Patchwork: n Expressive e-Textile Construction Kit

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bstract

Though critical engagement with identity usually does not begin until adolescence, children begin developing the foundations of their understanding about identity at a young age. Patchwork is an interactive construction kit which enriches learners' experiences with identity reflection and expression. Learners are prompted to create patches with scaffolded electronic textile elements to express pieces of their own identity. Patchwork builds on the self expressive nature of traditional patches. Ultimately, the learner is scaffolded through both learning electronics as well as identity reflection and formation.

Demo Video

https://youtu.be/zDRsZVn6bHE

uthor Keywords

Constructionism; e-Textiles; identity development; construction kit

CCS Concepts

• **pplied computing** **Interactive learning environments; •Human-centered computing** *Activity centered design; Interface design prototyping;*

Figure 1: Cover of Meet Sky story book.

Patchwork Goals

- Learn about identity and expression through construction.
- High-ceiling through computational and construction progression.

Figure 2: The patch can be moved from backpack to clothing and back again. Patch is an example response to What is something you love?

Introduction

Patchwork is an identity construction kit designed to engage learners in identity reflection and representation through the construction of patches. The first module of Patchwork targets children aged 8-10 years old, an age marked by a budding relationship of self with the world [5]. In this module, Patchwork introduces learners to ideas around identity through a storybook which also guides the construction of a patch and electronic textile circuits (Figure 1). Ultimately, learners are empowered to construct dynamic representations of their identity and self-expression on the patch.

Background

Electronic Textiles

Leah Buechley, one of the earliest leaders in the field, notes e-textiles afford a particularly advantageous introduction to electronics: needles and thread are much less intimidating than soldering irons [4]. In addition, e-textiles build upon traditional handcrafts by meshing the expressiveness of clothing with the technical capacities of electronics.

This unique combination presents a space to enrich children's and adolescents' experiences in learning about identity and lead to a sense of self as an author, artist, inventor, creator, or teacher [9]. Specific to the realm of e-textiles, Kafai et al. argue that the creative freedom offered by e-textiles helped students feel a great deal of ownership in designing their projects [8]. This ownership relies on learners' ability to contribute their own identity and experiences to the process of designing projects.

Identity and Expression

Goffman postulates that the presentation of self is facilitated through a performance, what others see represents the conception we have formed of ourselves [6]. Central to this performance, Goffman defines the front as expressive equipment to define the situation [6]. Clothing is a front and with the manipulation and construction of clothing forms, individuals can curate conceptions of themselves.

What is performed and presented is relative to individual's experiences, presently society defines children's understanding of emotion [11]. Children can identify and express a wide range of emotions through associations with colors, symbols, and facial expressions [3]. Moving into ages five to twelve, children come to understand identity as how they fit into social world [5]. In this stage of development named industry versus inferiority, identification and competencies interact with perception of oneself in society and are marked by a desire to perform [5].

Shortcomings

While the creation of e-textiles was an act of democratization and scaffolding at the intersection of technical and crafting, working with e-textiles can be difficult. It requires sewing and circuitry. In addition, existing e-textile kits, such as the LilyPad sewable electronics kit, walk through projects, but do not prompt to reflection on the relationship with the craft or topic and the projects are unchangeable overlooking the dynamic nature of identity. Patchwork provides building blocks, similar to Little Bits, making it easier to use e-textiles and freely change their identity and expression.

Design

Design Overview

Patchwork guides learners through expressing their identity through the creation of wearable e-textile patches. The design of Patchwork is driven by the goals shown on the left. The first stage Meet Sky serves as the building blocks of the kit and is currently prototyped and encompassed in a book. This book takes the learner through Sky's journey exploring components of identity. It guides the learner through

Figure 3: Electronics included with the Meet Sky Kit.

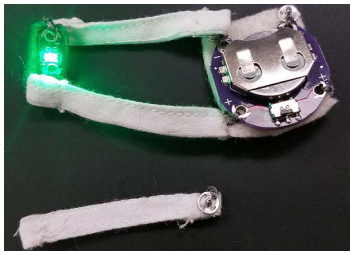

Figure 4: Learners connect electronic components with snaps to construct basic circuits.

