Designing Playful, Tangible Self-report Tools to Give the Child a Voice

Abstract
This paper describes the exploration of the development of tangible quantitative self-report tools for children to reliably measure the subjective effect of pedagogically framed play. In this work in progress the method and process of designing self-report tools with and for children aged 6 to 9 years is described. Empirical findings are contributed to the field of interaction design and children for measuring the subjective effect of pedagogically framed play from the perspective of the child, by exploring embodied tangible formats.

Author Keywords
Self-report; tangibility; embodiment; user centered design; the voice of the child; play.

CSS Concepts
• Human-centered computing ~ Human computer interaction (HCI) ~ Interaction devices ~ Haptic devices

Introduction
Recent studies shown the importance of play and participation in play for social inclusion in schools [4]. It is crucial to include children in the design process of these play practices [16]. At the same time there is a demand for measuring the impact of play interventions from the perspective of a child. However, child self-
**Play-factor**
The design challenge will be based on the psychometric process of developing 'Play-factor': A tool intended to measure children’s experiences of good and bad play experiences, in order to both map the area from a child’s perspective and potentially create a series of scales to evaluate play. The current iteration of ‘Play-factor’ structure contains seven subscales, based on episodic interviews with children and their phrases of how to describe their experiences of being involved in play activities. These phrases are currently organised into seven factors and 35 items[10, 15]. These factors include: 1) That play feeling; 2) The barrier; 3) Imaginative; 4) Wild and physical; 5) Big play; 6) Silliness and transgression; 7) Our play.

**Related work**

**Child self-report**

Self-report can provide us with data for which users are required to have optimal linguistic and reflecting skills [11]. As these skills are suboptimal with children, previous research has focused on alternative methods to conduct surveys that are understandable for children. For example Sorémo [6]; the ‘Fun Semantic Differential Scale’ [17]; the ‘Fun Toolkit’ [14, 13], including the ‘Smileyometer’, the ‘FunSorter’, ‘Again Again Table’, and the ‘Self-Assessment Manikin’ for children (SAM) [8]. Hayashi et al. [8] presented successfully a tangible version of SAM and proved the benefits of this tangible format. However it was used to collect children’s affective responses and it still leaves space for interpretation. Furthermore, this complicates self-reporting, due to inefficiency in analyzing with a large sample. In addition, children tend to satisfice rather than optimize when conducting a survey, whereas optimizing is regarded as the preferred process. The satisficing theory identifies optimizing and satisficing as two processes that attribute to differences in the reliability of survey responses [9]. Optimizing implies that the user goes thoughtful through all stages of the question-answer process [3]. Meaning s/he understands and interprets the question; retrieves the relevant information; integrates this into a judgement, and reports this judgement by translating it to the format of the presented response scale. Satisficing occurs when a user gives a superficial, acceptable response, without going thoughtful through the stages. [3]. The level of optimizing relates to the motivation of the respondent, difficulties of the task and the cognitive abilities of the user. When a child misunderstands the question or finds it difficult to answer, it will be more tended to a satisficing approach rather than an optimizing one [13]. Therefore, the goal of our project is to meet the children where they are and to explore how one can increase motivation, decrease difficulty and take cognitive abilities into consideration.

**Tangible self-report**

Tangibles are physically based forms which can be touched, felt and manipulated [1]. Particularly for children, there are clear advances to a tangible and/or embodied, non-verbal way of transferring information [11, 2]. According to Antle et. al. [2] children are able to act on preconscious knowledge, though they are not able to verbalize it yet. According to Pasch [11] a lot can be learned about a child’s affective state through cues from an embodied interaction. In this paper we explore how a tangible and embodied tool can support us in understanding the child’s perceived play experience. There are several studies which made use of tangible playful surveys. For example, the ‘Voxbox’ for adults and ‘Small Talk’ for children in which they explore how a tangible system can gather opinions in a
playful and engaging way \[5,7\]. However, there were disadvantages by conducting a similar method for adults as for children. The answering method – clicking, sliding or pushing a limited option - did not seem to come close to the child’s way of expressing. Therefore, we want to explore how we can come closer to that and provide a format they can express themselves with and in addition, collect data which is easy to analyze and visualize for large samples of children.

**Method**
In this work in progress we take you through two iterations where we attempt to design tangible embodied tools to measure the subjective effect of pedagogically framed play.

**Design process**
An user-centered design approach has been followed, combining various methods to iteratively develop the tool and develop an understanding of the requirements and qualities needed for such a tool.

**Play-factor**
As described in the side bar on the previous page, the design challenge uses the items and questions of the ‘Play-factor’, which is based on children’s own phrases and words about play experiences. The challenge in this design project is not to develop the factors and the items of the ‘Play-factor’, but to translate the questions of the ‘Play-factor’ into a more tangible format that fits the child’s way of expressing.

**Study design**
We evaluated two prototypes with children from two different schools in Århus, Denmark. The evaluation of the first prototype was carried out in collaboration with 16 children from the two different schools, aged 6-9 years. All children answered eight questions through interacting with the items on the box. The evaluation of the second prototype was carried out with 11 children from one of the schools, aged 6 to 9 years.

