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# Developing a Tangible Interface for Storytelling

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**Abstract**

This paper describes a first study of a paper based interface, consisting of a large format book and a set of picture cards that children can use to create stories. The handling of the picture cards has shown to be highly motivating and engaging, helping children to build a storyline creating logical relations among different characters and objects. The interface has shown to be an experimental space where children can play with the language and simultaneously reflect over it, in a collaborative process. We present the data collected with a group of five years old preschoolers and report our findings regarding the interaction design, as well as a reflection over future work.

**Keywords**

Children, Tangible Interfaces, Paper based Interfaces  
Storytelling, Interaction Design.

**ACM Classification Keywords**

H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

**General Terms**

Human factors

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## **Introduction**

This work is part of a broader project that aims to develop a kit of tangible interfaces for preschool education to provide children with a set of tools to build their own learning materials, promoting exploration, experimentation and creative production.

Stories have always been intricately linked to the world of childhood, children simply love to hear and tell stories, and it is precisely through storytelling and fantasy role play that they explore and learn to know the world around them [4]. Thus inventing, creating and telling stories is fundamental to the development of the child both as an individual as well as a social person [11,5]. Through an experimental and exploratory process the children experience how others behave and feel, trying out different roles, identifying positive and negative aspects, while learning to express themselves and to communicate with others. The competence of being able to express oneself and to communicate with others implies the gradual acquisition of the discourse rules [1] and that goes together with the need for experimental spaces where children can play and experiment with the language [1,2]. Building sentences, redoing sentences, changing the elements, playing with the word order, learning new vocabulary, and redoing everything again if not satisfied. In recent years there has been a growing awareness in the development of technology that supports child-driven play and creativity and an interest in developing solutions that promote free expression, creativity and fantasy play engaging children as story authors [2,5,6]

The paper based interface presented here is intended as a tangible platform where children can create their own stories by placing picture cards on a book page,

rearranging them until creating meaningful sequences and stories. As the cards give written and oral feedback after being placed on the book, they help children to reflect on their narratives. The tangibility of the interface supports children's creative expression making it easy for young children to interact with the content [21], transforming the creation of a story in a multitude of stimuli that range from: sensory, visual and auditory. According to Gardner: "Words, pictures, gestures and numbers are among the multifarious vehicles marshaled in service of coming to know the world symbolically, as well as through direct physical actions upon it and sensory discriminations of it" [10]. Body motion and sensory perception such as touch, sight and hearing are crucial to children's development [11,14] facilitating learning and content retention [21]. Therefore, educational environments should support those physical activities.

## **An interface for Storytelling**

The interface presented here introduces a book for children to create their own stories. The current prototype consists of a set of picture cards and a large format book. The pages have rectangular marks on it, that have the same diameter as the picture cards, so that each card fits exactly over it. They are used to define and indicate where the cards have to be placed.

## **Design and Implementation**

Telling and reading stories are part of the daily activities carried at preschool; very often someone reads a story showing the children from time to time the drawings on the book pages. Sometimes the children are asked to make drawings of it, or puppets out of different materials and then retell the story using the materials they have created. In

order to develop an interface that would meet children's needs and to incorporate their ideas and feedback into the design of the interface [8,9] we were lucky to work with a group of 26 children of five years of age. During one of the first sessions with the children we read a story and asked them to draw the characters. Each child chose a character and drew it on a paper card. The characters were divided through the children so that each card had only one character represented on it. A large format book with blank pages was placed on the floor in the middle of the room, the children sat around and we asked them to tell the story using their picture cards. The children placed the cards on the book and each one told her/his part. They did not seem very engaged in telling the story; instead the activity resembled more a memory exercise, leaving no space for children's creativity. That led us to rethink the design of an interface that would be able to engage children in creating their own stories and we finally came to the idea of developing a book not to read but to invent stories.

### **How does it work?**

The book functions as the work area, where the picture cards are placed. The picture cards are based on tag technology triggering audio; each card is identifiable by the system and can be placed everywhere on the book marks.

Every picture card has only one element represented on it. At the moment the cards comprise only a reduced number of elements, such as: animals, toys, food, actions, places, weather and times of the day. In the future more series of cards will be developed, so that the children can have a wider range of elements to create more complex stories. The children can pick the cards, choosing the elements they like/need to create a

story and place them on the book page, each card over a mark. When a card is placed on the mark it gives audio feedback according to the element drawn on it. For instance when the dog is placed it triggers the sound "dog". As an example, imagine a story about a cat that goes to the forest, plays with a ball and when it begins to rain goes home and drinks a bowl of milk. So the child to create the story above has to place the following sequence of picture cards: cat → go forest → ball → rain → go home → bowl of milk. At the time s/he is placing the cards s/he hears the story: "The cat, goes to the forest, plays with the ball, it rains, goes home, drinks a bowl of milk." The children can rearrange the story by changing the sequence of the cards, by adding new ones or by removing some of the ones they have used.

