EPPics: Enhanced Personalised Picture Stories

Sveva Valguarnera
sveva.valguarnera@usi.ch
Università della Svizzera Italiana
Lugano, Switzerland

ABSTRACT

EPPics is a project that focuses on the concept of creating personalised stories to foster pre-reading skills in preschool children. The children, together with their teachers and parents, are engaged as co-designers in a collaborative design approach. After describing the theoretical foundation of my work, I will detail the steps that I have taken so far: a preliminary user study conducted in a preschool in Lugano and a series of interviews to create child personas. I will then outline the next steps in my research: the design of a interactive storytelling app for children, and the design of a conversational agent to help parents read with their children.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; User studies.

KEYWORDS

personalised stories; storytelling; children; preschool; pre-reading skills; collaborative design; co-reading

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1 INTRODUCTION

Even before they start reading and writing, children are exposed to language and learn new words: in fact, the size of children's vocabulary when they enter first grade is an indicator of their reading comprehension and ability later on [23]. Traditional reading by adults (parents/teachers) has proved to have inconsistent effect on the development of language, on the contrary, the current research suggests that reading *with* children, interacting with them and adopting dialogic reading, can be more effective in the development of language [18] [23] [39]. However, co-reading is not the only way in which children develop literacy skills; storytelling - which is also interconnected with symbolic play, as children use both to enact narrative scenarios [26] also has an important role in literacy development [22] [28]. EPPics proposes to combine all these elements - co-reading, dialogic reading and storytelling - to design an authoring tool and help young children develop literacy skills, while also investigating the role of children as users and designers of technology, and promoting a collaborative approach, involving kindergarten children and teachers as co-designers.

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2 RELATED WORK

2.1 Children and teachers as design partners

Involving users in the design process has a positive effect on both the success of the system and the satisfaction of its users [19]. The process of co-design also has inherent ethical qualities, as users can express and share their experiences [33]. However, involving children as co-designers causes inherent challenges as it significantly slows down the design process; in a classroom setting, another challenge consists in the fact that teachers need to be involved, and to accommodate design activities during class times [12]. The ideal age for participatory design is between 7 and 10 years old, as children that age have a good capacity for reflection and abstractions, but they still lack preconceptions about the design domain [31]. Our project, however, focuses on children aged 3 to 6 years old. And as we are focusing on the formal contest of school, we investigate the role of teachers as design partners, which is especially important as we work with very young children, who are below the ideal age for taking part in participatory design. There is evidence that the involvement of kindergarten teachers in the design of technology for early literacy can have a positive effect on learning outcomes [9]; primary school teachers have also been involved in the co-design of technology for learning, resulting in them taking ownership and agency not only in the design, but also in the dissemination of the innovation [27].

2.2 Child Personas

Antle [2] [3] proposes an approach that is specific for the design of child-personas, which differ from adult personas for one important aspect: while adult personas are based on their task-oriented goals, child-personas are based on their specific needs, determined by their age and their level of development. The design of child-personas is also aimed at creating engaging experience; while there are some cases in which child-personas should also target specific tasks - for example, during the design of educational products - there should always be a focus on children's experiential desires. Antle's child-persona framework also takes into consideration children's developmental abilities, going beyond Piaget's stages of cognitive development and identifying different areas of child development, such as motor, social and cognitive development, in which children may have different abilities and limitations [3]. These facets are seen as areas for exploration, providing designers with elements they should pay attention to, instead of a specific set of rules. The cultural probes approach [13] [14], which consists in assigning users tasks to make them active contributors instead of simply

sources of data, has also been adapted for older (10-14 years old) children [16] [24] and used to design child personas.

2.3 eBooks

There is considerable research on the topic of eBook reading and co-reading for children, both for preschool and for older children who already know how to read. Print, basic and enhanced eBooks have been compared by Chiong et al. [8], finding that enhanced eBooks prompted significantly fewer content-related actions (actions that pertained to the text) and more non-content related actions compared to their print counterpart. The negative effect on content-related action, however, was not present in basic eBooks. This suggests that enhanced eBooks, that contain interactive and multimedia elements, might be less effective than print books and basic eBooks for the activity of co-reading. However, enhanced eBooks might be helpful to motivate reluctant readers, as children showed a higher level of engagement while reading them. The negative effect of animations in enhanced eBooks is also confirmed by Dalla Longa and Mich [10], whose pilot study showed that children who activate few or no animations in an enhanced eBook are the ones that better recall the content. The effect on engagement is also confirmed by Raffle et al., who designed StoryVisit, an app that allows children to co-read eBooks with adults over a distance; according to their research, sessions lasted 50% more when an animated character was added to the eBook [30].

2.4 Storytelling

The topic of storytelling has also been studied extensively, as many tools and prototypes have been researched, both for preschool and for older children: **Kids in Fairytales** [17] is a mixed reality 3D system aiming to immerse children in stories to motivate them to read them later. **Fiabot!** [32] is an authoring tool originally meant for primary school children and only later used with preliterate children; **1001stories** [11] empowered children to create multimedia stories, with a high level of engagement and sound educational benefits. Some tools allow children to create stories through the manipulation of physical blocks, such as **TOK** [36], **PageCraft** [5], the **t-books** toolkit [35] and **The Telling Board** [29]. **KidPad** and **Klump** [4] are also tools for shared storytelling, designed to foster collaboration among preschool children: KidPad is a shared 2D drawing tool, while Kump is a textured deformable 3D object that can be manipulated. **MyStoryMaker** [21] builds on the literacy-as-play theory, while also emphasising collaboration. **The Conference of the Birds** [6] is also a collaborative storytelling environment, however in this case the collaboration is over a distance - as with [30]. Finally, **Jeffy's Journey** [38] is a TES - technology-enhanced storytelling - activity developed to support parent-child interaction through dialogic reading, using both contextualised and decontextualised prompts.

