Samba schools as an inspiration for technologies for children under the age of five

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ABSTRACT

Seymour Papert's vision of constructionism called for children to be active, empowered, creative learners, building public entities linked to their strong interests in order to connect with powerful ideas. The increasing ubiquity of technology use by children under five, and its information access bias call for more widely-available, constructionist-inspired technologies and learning ecologies for this age group. Our approach in designing technologies to reach this goal has been to support children creating, connecting, and communicating, following Papert's example of Rio de Janeiro's escolas de samba (samba schools) as learning communities to emulate. In addition, we think of the design process itself as a constructionist learning process, one where we form our own escolas de samba to create, connect, and communicate together in a Carnival of ideas.

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Contents

1. Introduction

In the early 1980s, Seymour Papert widely shared his vision of constructionism as the PC revolution brought computers to homes and schools [1], a vision he had been developing since at least the 1960s (e.g., [2]). The research and practice that arose out of this vision in the following decade focused primarily on children older than age five, and tended to have a focus on the development of mathematical thinking [3]. The first author, Hourcade, was one of the children of the 1980s who benefited from activities inspired by Papert, learning to program Logo, and eventually obtaining a Ph.D. in computer science about 20 years after first instructing a triangle-shaped turtle to draw a line on a screen.

Papert's empowering, child-centered vision was wider than Logo programming and encompassed an educational approach that involved children learning and arriving at powerful ideas by working on projects that arose out of their strong interests, with

the guidance of adults, and access to computers as powerful and flexible tools to develop these projects [3–5]. In espousing this vision, Papert was not against the use of computers for accessing information, but rather, he sought a balance between information access and creation, both in computer use, and more generally in learning [4].

How could this vision be translated to the increasingly ubiquitous use of computers by children under the age of five with the devices they primarily use (i.e., smartphones and tablets) [6,7]? It is important that we get it right, as technology occupies more and more of children's time [7], at ages critical to brain development [8]. In this article, we describe how Papert's discussion of Brazil's escolas de samba (samba schools) inspired our views on the design of technologies for preschool children with a focus on widely available devices.

2. Papert's learning vision

In the last chapter of *Mindstorms*, Papert gave an example of his vision of learning. It is telling that he did not select a project or individual effort that led to a major accomplishment, such as the

Apollo program, or Albert Einstein's Theory of Relativity. Instead, his choice was Rio de Janeiro's escolas de samba [1]. We are not the first to be inspired by this vision (e.g., [9]).

Escolas de samba are nonprofit civil societies for culture and leisure, which have the main goal of organizing yearly Carnival parades throughout Brazil. The parades are prepared in advance and require very competent organization because every detail has to be perfect to increase the likelihood of a positive reception by the public and the possibility of winning first place in the parade [10]. The ten great escolas de samba from Rio de Janeiro each have 1200 to 2000 regular associates. During Rio's Carnival, around 3000 to 4000 additional people join the escolas de samba for the parade [10], projecting a unity of music and dance to their audience [11]. The annual Carnival parades of the great escolas de samba are cultural, political, and economic events, which also affect the urban landscape of Rio de Janeiro [12].

The process of putting together the show is a highly social activity encompassing many roles [10–12]. Some involve very concrete aspects, such as dancing, making costumes and ornaments, or building floats [12]. At the same time there is a tremendous amount of multi-layered planning involved, necessarily engaging abstract thinking. Thus, the process engages the body, the mind, and the physical environment. It leverages people's strong interests to connect them to many powerful ideas across the arts, politics, and engineering, among others. While the audience sees a magnificent product, for the participants, the process matters at least as much as the final performance.