### **Testing the Interface**

Designing the interface was an attempt to engage children in creating stories, to encourage their imagination, to make them think, to learn building logical sequences as well as to develop new vocabulary. The current version of the prototype was tested with the same preschool children, but this time we worked with a small group of twelve children divided in two groups of six.

The prototype was placed on a table and six children at a time stood around it. Initially we planned to ask three out of the six children to look through the picture cards, choose the ones they like, place them on the marks so that they could create and hear a story. Unexpectedly all the six children tried to grasp the cards, being so deeply involved from the beginning, that it was impossible to build two groups of three, instead the six children worked together. They began immediately to place the cards on the book, in a very dynamic process,

dealing with each other, which card would fit better the narrative, trying to create a story (fig.1). Both groups of six children behaved similarly.



**Figure 1:** Children building a story

### **Does it make sense?**

At the beginning the children chose the pictures they liked most and positioned each card over a mark, but after hearing the completed sequence they felt the need to make some changes, since some cards did not match neither with the following nor with the previous ones. For instance one of the groups chose the following sequence: it is sunny → goes home → goes to the playground → plays with the ball → hides the bone → plays with the yarn ball. The teacher, who was in the background and did not know the interface in advance, decided to go between and talked with the children about the storyline, leading them to the conclusion that they had first to define a character before choosing an action [1]. Finally the children rearranged the storyline and created a story about three animals, with the following cards: the dog → hides the bone → it is sunny → plays with the ball → the mice → eats the cheese, the cat → drinks a bowl of milk → it rains → goes home → plays with the yarn ball → it is night. The fact that the content is attached to the cards led the children to think of how a story is built as well as about logical sequences.

### **Behind the Interface**

In addition to work out how a narrative is built, when the children had finished the story, the teacher had the idea to ask the children to tell the story themselves following the sequence of the picture cards. This way she was able to expand the use of the interface, as the words/sentences triggered by the cards are rather simple. The children can thus retell a more elaborate story and if they want they can just find another meaning for the pictures, so that different levels of the story can be created. The storyline works as a support and guideline. At the end, when the children are happy with their stories they can press a button to send the story to their class blog.

### **Related work**

In the last decade there has been a growing interest in developing tools for children that allow them to create stories in a more active and creative way promoting story authoring and collaboration among peers. Many researchers have shown that collaboration significantly raises the level of engagement and activity by children and at the same time has the potential to have beneficial effects on learning [3,12,20,22]. Additionally the tangible interaction frees children from mouse and keyboard creating a more natural interaction [5,13]. Some examples of such interfaces are: Kid story [3], 1001 Stories [7], StoryMat [5], TellTale [2], Pogo [6], Jabberstamp [17], SPRITE [19] or Singing Fingers [18].

### **Discussion**

Following this line of development the prototype presented here pretends to be an experimental space, where children can explore the language, using their body and senses. The major contributions of this interface are the simplicity of the set up, which would

make it easy to implement at preschool or at school, as well as being a tangible space, made out of materials traditionally used at preschool, for playful exploration bringing together visual, auditory and sensory stimuli. A space where children can find out and learn about logical relations and sequences, enhancing their creativity and ability to create stories by working together and collaborating with each other. Instead of telling children a story and work that story with them using drawings or puppets, this interface, in turn, aims to promote children's potential in imagining, creating and sharing their own stories. At the same time it can be used by the teachers to propose a series of educational activities. The picture cards can work as an input for the creation of the stories helping children to generate ideas. It was noticeable in children's first attempt to build a story that at this age it is still not easy to build logical relations; since the cards give auditory feedback the system might foster a better understanding of a storyline, working at the same time as an experimental space to reflect about the language helping children to build logical relations and to develop their literacy. As we found out such a challenge has revealed very motivating for the children, who engaged from the beginning in creating a story. The recorded stories, which can be uploaded to children's class blog allow seeing children's progression over the time and at the same time allow for sharing with family and friends.

### **Conclusions and Future work**

We have reported on the design and first testing of a paper based interface for children to create stories. Our observations showed that the physical handling of the pictures was very motivating and engaged children from the beginning in creating their own stories. The interface has shown to promote collaborative work and

to function as an experimental space where children can play with the language and at the same time reflect over it. In future work we plan to develop different sets of cards that focus on different skills. Further we plan to embed light and sensors on the cards so that it is possible to extend the kind of exercises and activities supported by the interface. We also think of giving the children the possibility to draw and record their own cards. Further we hope to contribute with our research to the discussion on the cognitive benefits related to the physical manipulation of materials [15,16].

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