in formal school context.

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Children, Computer, Interaction; School; Formal, learning; Design, roles; Design, stages; Evaluation.

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

Introduction
This paper discusses how the Collaborative Design (CD) approach has been and can be further adapted to a formal setting such as that of primary school. School and formal education settings are contexts that afford specific design opportunities and constraints. Indeed,

Figure 1 Children in class during the analysis phase

Figure 2 Children creating stories using Fiabot!

Figure 3 Children reading the story with Fiabot!

including the perspective of children in the design of technology for educational purposes requires to consider a number of factors. The purpose of this paper is to provoke discussion around the benefits and the costs of using such approach in a formal educational environment and to highlight the issues regarding the confirmation bias and limited decision making in this contexts. The next section will describe the concept of CD, why and how it needs to be adapted to fit into the school context. We will then briefly present project PADS (Paper and Digital resources in School). Finally, we will analyse in great detail the open issues with CD in school in the light of our experience.

Literature Review

CD [3] is routed on the tradition of Participatory Design (PD) [2]: the stakeholders are engaged actively in the process and their ideas and perspectives become part of the solution. Applying CD in Children-Computer Interaction (CCI) makes children the main protagonists in the design process in which they can play different roles. The CD techniques and methods applied in formal education need to consider the specific issues of this field. As suggested by Dodero [1] designing with and for children in an educational environment means to include different specific factors. One of those concerns with measuring the benefits of the intervention in terms of evaluating the achievement of the school curriculum objectives. Following we present the research project, PADS, and some reflections by using the Dodero model.

CD for Project PADS

PADS project began in 2009 and lasted for 6 years [4]. Its purpose was to *design technology for supporting teaching and learning in primary schools with a specific focus on the acquisition of reading and writing skills.*

We involved two primary schools from our local area in Switzerland. Approximately 130 pupils (ages 6 to 12), and 7 teachers were actively engaged. We addressed a specific topic of the curriculum: the literary genre and the writing laboratory. We followed a design approach inspired by CD where qualitative data were gathered through contextual inquiry, observations in class, and focus groups. In every step of the process (requirement elicitation, design and prototyping, and evaluation) each set of data was transcribed, and analyzed separately. The outcome of PADS was the Fiabot! app. Here we use our experience to interpret the open issues in CD in school.

Open Issues with CD in Schools

Here we address the issues described in Dodero [1] and expand them according to our experience.

Learning Benefits were crucial for all stakeholders. Our experience points towards the importance of working closely with teachers and share their learning objectives and practices. We realized that teaching has a flexible dimension and teachers can be open and quick in adopting new technology if they can see benefits for their pupils in terms of higher levels of engagement with the topic. During the project teachers expanded their learning objectives to include element of digital literacy. We managed to **measure the learning benefits** directly by asking teachers to evaluate children's stories. As well as indirectly by observing the changes in teachers' and children's attitudes during our long-term study. Teachers defined specific criteria to evaluate the process of creation as well as the story itself. They noticed how children using Fiabot! were very active in sharing tasks and producing multimedia content. In addition, we recorded

children's overall enjoyment and teachers' emotional response in terms of enthusiasm and motivation. For instance, in one class Fiabot! was used independently for running a school activity where children shared the stories they created with families and peers. We interpreted the will to use Fiabot! outside the research-planned activity as a sign of engagement of the app within the community.

Benefits for other Stakeholders. Teachers who took part in our project changed the way they looked at and made use of technology in their classes. They described the overall experience of taking part in the project as status enhancing. The perception colleagues had of their expertise and value improved too. Children reported that their parents started looking at technology as an opportunity for learning not a disruption. Indeed, pupils were encouraged to continue using tablets at home for informal learning related tasks, such as writing holiday diaries and reading newspaper online.

Timetable Constraints were unavoidable**.** The timetable was agreed with the school and the activities scheduled accordingly. Members of our team became part of the everyday school experience. Children got used to engage with researchers and the proposed tasks. They did so over a period of time enabling us to observe them in a naturalistic setting.

How to design Engaging Activities and Evaluate their level of Engagement on short and long term was the core question for project PADS**.** During the refinement and testing of Fiabot! teachers and children established an enthusiastic collaboration with the design team. Being able to use at school a tablet made children even keener to work on this activity. Interesting dynamics emerged as children were helping each other and provide support to teachers not so familiar with that type of technology. These were all indicators of the growing level of engagement the introduction of Fiabot! produced on children and teachers in terms of spontaneous adoption, emotional response and overall enjoyment. Finding the right balance for an activity to be a doable challenge is where the experience and expertise of our teachers was precious and became very visible in our long-term study.

Measuring levels of engagement was a difficult task even if we had a benchmark for comparison (the activity we observed before our intervention). We collected qualitative data via interviews, observations, and focus groups. In addition, we considered also how over the years children grew into wanting to engage more with our study and how contagious they were with their peers. We could witness overtime the growth in the desire to share their achievements with peers and family, together with the wish for more and repeated exercises using our system. Children commented on how fast time was passing when working on their story, the time flying sensation often reported when in flow with an activity. During the full length of the project, children and teachers played different **roles**. Children moved on from being told what to do during the initial stage, when they had a *limited decision making power* to improve their agency when trying out existing tools, and finally took leadership in using Fiabot! and evaluating it.

Requirements for Teachers and Students were kept to a minimum**.** We mostly asked teachers to perform tasks they would have conducted anyway as part of their daily job. Teachers provided great support and

deep insight when organizing children in groups, setting up engaging activities, defining grids for evaluating their stories. Children engaged easily with activities defined by their teachers and equally naturally accepted after few meetings the presence and support offered by the research team. Crucial to the success of the various activities was the **organization of learners in groups**. Teachers could use their experience and knowledge of pupils' personality, strengths and weakness. They knew exactly how each child would react to the others and which combination would provide a more creative, productive and overall positive experience versus one that would generate conflicts and enable them to explore the social dynamics in the class. If teachers wanted the children to focus on content understanding and acquisition they will use the positive collaboration approach; on the contrary, if they aimed to enhance socialization, they will go for the conflict collaboration strategy. Teachers and children were free to choose **how to organize learning environments** and use available spaces. The school building with its familiar spaces was an ideal setting for children to explore and pick the most suitable room for them to use. Library, common rooms, corridors, courtyard and even toilets were selected to serve different needs at various stages. By using iPad™ pupils could move around and share devices on the go.

Conclusions

Our long-term and extensive experience in two schools allowed us to better understand the breakthrough and breakdown of the CD approach in an educational environment. The issues we have just described should be cautiously considered when planning to apply CD in such a context. With the caveat that the problem space concerns not just the children perspective but it needs to include the school curriculum specifics as well as the teachers' point of view. *It is important to notice how even in such as formal setting, overtime, children moved on from a limited decision making situation to become more independent and assertive*. Teachers commented on how the introduction of technology affected positively pupils beyond the CD activities. As researchers, we want to investigate the many factors behind this change and how the contribution children made to the CD process developed over time. Currently we are working to produce a framework inspired by our experience that would support researchers in this exciting adventure.

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