This view of learning is compatible with dynamic systems approaches to development that study change across bidirectional interactions between the brain, the body, and the environment, including other people [13–15]. From this perspective, designing better learning is about creating optimal environmental conditions such that the desired learning occurs. These conditions are not about information transfer or interactions with a specific type of device, but rather ecologies comprising social, physical, and electronic elements. This is consistent with the views of prominent, highly influential scholars on the importance of social aspects in learning, including Vygotsky, who also highlighted the importance of tools, language, and play [16], Paulo Freire with his emphasis on dialogue [17], and Piaget who listed social aspects as one of the four key factors affecting development [18].

What do such optimal environments look like for preschool children? What role should widely available computing devices play? What role are they currently playing?

3. The 3Cs for preschool children's learning environments

The current status of computer device use by preschool children is not exactly what Papert would have likely preferred. It often involves socially isolating activities structured by apps, with a primary focus on the device, experiencing media, and engagement through instant gratification [8,19]. It does not resemble the escola de samba experience very much. In fact, some are alarmed by mobile devices socially isolating children, and disconnecting them from their physical and social space [20].

Individually experiencing a small amount of very engaging, gratifying media is unlikely to harm children. However, that does not mean we should not look toward bringing balance in the direction of a more constructionist approach to technology use by preschool children. There are examples of research projects bringing constructionist approaches to preschool children, primarily in the form of tangible user interfaces used for programming (e.g., [21–24]). Our approach, inspired in part by Papert's example of escolas de samba, has been to design and lower barriers to learning ecologies that strive to provide preschool children with greater support for the 3Cs: creating, connecting, and communicating. Not

only is this approach compatible with Papert's views, but it can be easy to communicate to researchers, practitioners, parents, and other stakeholders. It is also consistent with approaches used in high-quality preschool curricula, such as *Tools of the Mind* [25], and those proposed by other child–computer interaction researchers (e.g., [26]) and implemented in some research projects (e.g., [27–29]). Below, we discuss how the 3Cs connect to Papert's example of escolas de samba.

Creating can take many forms. It can be physical or virtual. It can consist of creating functional items, art, stories, or some mix of all of the above. We need to design more technologies that enable children to be authors and creators, with the least amount of constraints possible so they can more easily link their strong interests with powerful ideas.

Escolas de samba have a highly creative focus across many areas. The plot is the central point of the parade's production and is translated into songs, choreographies, costumes, ornaments, floats, and technology [30]. This process brings together powerful ideas from engineering, mathematics, the arts, and local culture. We need to enable similarly creative endeavors for preschool children that involve planning and a continuation of creative activities that link to their interests over an extended period of time, just like escolas de samba do.

Connecting with the social, cultural, and physical environment means children get to use their whole bodies in activities, interact with non-electronic physical items, and feel connected with their strong interests and with people around them. It is about learning together. All this means that when we design a learning environment that involves technology, we do not have to stop at designing the technology, but instead also design the physical and socio-cultural environment [31].

Escolas de samba are all about connections between people, their cities, and their culture. Participating in an escola de samba is an intrinsically social and physical activity. In Rio de Janeiro in particular, each escola de samba requires the collaboration of thousands of people creating and learning together. There are many elements connecting with the physical environment as well, including making all the physical items necessary for the parade performance, connecting with the city and its neighborhoods, and the very physical nature of the Carnival parade itself. In other words, participating in escolas de samba is very, very far from an isolating experience. In fact, all the connections amplify individual creativity, and make it relevant to participants' strong interests. We need to do the same when designing learning ecologies for preschool children.

Communicating is crucial for the social aspects in Papert's vision of constructing public entities. There can be no exchange of ideas, no feedback loop from others without communication. Technology can actually be used to improve communication. While the most common way this happens is to help with remote communication, technologies can also help children communicate more richly with those in physical proximity by giving them additional channels of communication (e.g., [32,33]). Finally, the preschool years are critical for language development [34], and children cannot afford to be in environments that discourage communication. We need to design learning environments that encourage and enhance communication at least with those in physical proximity and with remotely located loved ones.