**Data analysis**
The evaluation was video-taped and analyzed through a qualitative analysis and a limited descriptive quantitative analysis to indicate optimizing or satisficing. The data of all participants were pseudonymized. An observation table was used to indicate insights in behavior; the interaction, moments of confusion and attitudes concerning the tools.

**Cycle one | Design exploration of ‘Forestil dig det’**
Design
As most children aged 6 to 9 years, do not have excellent linguistic skills, we designed a box in which the factors were translated into a visual tangible format. Through literature research in storytelling and drawing, sketching and low-fi prototyping, the factors of ”Play-factor” were translated into visual tangible images. This resulted into ‘Forestil dig det’. It translates the questions into a more visual and tangible design and into the way of interacting with the prototype. This way, we aimed to enhance the child’s embodied way of explaining experiences, and to gather convenient data.

**Analyzing the first design exploration**
It appeared that children aged 8 and older were able to use ‘Forestil dig det’ to answer the factors. Children under 8 years of age had a lot of difficulties with ‘Forestil dig det’. They took the items very literally and found it confusing and difficult to answer this way. Except the sliders (figure 2), added in the last item.
They found that interaction easy and intuitive to interact with to answer the question.

**CYCLE 2 | DESIGN EXPLORATION OF ‘MUPPER’**

**Requirements**

Transferring text-based questions into visual, tangible, de-constructed images of the question as shown in cycle one, did not support our participants. As our participants considered the slider as intuitive, the tool should contain a slider effect or an equivalent of this effect. The tool should guide children intuitively through all stages of the question-answer process and should meet them cognitively where they are [3].

**Design**

To meet them where they are, we searched for activities and embodied gestures that would fit the task of explaining a level of agreement. Based on field research and evaluations, we chose to focus on one embodied interaction. This resulted in the design of ‘Mupper’. ‘Mupper’ is a tool that can be pulled out like an accordion and pressed back in again. The tool contains a screen with an application running, which will guide the children through the four stages of the question-answer process [3]. One can find the examples of the application screens in the side bar on page 6, figure 9, 10 and 11. We hypothesized that this movement mimics the expression/gesture of showing how much or how big something is and therefore go thoughtful and intuitive through the stages.

**Results**

Children who used ‘Mupper’ in cycle two were matched well. The children did not only provide high or low answers, they switched between one to five on the Likert Scale. In the evaluation afterwards, multiple children mentioned it being fun and helpful with expressing. One child mentioned: “It helped me talk without talking”. We have indications that this type of embodied interaction comes close to the child’s way of expressing and therefore helps them to integrate a judgement and report this judgement by translating it to the presented format. The storytelling and the reminders of the character “Mup” guided the children through the questions and helped them interpreting the question and retrieving the relevant information. The design of the “Mupper” could be improved, it sometimes fell over and was a bit inconvenient to hold for the smaller children. Furthermore, the movement of pulling the string out and back in again seemed exciting. However, this resulted in one child playing with the tool instead of answering the questions.

**Discussion**

As we mentioned in the introduction, when a child misunderstands the question or finds it difficult to answer, it will not walk thoughtfully through all stages of the question-answer process and be more tended to satisfice instead of optimize. Our work revealed that transferring text-based questions into visual, tangible, de-constructed images of the question as shown in cycle one: ‘Forestil dig det’, did not really support our participants to be able to answer the questions. It showed us that an embodied interaction, as shown in cycle two: ‘Mupper’, came closer to the child’s way of expression and that this helped them to go thoughtful through to all four stages of question-answer process. More research is needed, however we have preliminary indications that we could overcome the problem of
having difficulties with answering by focusing on bodily involvement. We could see that the embodied interaction especially helped them with the last two stages: integrate a judgement and report this judgement by translating it to the presented format. The design also supported their motivation of being involved. We have preliminary indications that by providing an embodied format that meets the children cognitively where they are and fits their way of expressing, we can stimulate motivation and confidence in completing the task and help them to go thoughtful and intuitive through all the stages of the question-answer process. Which could result in children choosing the optimizing approach instead of the satisficing one. An embodied tool like this could be a powerful way to get an understanding of their word and their voice.

This kind of work makes it possible to think about how one can involve the child’s perspective more into the design of measurement tools. Although this works only focuses on gathering play experiences, this work could also apply for a various of other areas where we could include the child’s perspective. This project makes it obvious that further exploration is needed. This way, more measurement tools that hopefully meet the child can be designed.

Conclusion
We developed quantitative self-report tools for children to reliably measure the subjective effect of pedagogically framed play. Our tangible tool that enables embodied interaction shows promising results. The evaluation showed that an embodied interaction, as shown in cycle two came closer to the child’s way of expression and helped them to go thoughtfully through to all four stages of question-answer process. Although we cannot generalize based on our small sample, we would like to see more explorations of embodied tools to get an understanding of children’s word and voice. Additionally, we will explore how we can design the context of use with children and teachers in both Dutch and Danish schools. This contains an exploration of how teachers could have a dialogue with children using the results of the measurements as a guideline for improving the play activities and enhancing inclusion. Constructing a cycle where child’s perspective gets involved in a higher extent.

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References


