

Interaction Design, Books, and Cultural Forms

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ABSTRACT

What reasons do we have for continuing to incorporate traditional print media into interaction designs for children? In this position statement, I address this question from the perspective of *cultural forms*. My argument is that in the creation of novel forms of interaction it is advantageous to present strong and recognizable cultural forms to help parents and children structure their activity around familiar artifacts. This, in turn, helps activate valuable cognitive, physical, and emotional resources that parents and children can bring to bear on the new task.

Categories and Subject Descriptors

H.5.2. [Information Interface And Presentation]: User Interfaces – Interaction styles;

Keywords

Children; cultural forms; storybooks; tangible interaction.

1. INTRODUCTION

In an age of tablet computers, e-books, and "retina" displays, what role should traditional print storybooks play in interaction design for children? Especially considering interactive media for children, designing with traditional materials such as paper and ink seems woefully antiquated compared to the latest touch-enabled e-book reader. Are there reasons beyond nostalgia for continuing to incorporate printed books in interaction designs for children?

In this position statement, I make an argument that the answer to this last question should be an emphatic "yes". The crux of the argument involves the notion of *cultural forms* and the role that cultural forms can play in interaction design [8]. Put simply, in many situations the social activity that takes place around an interactive artifact is at least as important as the usability of the object itself. So, for example, when a parent and child read a storybook together, what's on the pages of the book (or the screen of an e-book reader) is arguably less important than the interaction that takes place between parents and children as they read *together*. This is not to say that design is not important—the quality of the material matters. But, the ability of design to cue productive social interaction is a critical but often overlooked aspect of design.

So what does this have to do with cultural forms? And why should it make any difference whether a book is paper or digital?

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To answer these questions I'll briefly describe what I mean by cultural forms, and I'll explain why social interaction around single-purpose artifact (like a physical storybook) might result in richer forms of social interaction than a multi-purpose, polymorphic artifact (like a tablet computer), especially when the goal is to support some form of novel activity. To make these ideas more clear I'll also include an example interactive storybook that my colleagues and I are developing.

2. CULTURAL FORMS AND DESIGN

My use of the term *cultural form* is derived from the work of Geoff Saxe and his form-function shift framework [12]. Saxe uses this framework to describe how people appropriate and repurpose cultural forms over time to serve new functions in light of shifting goals and expectations. Saxe defines cultural forms as historically elaborated social constructions that are inherently linked to social practices [12]. Examples include things like counting systems, social conventions, games, tools, monetary currency, and so on. Cultural forms can be intangible (as in games like hide and seek), or they can involve physical artifacts (as in games like jump rope).

The idea of creating interactive systems based on cultural forms has two advantages. First, cultural forms are inherently linked to social practices. In other words, an artifact like a storybook is nothing more than a few sheets of paper and cardboard in the absence of recurrent, socially organized activities that give it meaning. A storybook is a storybook because a child knows that she can pull it off a shelf at bedtime, sit with it on her mother's lap, and read it together. And, the act of reading involves far more than decoding symbols on the page and reciting the words out loud.



Figure 1: Physical storybooks present a strong and recognizable cultural form around which parents and children can structure reading activities.

Parents and kids have elaborate reading rituals that include making connections between the text and the world of the child, pointing out characters and objects in the illustrations, asking and answering questions, providing emotional support, and tailoring the reading session to the child's needs and abilities [1, 3, 4, 5].

This leads to a second advantage, which is that the practices surrounding cultural forms involve a variety of social, emotional, and cognitive resources. If we can successfully evoke source cultural forms in our designs there is the possibility that users will bring these practice-linked resources to bear on the novel activities that our interactive system supports. Even though cultural forms have a degree of historical stability, they are also malleable. People continually appropriate and restructure existing forms to serve new functions in light of shifting goals and expectations [12]. This opens the possibility that interaction designers can intentionally create transitional forms that maintain aspects of the source forms, while, at the same time, supporting novel activities.

However, the use of cultural forms in interaction design depends greatly on legibility. In other words, if people don't recognize an object or a situation as an instance of a known cultural form, then valuable practice-linked resources will remain dormant. From this perspective, we can begin to understand why a designer's choice of form becomes important, especially when the goal is to support some type of novel interaction. In situations in which a parent or child might be uncertain about what they're supposed to do or how they're supposed to engage with one another, cultural forms can provide a convenient and comfortable structure. In other words, the form indicates a productive starting point for beginning to explore novel capabilities.