The end product of escolas de samba is mainly about communication and expression through song, dance, fashion, and physical artifacts. The process obviously requires a tremendous amount of communication in order to coordinate such a complex enterprise involving people in a wide variety of roles. We need to aim for this level of communication in our designs of learning ecologies for preschool children.

4. Getting there: deeply engage

If the child–computer interaction community has learned something over the past 30 years is that designing based on principles and guidelines is not sufficient. We also have to deeply engage with children, their physical and sociocultural environments, and the adults in their lives. While there have been plenty of experiences co-designing with elementary school children, these experiences are limited with children under the age of five [29,35,36].

Since the spring of 2016, we have been part of a project designing a learning ecology for three and four year old children. While having experience co-designing with elementary school children and older adults was useful, with children under the age of five, the possibilities for communication and collaboration are more limited. In this context, the 3Cs can come to the rescue again. Our focus has been to deeply engage with the children by creating, connecting, and communicating. Through weekly visits to their preschool, we have shared our technology creations and obtained feedback and ideas, connected with the children, their social, physical, and cultural environment, and learned how to better communicate with each other, sometimes with the help of technology. Given children's ages, we have begun adapting co-design methods developed for older children (e.g., [35,36]) to the abilities and interests of children aged three and four. A significant amount of experience and reflection will be necessary in order to develop reliable methods for co-design with this age group, while keeping in mind the 3Cs [37].

In spite of the need for adapting methods, we believe that the best way to learn to design constructionist-inspired learning ecologies for children is for the designers themselves to pursue constructionist activities with children. In pursuing these activities in our own project, we have been forming our own escola de samba, bringing together different ages and skill sets, empowering all participants, creating public entities, and connecting strong interests with powerful ideas.

The 3Cs learning ecology we are developing, *StoryCarnival*, intends to lower barriers to sociodramatic play in the style of the *Tools of the Mind* curriculum [25] with the goal of improving children's self-regulation skills. There is a significant amount of evidence on the positive impact of this type of play on children's self-regulation (e.g., [38]). Papert's views on escolas de samba also inspired the project, something that ended up reflected in its name. *StoryCarnival* activities are guided by a multiplatform app intended for use by groups of three to four year old children and adults. It lowers barriers to sociodramatic play by presenting interactive stories that provide children with shared narratives appropriate for this type of play (e.g., characters of equal importance, but different skills), and helps them plan play through character selection, and the use of physical space and physical props or other everyday items as part of play. Once play begins and children create their own narratives through acting, technology is largely absent, although it can be brought in to provide ideas or remind children of the shared narrative. We also plan to incorporate supports for adults to guide the process, and to author shared narratives that may be more relevant to specific children's preferences and daily realities.

StoryCarnival is an example of a 3Cs learning ecology for children younger than five years old that does not require the use of any customized hardware, but instead makes use of widely available computer devices and existing physical spaces and items. Such an approach, while challenging to implement, may be able to reach children that currently cannot access approaches that require the use of custom hardware or specialized room setups, and is also more sustainable. The 3Cs and Papert's example of escolas de samba apply to a much wider set of technologies, but an exploration of approaches such as those in *StoryCarnival* is likely necessary to bring a constructionist balance to the use of computer devices by children under the age of five.

5. Conclusion

Constructionist ideas are relevant to the design of technology-infused learning ecologies for all age groups. They apply not only to what we design, but how we design. When thinking about preschool children in particular, it is important to remember Papert's call to balance the use of technology to access information with its use for constructionist activities. Our approach has been to emphasize creating, connecting, and communicating.

Following Papert's vision of learning, we think of escolas de samba as examples of the learning ecologies to design, and how to design them. In doing so, we remember that not all escolas de samba are the same. There are different levels of resources, numbers of people, skill-levels, and goals, but they all share the empowering, creative, social, highly-connected, communication-oriented, constructionist approach. When designing learning ecologies for children, we have strived to form our own escola de samba, in order to learn from each other in a Carnival of ideas.

Acknowledgment

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