Fröbel's Forgotten Gift: Textile Construction Kits as Pathways into Play, Design and Computation

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ABSTRACT

Reflecting on one of Fröbel's overlooked "gifts", sewing and embroidery, this paper explores a recent renaissance in commercially available textile construction kits for children. Through a survey of such kits, we argue that revisiting embroidery in this digital age is a powerful leverage to introduce computation into material culture. In particular, we highlight the evolution of recent children's textile construction kits beginning with the Barbie Fashion Designer in 1996 then moving onto more recent developments, like the LilyPad Arduino, that combines computation, ICT, fashion and craft. We discuss the implications of these designs for learning, play, and broadening participation in computing fields.

Categories and Subject Descriptors

K.3.1 [Computers and Education]: Computer Uses in Education - *Collaborative learning.*

General Terms

Human Factors

Keywords

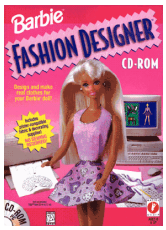
E-textiles, gender, computational crafts, play

INTRODUCTION

In the early 1800s, the German pedagogue, Friedrich Fröbel, perhaps best known for coining the term "kindergarten," developed a series of 20 developmentally appropriate toys and activities, which he called 'gifts' [3], for hands-on learning. These gifts ranged from woolen balls to building blocks, needlework, and clay, and were designed to help young children recognize and appreciate the common forms and patterns found in nature. Many of today's popular construction kits, such as Lincoln Logs and Lego blocks, have been inspired by Fröbel's materials. Interestingly, however, one of Fröbel's gifts seems to have been left behind since its introduction over a century ago: the 12th gift that engaged children in embroidery and sewing (see Figure 1).

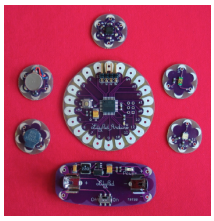
One possible reason for this oversight might be the cultural implications of needlework since traditional crafts are historically considered the domain of women. Another reason might be that embroidery was considered purely decorative, and therefore not of the same caliber as toys like the building blocks that started Frank Lloyd Wright's career as an architect.

Fröbel's 12th gift



Barbie Fashion Designer

Harumika Fashion Styler



LilyPad Arduino

Figure 1. Past and Present Textile Construction Kits

In part because of their widespread popularity, Fröbel's building blocks have since journeyed into the computational realm in the form of LEGO Mindstorms, Logo, Alice, and Scratch, among other digital applications. While popular among boys and girls alike, these construction kits have heavily focused on programming, robotics and engineering – domains traditionally associated more with male interests. Some inroads into traditionally female interests have been made with variants such as Storytelling Alice [7], and this has broadened the range of computational applications and widened their appeal among girls. However, playing with construction kits is still largely perceived as a male-oriented activity.

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There are, however, some notable exceptions to this perception, as commercially available textile construction kits have emerged on the market, now extending Fröbel's gift into the digital realm. These new developments will be the focus of this paper because they presents a rich case to examine how gender, education, and technology weave together in the design of computational construction kits. Several examples will serve as the background for this examination, most notably commercial products such as Barbie Fashion Designer, which have brought girls to computers through the heavily contested territory of traditional femininity, as well as more recent textile construction kits, such as the LilyPad Arduino [4], extends embroidery into the computational realms within the alternative Do-It-Yourself movement [1, 10].

In this paper, we will examine how Fröbel's forgotten gift has taken on more contemporary forms by comparing three construction kits: the original Barbie Fashion Designer™ software, the Harumika™ styling set, and the LilyPad Arduino kit. Our focus will be how these different textile construction kits take into account new forms of play spaces (online vs. offline), play partners (small group vs. massive groups), and design (ready made vs. computation). Our discussion will address the implications of these designs for learning, play, and broadening participation in computing fields.

BACKGROUND

The context for Fröbel's forgotten gift is situated within the complicated territory of gender, craft, and technology that has been treated elsewhere in much more deserving detail [2]. Only recently have historians considered the crafts worthy of critical inspection and turned their attention to the role that crafts have played in women's work and leisure. Likewise, many educators have always paid more attention to academic subject matters of mathematics and science neglecting to take into account how vocational education combines the hand and mind [12]. The history of technology, more than any other, has often relegated women to the sidelines [11]. A few researchers have begun to untangle these relationships in the context of computational crafts and extended them now to computational textiles [5].

We would like to start our examination in the mid 1990s, when a software package called Barbie Fashion Designer™ (BFD™) came onto the market. Over the 1996 Christmas Season, BFD™ outsold all other games, even the console games favored by boys, generating over $15.5 million in revenue. Seemingly against conventional wisdom, it demonstrated that girls could be interested in using computers. Not everybody though was happy about this success. Indeed many feminists complained that combining computing with the Barbie brand and crafts – domains traditionally associated with girls and women – was promoting traditional values of femininity.