3. COMPUTATIONAL LITERACY STICKERBOOK

To make this argument more concrete, here's a quick example. My colleagues and I have been developing an interactive stickerbook to support emerging computational literacy skills [6] for preschool and early elementary school children [9]. As an informal learning activity, we hope to create a product that encourages productive

parental involvement to support children's explorations and to tailor the activity to a child's needs and experience level. Ideally this would work for parents with or without prior programming experience.

Thinking about this project from the standpoint of cultural forms helped us to identify several possible design directions. The idea of using a stickerbook to introduce programming activities was immediately appealing because we thought that it provided a rich and recognizable form with advantageous resources. Specifically, we hoped that the storybook form would promote productive parental involvement in structuring the activity. We also assumed that kids would be familiar with stickers and would know how to adhere them to a sheet of paper.

This project was challenging in that both the narrative structure and the supporting technology were untested and needed to be able to function in concert to create an engaging and enjoyable experience for parents and children. Based on Wyeth [15] and Horn et al.'s [10] work on programming curriculum for early elementary school children, we attempted to introduce a series of powerful ideas [2, 11] from computer programming and robotics through the storybook. Following [10] we selected programming activities to build on one another conceptually while remaining developmentally appropriate for children in our target age range.

Working with a storybook illustrator we iteratively developed and tested several prototypes and storylines over the course of a year. Our current prototype follows the story of a lonely boy named Roberto who travels across a city in search of new friends (Figure 2). Each encounter between Roberto and the characters in the story prompts a programming activity as shown in Figure 2. As with other tangible programming languages, the stickers themselves encode a physical syntax that indicates how they can be combined together on the page. We tested several variations of sticker shapes before settling on those shown in Figure 4. The challenge was to find a shape that took up as little horizontal space on a page as possible while still allowing room for text, an icon, and a TopCode on each sticker. The sticker shapes also had to be easy for young children to manipulate and stick on the page with reasonable accuracy.

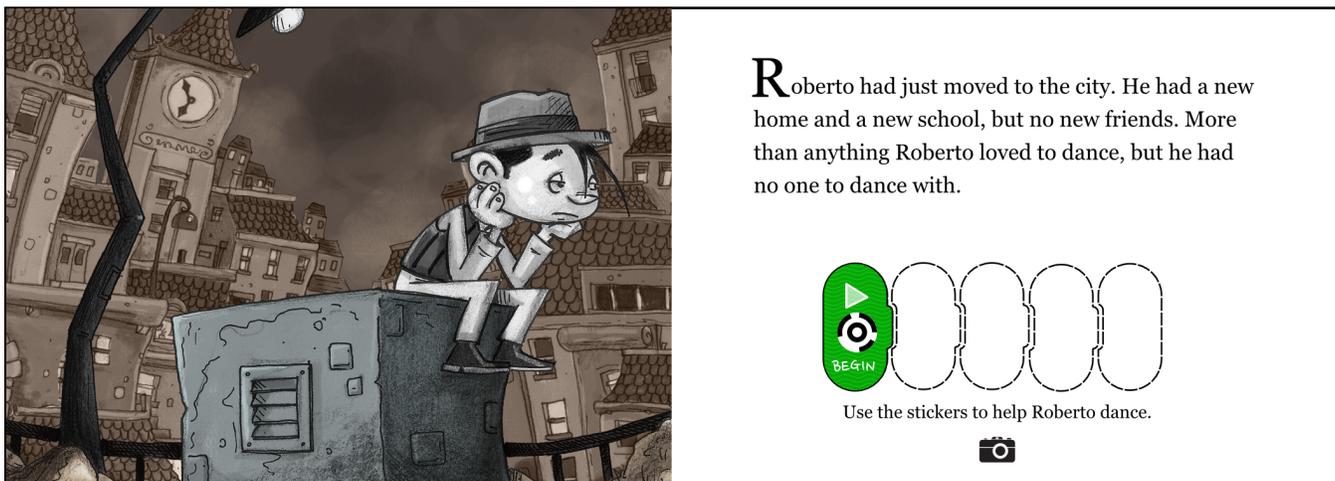


Figure 2. A page from the Roberto stickerbook. Illustration by Igor Ivanovic (brainlesstudio.blogspot.com).

Dashed sticker outlines on the pages of the book (see Figure 2) indicate the structure of the programs that can be created, as well as the types of stickers that can be used. There was a design tradeoff in terms of providing enough guidance for parents and children to learn how to create programs without getting frustrated while at the same time not being overly restrictive in terms of creative expression. Finally, to revise programs, children can either peel the stickers off the page to reuse them, or they can stick a different programming statement directly on top of another statement.



Figure 3. The stickers control a digital version of Roberto that is animated on a smartphone or tablet computer.