Figure 5: Shapes included in Meet Sky kit for expression.

the use of the magnetic patch, fabric shapes, and electronic elements to give the learner tools to express themselves.

Patch

In scouts, badges are awarded for completing specific skills and patches for participation and interests. Patchwork pulls from the expressive patch instead of a badge. This shifts the emphasis away from mastering, towards using these as tools for exploration and expression of identity. To accomplish this, the patch facilitates the following key features:

Sharing: The patch design was directed by the two parts of constructionist learning: the learner constructing ideas to understand, and then, the learner shapes and sharpens these ideas through expression and sharing [1]. The patch in particular utilizes Goffman's idea of clothing as an expressive presentation of self. Then by wearing and displaying the patch, the learner can share their expression and refine their ideas within the context of their community.

Flexibility: The patch is flexible in that it can be moved from item to item (Figure 2). This enables sharing and communication of the learner's expression. Additionally, it consists of a fabric covered metal base that allows the learner to assemble, move, and rearrange the other components easily and fluidly. The flexibility of the patch allows identity, expression, and learning to be fluid as the learner grows and allows the reuse of materials to continue exploration.

Electronic Textiles

E-textiles offer not only additional tools for expression but an added dynamic layer. E-textiles allow the learner to add light and sound to their expression. Electronics can be disconnected or changed to alter expression, aiding the learner in fluidly changing their expression as they get feedback and both sharpen and change their ideas. The Meet Sky kit aims to lower the barrier to entry of e-textiles.

Each electronic component is sewn into a fabric piece with snaps to connect to other e-textiles and a magnet to stick to the patch (Figure 3). This allows the learner to create without sewing or advanced circuit knowledge. The snaps in particular, facilitate assembly, as they only connect in one direction, which prevents the learner from connecting the electronics in non-functional direction (Figure 4). Furthermore, the Meet Sky patches are not only a construction of artifacts but also serve as a tool. As learners advance to sewing and more advanced electronics, the patch and e-textile components of Meet Sky can be used to block out the correct set up before sewing their own dynamic pieces.

Shapes

Patchwork includes fabric shapes for use in expression, each shape has a magnet on the back side, for assembling on the patch. The included shapes are simple, known, and provide the building blocks for a learner to express themselves (Figure 5). The simplicity of these shapes allows the kit to be simple, yet allow for a wide range of creations [10]. Fabric shapes can be cut and modified by the learner.

Story

The Meet Sky kit is facilitated through a story of a young robot named Sky (Figure 1). The story walks Sky and the learner through patch creation of identity centered topics of family, emotions, abilities, love, and friends (Figure 6). In addition, the book prompts the learner to create three circuits (Figure 4). The book works with the kit features (snaps, basic shapes, etc.) to focus the learner on a piece of the challenge and gradually provide tools and scaffolding for the learner to step-up in complexity and skill [7].

Future Work

We plan to continue building Patchwork. First, we plan on conducting user tests to measure and understand how

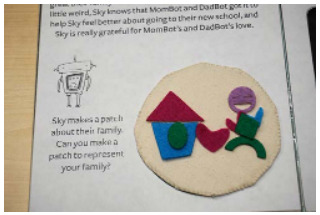

Figure 6: Example patch for Can you make a patch to represent your family?

learners experience reflection with the Meet Sky kit. Then build subsequent modules: *Befriending Data* - Sewing, connecting pre-programmed microcontroller data inputs, self-perception, *Finding Connections* - Connecting multiple patches technically, collective nature of identity, *BFF* - Building custom sensors, formulating programming skills, form and challenge the cohesive image of identity. These stages are key as identity is an ongoing process. In addition, engagement is enhanced with challenge, choice, and variety [2]. Multiple stages also allow the scaffolding to be peeled back, to continue adding variety and challenge while providing a platform for reflection on the process [7].

Conclusion

Patchwork is an identity construction kit that helps learners think deeper within identity and challenges them to represent identity through a patch medium. With the flexibility of the magnetic patch surface and freedom to move the patch across garments learners are empowered to construct dynamic patches, modeling the dynamic nature of identity. We seek to understand how children come to represent identity, providing support and a tool to aid in the process.

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