Unnoticed amidst all of these debates remained an unusual feature of BFD™ – its combination of the 2D world of computer screens with the 3D world of textile production. In BFD™, a designer would create clothes for Barbie, selecting from hundreds of different patterns and colors, on the screen, and then print out the design on special fabric-like paper that could be glued together to make new dresses for Barbie. Rather than purchasing ready-made clothes for Barbie, players could become their own fashion designers.

Today, more girls than ever are using computers for all purposes [9], and virtual worlds have become a major playground for girls [6]. New construction kits have become available that combine crafts and computation with textiles (e.g. EduWear, Aniomagic). Much of the work has focused on computational elements: creating interfaces that facilitate transition and design between 2D and 3D, creating kits that allow for construction of new activities combining crafts and computation, and facilitating entrance into programming and engineering. In the following sections, we will review three of these construction kits.

THREE TEXTILE CONSTRUCTION KITS

Barbie Fashion Designer (BFD). The BFD package came with 8 sheets of designer paper fabric, a sheet of seam stickers, sequins, 12 sets of Hook and Loop stickers, 4 colored markers, 5 pairs of Barbie shoes, tulle, and Tulip Paint (see Figure 1). The program started with a greeting and an invitation: "Hi, I'm Barbie. Let's make some fun clothes for me to wear." Barbie then walked you through the nine different areas of the game. First, you pick "a theme to design an outfit for" (choosing among Dream Date, Totally Trendy, Party Surprise, Cool Careers, Vacation Fun, and Wedding Fantasy.) The player then visited the clothing, accessories, fabric design, and color workshops to choose and design an outfit for Barbie to wear. The final outfit could be previewed in a dressing room or modeled by Barbie on a runway in a "glamorous fashion show". Finished outfits could be named and saved in the closet, or laser printed on special fabric to be made into actual clothes for a real Barbie doll.

Harumika Fashion Styler. The Harumika™ textile kits are developed by Bandai, Inc. in Japan and have been sold in the US since 2009. These kits allow girls to create miniature fashion designs without sewing thread or stitching fabric, instead sealing corners and ends with a stylus design tool. Alongside the stylus design tool, the Style Start Set includes a Harumika dress form, signature fabrics, fashion accessories, a rhinestone sheet and fashion stickers to make fashion designs (see Figure 1). Each kit is themed: the New York, Paris, or Tokyo sets each comes with everything create unique wardrobe options; no needles or thread required. The showstopper set also includes a digital camera that can be hooked up to the USB port of a computer to upload pictures of your designs to the Harumika website and add them to your online store. The online community also has several other features, including

the ability to browse designs, create virtual attire, and pick up new styling tips.

LilyPad Arduino. The LilyPad Arduino is a computational construction kit that allows users to build their own soft wearables by sewing a microcontroller, sensors, motors and/or lights together with conductive thread and/or conductive material [4]. It includes a micro-controller with sewable features and various components (see Figure 1). The manufactured versions are hand-washable textile embedded parts that can be programmed via a downloadable, multiplatform and cost-free tool: the Arduino integrated development environment (IDE), which already has a strong built-in community support base. Additionally, the Arduino IDE allows users to write their own programming in Processing or C. A new online community, called LilyPond (http://LilyPond.mit.edu) is now being created for users to share their designs.

DISCUSSION

Play Spaces. Each of these textile construction kits creates a unique space for play. With the original Barbie Fashion Designer, this space was extremely local. While BFD brought together the playroom and the computer room, fashion projects remained tied to the individual home as "the playground is around the computer" ([8], 56). All designs were stored on individual hard drives and in order to share their designs, girls would have to copy the files to disk or print them out on their home printers. But, in either case, interactions were limited by one's local social network. One could show off new designs for friends and relatives, but few others.

Today, the Harumika kit embraces similar spaces for play. Because Harumika designs are both physical and miniature, they remain tied to the playroom, shared primarily with one's local social sphere. However, along with this local space, Harumika opens up an increasingly large virtual play space. Unlike BFD, which stored designs on a local hard drive, Harumika allows individuals to upload their designs to a public website. Through the web, budding designers can share their designs with friends *in absentia,* while also opening their designs to a broader public. Moreover, by creating this digital space, Harumika makes the very act of construction a more social affair. Rather than seeing themselves as islands of creativity, designers can become members in a larger community of practice.