The programs that families create are acted out by a digital version of Roberto on the screen of a smart phone or tablet computer (Figure 3). To translate physical stickers into executable computer code, we adapted the technique of Horn et al.'s Tern programming system [10]. In particular, each sticker includes a TopCode computer vision fiducial that identifies both the type of sticker and its placement relative to other stickers on the page (Figure 4). To capture programs digitally, we developed an app that uses a mobile device's built-in camera to take a photograph of the page. A runtime interpreter controls an animated version of Roberto that appears on the screen of the device (Figure 3).

4. CULTURAL FORMS AND PRINT MEDIA

Coming back to the idea of cultural forms, I hope that this examples helps to illustrate my point. For the stickerbook, we are trying to encourage an activity that will be unfamiliar to many parents and children: computer programming. And, even though this is something that is arguably important to learn even at young age [11, 2, 6, 15], many parents will have little to no background with

programming or computational literacy. How, then, can we help parents structure and scaffold their children's learning? Here we turn to children's storybooks as a cultural form that involves another form of literacy (language literacy). With storybooks, we know that parents employ a wide range of extra-textual activities to support children's learning, and that these activities have been shown to result in early literacy achievement for children [1, 3, 4, 13]. Given this, our stickerbook project seeks to test the idea that parents will be able to support *computational* literacy through activity patterns that are comfortable and familiar.

Of course, the stickerbook that I've presented here is just single example of a way to use books to support novel forms of interaction. One of the wonderful things about artifacts created with paper and ink is that they are abundant sources of cultural forms—greeting cards [7], monetary currency, playing cards, photographs, scrapbooks, business cards, and so on. With a little creativity, its easy to imagine a wide array of interactive systems that might be designed with print media as a foundation (e.g. [7, 14]). And, it is perhaps not a leap to think that social activity and the meaning that people ascribe to such artifacts will be richer as a result.

One of the main reasons to believe this goes back to the legibility of cultural forms. Imagine an interactive storybook that can take two forms: an app on a tablet computer or a physical paper storybook. In the first instance, what is the cultural form that is most salient to parents and children? Plausibly, it's the tablet computer itself, a very recent and polymorphic form. The tablet can be a video game, an email client, a music player, a video player, a camera, and so on. The work practices and social activity structures surrounding the tablet computer are correspondingly diverse, but this flexibility comes with a price.

As parents and kids engage with the device, there is a period of uncertainty and orientation that must take place before the familiar form of the storybook begins to surface. Powering on the device, thumbing through homes screens, and finding the right icon to launch the app. There is also a looming possibility that the activity will be interrupted when a child accidentally (or intentionally) presses the home button, and instantly dissolves the storybook world. Finally, there is a period of learning that must take place once the book/app is launched. This is because the use of an e-book implies a sort of metaphorical gulf that parents and children must bridge. In other words, a mapping between the experience of reading a physical book and interacting with an e-book must be constructed and then mutually agreed upon by the parent and child. "Look, this screen is just like the page of a book, and sliding a finger is like turning the page."

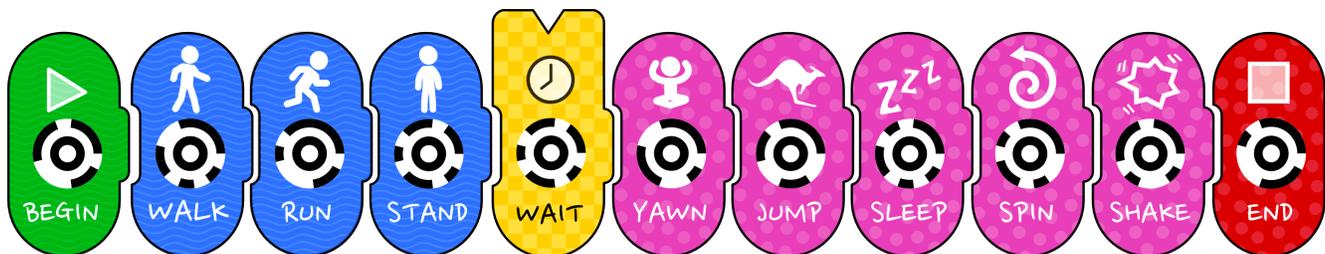


Figure 4. A collection of stickers that children can use to create programs for Roberto.

The broader point is that the *legibility* of the storybook as a cultural form suffers when it is presented to users through the guise of a tablet computer. Whether or not this decreased legibility actually affects the quality of learning or interaction is an open question. But, my hope is that the theoretical lense of cultural forms offers a foundation for a testable hypothesis for future research.

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