Wearable Tech: Smart Boys in Smart Clothes

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Introduction

Wearables (a.k.a. soft circuits) are electronics worn on the body, either as accessories or as part of materials used in clothing.

I'm curious whether this work might inspire boys who had never thought of themselves as tech-savvy or interested in electronics.

I wondering whether showcasing these personal creations allow boys to talk more freely about their creative ideas and personal style?

A favorite resource of mine was Emily Lovell's *Getting hands on with soft circuits: A workshop facilitator's guide*. The materials and basic concepts for wearables projects are introduced well for students and teachers alike. The tutorials teach sewing with conductive thread as well as making progressively difficult circuits. It was good practice for the boys projects.

The Research Question

How might making wearable electronics inspire self-expression in middle school boys?

Research Context

From its inception in 1957, Cathedral School for Boys has always strived to be a school that reflects the many neighborhoods of San Francisco. CSB is an independent Episcopal school located on the grounds of Grace Cathedral. The school enrols approximately 267 boys in kindergarten through eighth grade.

Participants

I had nine 5th and 6th Grade boys in my project-based learning course Wearable Electronics. This group of boys represent a range of academic ability levels, interest in electronics and experience working with textiles.

Parent volunteers and alumni were welcome to attend our PBL sessions. We had two adults at each session providing support with sewing, electronics or programming.

The Research Action

Each boy wrote a driving question to guide his project over 12 weeks.
During the 2.5-hour class period, students designed and made wearable electronic artifacts with teacher support.
Students recorded their progress in a journal, sharing their feelings about the project and its challenges.
The boy wore the article of clothing and demonstrated its features to peers.

Data Collection

- **Journal:** Written reflection on their project, and feelings about electronics
- **Survey:** (14) Multiple-choice questions with 5 anchors on self-expression and feeling connected to others
- Interview: Students videotape other students about their wearable project, and whether they feel it may be used for self-expression.
- Questionnaire: After the project expo, students share key events and challenges, also revisit questions from the journal writing.

Data Analysis

Journal responses were used to establish three main categories for results: (1) feelings about clothes, (2) feeling connected at school, and (3) feelings about wearable electronics.

The 14 multiple choice survey questions were chosen based on the three categories. Results for each question were scored based on the five anchors (e.g. 0-Not at all Important up to 4-Highly Important) with averages among all participants recorded for each question.

Videotapes of the interviews were viewed carefully and transcribed. Questions also focused on the three categories. Notes were take on the body language and tone of the student responses.

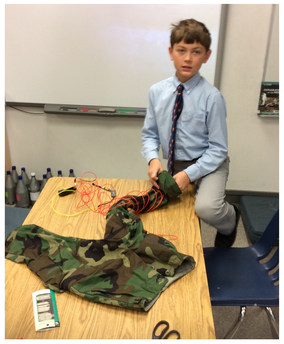
Results from the journal, survey and interview were triangulated. I looked for commonalities within and across the categories. Having overlapping questions in the different modes of data collection provided a check on interviewer bias, also a measure of credibility to the accuracy of the findings.
I listed the significant events and written excerpts for each student. Those that were experiences common to the participant group are listed as themes.

Key Findings and Discussion

- The students felt clothes were quite a bit important for self-expression and individuality, but comfort was a priority.

"I think Spirit Week is fun. I like Pajama Day and Red and Gold Day. No so much Crazy Tie Day. I just want to feel comfortable."

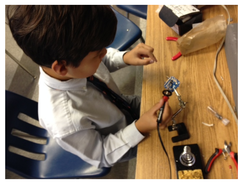
"Can we cut the lights on the stage, so everyone in the room can see my vest light up?"



- Students stated wearable electronics can be a way of connecting yourself to others.

"Wearable electronics helps me express myself in showing people what I like, what I do, and stuff."

"I will be able to express myself electronically! People will try to make things like I did."



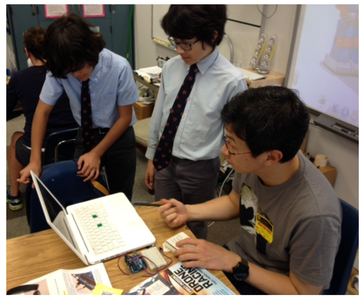
- Students enjoyed working with electronics and picking up new skills. However, the more parts of the project they learned to do themselves, the more proud they were of the final project.
"I really liked soldering and it's pretty easy to do. "

Conclusions

The students said they enjoyed making their wearable projects. They felt wearables were a vehicle for self-expression, even though personal opinions on the importance of clothes varied. During the expo, they enjoyed showing off the features to peers.

Students reported a strong feeling of connection to peers, but less so with adult figures. Beyond the expo, I'd be interested in giving students permission to don their wearable artifacts for an entire school day. It would be fascinating to record interactions with younger or older students, teachers, even adult visitors. Would these interactions help them strike up conversations, make a friend, or be recognized in a new way ?

We were very fortunate to have parent volunteers for sewing and programming support, who came in weekly. They were as passionate and dedicated as our students. Another interesting study would be the role these parent volunteers may play in improving students' feeling of connection to adults when they are learning and working on a project together.



Key Readings

Martinez, S. L., & Stager, G. (2013). *Invent to learn: making, tinkering, and engineering in the classroom*. Torrance, Calif.: Constructing Modern Knowledge Press.

Stringer, E. T. (2007). *Action research* (3rd ed.). Los Angeles: Sage Publications.

Buechley, L., & Qiu, K. (2013). *Sew electric: A collection of DIY projects that combine fabric, electronics, and programming*. Cambridge, MA: HLT Press.

Lovell, Emily. *Getting hands on with soft circuits: A workshop facilitator's guide.* http://alumni.media.mit.edu/~emme/guide.pdf

Sparkfun Projects
https://learn.sparkfun.com/tutorials/tags/projects

Adafruit Learning Systems
https://learn.adafruit.com/category/wearables

Further Information

This poster and further information is available at http://www.theibsc.org/.

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