Like Harumika, LilyPad leaves room for both public and private spaces. On the one hand, the very materiality of the LilyPad encourages the local play already prevalent with BFD and Harumika. And, like the original BFD, this local play occurs in two dimensions: both on the computer screen and in the work/play room. On the other hand, like Harumika, the LilyPad is connected to a larger social network. Through the LilyPond website, designers can share their LilyPad creations with any number of users across the globe. Finally, the LilyPad also opens up a third space form which both BFD and Harumika are exempt. Because the LilyPad is wearable – because designers can literally wear their creations on their sleeves – the LilyPad also allows an embodied public space. In other words, while Harumika incorporates a digital community, the LilyPad incorporates a physical, real-world community, as designers take their creations into the streets.

Play Partners. Play with all three kits starts as a local activity. Examining the tremendous popularity of Barbie Fashion Designer among girls, Subrahmanyam and Greenfield [13] point out that much of BFD's unprecedented success stemmed from the local nature of its play. While BFD kept its players constantly engaged and active, the "action" of the play here did not exist solely in a virtual environment like so many of the video games geared toward boys. Instead, girls could actively play out their own individual fantasies in the familiar setting of their home with familiar characters using BFD as a means to create this other world. "Here the software makes the computer yet another accessory for Barbie play," write Subrahmanyam and Greenfield [13], "(t)he computer takes on the role of a tool and, unlike other games, ceases to be an end unto itself" (59). To this extent, Barbie Fashion Designer acts as a tool that makes things – making play tangible beyond the confines of the digital screen.

Harumika's play also starts on the local level but, unlike Barbie Fashion Designer, its kits do not rely on digital interaction in the creative process. While the physical kits provide assistance, Harumika players work alone or with each other to create their own clothes relying on their own two hands. The digital only plays a part *after* the clothes have been created when participants have the option to post pictures of their clothes through the Harumika website (http://www.harumika.com) that allows players to establish their own accounts and share their own personalized "Look Books". The LilyPond site also serves as a forum for its users to share images of the interactive textiles that they have created. In addition, the LilyPond allows designers to tag their uploads and provide both descriptions of their projects and the LilyPad materials they used to create them. Digitally posting images and including descriptions on these websites perpetuates "play" to a large degree. What may initially seem to be the culminating activity of one's creative play with such kits actually encourages further play when budding designers find new virtual audiences for their creations and have the opportunity to see the designs of other users. Playing and producing become more closely intertwined through the digital environments associated with these kits. And as the Pew Survey [9], on media creation among teens indicates play and production are increasingly intertwined with girls leading in most areas of content creation, such as blogging and posting photos online – activities utilized by the online aspects of both the Harumika and LilyPad kits.

Design Competencies. What sets the LilyPad Arduino textile construction kit apart from the other construction

kits highlighted here in this paper is that the role of computation in the design process. Computation enables the designer to have more control over the final product, to enable interaction of the garment with the physical environment and enable user-interactivity. Traditionally, computation has been seen as narrowly technical activity that is not amenable for use in youth or DIY communities. However, new toolkits have changed this landscape and are slowly changing the landscape of who is able to program. Traditional computational construction kits, like the LEGO Mindstorms and the PICO Crickets have made computation amenable to novices and young children by leveraging a building block, visual programming language that enables designers to program their creations through commands that can be snapped together. The LilyPad Arduino kit, by contrast, is one of the few construction kits that merges computational capabilities with soft materials to make it amenable to fashion design and other textile objects. Being able to program the LilyPad allows the creator to customize their creations and add a personal touch (e.g., a bike jacket that can signal right and left turns through the touch of a button on the sleeve of a jacket). By adding computation to the textile construction kits, it widens the competencies that youth engage in while designing – expanding Frobel's ideas into the 21st century and beyond.

CONCLUSIONS

In the 1800's when Fröbel designed his 20 gifts and occupational activities, he worked with the materials of his time and with a keen eye for children's developmental challenges. Although, the computer has become the multifaceted material and tool of our time, Fröbel's model provides a bridge between material and digital culture. Computational construction kits increase access to both domains, promoting learning by drawing on both skill sets simultaneously. And yet, today, computational construction kits remain far from democratic because both construction and computation are viewed as predominantly male activities.

The value of e-textiles is, therefore, in creating new spaces that historically haven't been open to girls, and these new spaces will give us a better opportunity of reaching more players. The examples of textile construction kits contrasted in this paper illustrate the different conceptions of what role technology takes in children's play and design. Across all three kits, the role of technology is mediated by social context, whether play occurs among a small group of friends or across massive communities with thousands, if not millions, of members. It is in this last example, where we find the promising opportunities that could forecast features of the next generation Barbie Fashion Designer.

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