2.5 Reading with conversational agents

Conversational agents have been used in reading activities with children, both as listeners [37] and as active participants, engaging and interacting with children [40] [41] [34]. While early results are promising, there are some challenges in the interaction with the conversational agents - especially with younger children, who however seemed more interested in the CA as a reading partner than older children [41].

3 PAST AND CURRENT WORK

3.1 Initial User Study

My initial user study was conducted in November and December 2019 in a private preschool in Lugano, using a ready-made app that presented a wordless picture book with a sequence of images associated with audio prompts, which children could activate and listen. The question prompts were designed by a child psychologist, and there were three types of prompts: contextualised (who-what-when), decontextualised (why-how) and theory of mind (how does the character feel, what is the character thinking). There were two versions of the book: one with only contextualised and decontextualised prompts (condition 1) and one that also contained theory of mind prompts (condition 2). I conducted two sessions with each child, one using the app and one using a printed version of the wordless book; in the latter case, I read the prompts to the child one at a time. Each child was randomly assigned one condition - condition 1 or 2 - and used the same version for both sessions. The collected data suggests that theory of mind prompts elicited more meaningful answers (88% vs. 75% for contextualised and 77% for decontextualised prompts) and that condition 2 sessions were longer (141 words on average vs. 93 words on average for condition 1). However, these results can only be considered indicative of a trend, due to the very small number of data I was able to use. I also gathered qualitative data by interviewing children who had already completed both sessions: children on average liked the digital version better because it was faster than having the prompts read to them, and they found it more fun.

3.2 Collective Child Personas Framework

My next work - which is still in progress - is a new approach for the design of personas representing children in preschool - aged 3 to 6 years old. Initially I planned to follow Abel and Grace's dyadic caregiver-child personas [1] and create dyadic teacher-child personas. However, the data that I collected made it clear that this was not the best possible approach, so I formulated a different hypothesis, stemming from Kuniavsky's work [20] - which is, however, not peer reviewed - and also Giboin's work [15]. To refine my method, I started conducting interviews with preschool teachers, experts in linguistics and reading aloud, and representatives from publishing houses specialised in children's books. I interviewed six preschool teachers, three experts in linguistics, who also work in higher education to train preschool teachers, a former children's librarian and expert in reading aloud in schools and two representatives from publishing houses specialised in children's book, in order to gain different perspectives on the topic. The questions were designed to learn both about the teachers' own teaching and reading style and habits, and about the children, as we were not able to conduct direct observations. However, due to the semi-structured nature of the interviews, I was able to gather additional information. Using Kuniavsky's [20] and Giboin's [15] work as a starting point, as well as literature on the design of personas [25] [7] and specifically on child personas [2] [3], I started to develop a framework for the design of collective teacher-children personas. I identified the

following steps, which still need refining: 1) Collecting data from teachers, experts and children, 2) Sketching individual personas, 3) Identifying relationships and scenarios, 4) Outlining collective personas, 5)Validating the designed personas. Particularly, I still have to complete the last step, validating the designed personas and using them in a project.

4 NEXT STEPS

4.1 Children's collective reading habits in the classroom

My next step will be a study on children's collective reading habits in the classroom. Having already obtained written consent from parents, and approval from our ethics committee, we will soon start observing children's behaviour when during the collective reading sessions in the classrooms.

To avoid disruption, and also because of the current Covid-19 restrictions, we will be observing the children through a Skype video call - which will only record audio of the children, as the camera will be focused on the teacher - and we will analyse the audio to better understand how children interact with the adult reader depending on various variables, as identified from the analysis of the conducted interviews. These include the content, the time of day, the general mood, the sense of excitement, and the feelings created by the reading that all together define the reading atmosphere.

4.2 Interactive Storytelling App

Then, we will use the observations to inform the design of an interactive storytelling app for the use in the classroom. Collaborating with teachers as co-designers, we will design an app that will allow teachers to conduct reading sessions on an interactive whiteboard. We plan on both refining the design through a pilot test with a small sample of children, and on testing it more broadly with the use in the classroom.

4.3 Designing a conversational agent for storytelling

In parallel with the previously described steps, we will work on the design of a conversational agent that will function as a reading partner for children and parents in the home. This change in direction, compared to the original vision of the project, is mostly due to the particular situation created during the Covid-19 pandemic: with children and parents at home, and schools closed all over the world, families had to adapt to the new normal. Many parents relied on technology to entertain children, allowing them more screen time than in the past, but sometimes that meant relying on passive forms of entertainment such as cartoons or videos. The goal of our project is to design a conversational agent able to partner with children and adults and engage them in dialogic reading sessions, helping children to develop literacy skills, while fostering the appropriate atmosphere to make it a fulfilling activity.

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