Social Wearables for Edu-larp

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ABSTRACT
As part of our ongoing research program focused on social wearables, combining them with the collaborative and immersive experience of live action role play (larp), we are designing an educational larp camp that we plan to deploy in summer 2021. The camp focuses on increasing the interest of middle-school-aged girls in making and technology, with an additional focus on girls from lower socio-economic situations and diverse backgrounds who are frequently left out of STEM education efforts. The core research concept is that the activity of making social wearables in a larp context will enhance learning, interest in, and motivation for pursuing computation and ubiquitous computing design in our target demographic. We have explored hardware and IDE options within the interconnected network of maker ecosystems, and settled on a prototype kit centered around the BBC Micro:Bit ecosystem, with an additional string of RGB LEDs. This prototype kit has the advantage of zero-soldering fabrication, and robust elements that are more suitable to wearables use cases. In this paper, we discuss this early prototype kit, as well as the motivation for the camp itself. In presenting our demo, we look forward to benefiting from the expertise of the FabLearn community in the form of inspiration and design feedback for both the kit and the overall camp project.

Tools, Skills and Materials
• Tools→Makecode • Tools→Micro:Bit • Tools→RGB LEDs • Materials→Fabric.

Keywords
Social Wearables, Edu-larp, Co-Creation.

1. DEMO DESCRIPTION

1.1 Description of the Product and Project
Broadly speaking, our project is the development and repeated deployment of an educational live action role play (Edu-larp) camp that engages middle-school-age girls in the co-creation of social wearable technology. Our design-based research process will involve the creation of a tailored Edu-larp experience, along with a set of social wearables design and development activities, to be deployed in the format of a one-week camp session. Our design conjectures are that the tools, tasks, participant structures, and discursive practices which we design and develop will result in observable interactions and artifacts, as well as camper self-reporting, that all demonstrate the development of computational community formation. Our initial theoretical conjectures are that this experience will lead to enhanced learning, interest, and motivation for pursuing computation and ubiquitous computing (ubicomp) design. We hypothesize that a focus on the development and iteration of social wearable technology (technology aimed at supporting the benefit of the group as a whole) can provide an application space more amenable to girls' self-reported desire to build things that are meaningful to others [1][5].

The current prototype (one potential component of the week-long proposed camp) is an hour-long, semi-structured activity aimed at introducing people with little to no prior making experience to the social affordances available to them through easy-to-use, block coding of hardware behavior. The task is a pair programming activity using the BBC Micro:Bit Platform of maker microcontrollers and the Microsoft block-based coding language, Makecode. Both of these are educational entry-level programming tools that have been previously used to teach children programming skills [6]. We make use of the relatively new "dots strand" form factor of Adafruit Neopixels for their robustness and flexibility, which are important factors when creating wearables. We take this commercially available component and alter it to add prefab jst connectors bolted on to the Micro:Bit in a no-solder technique. We have chosen this to avoid requiring campers to solder as that is not the focus of the exercise. We chose to prefab the connectors as the dexterity required to solder can result in a frustrating loss of momentum to the experience of the task by placing time and energy on a relatively small step which can interrupt the creative process. We begin each stage by introducing the general concept of that particular task. Participants move through key topics such as microelectronics and block-based coding, inputs and outputs with buttons and an LED display, external RGB LEDs, and the use of libraries, sensors, interrupts, and radio wireless communication. Each stage ends with a prompt to accomplish a task, but is left open-ended to promote creativity. These prompts include: "Tie pressing one of the buttons to

Figure 1. A possible finished wearable

showing an icon on the led screen" and "Using the 'onshake' function, set the string of LEDs to a pattern of your choice." During this process, the researcher prompts the pair to think aloud and alternate working with a single interface. The researcher then proceeds to make observations and comments on their process as they work together. We plan to see if the pairs of participants are able to work through any issues they run into without asking for assistance or our researcher needing to interfere. The simplicity of the form factor allows flexibility in wear and rapid bodystorming using a working set of prototype hardware. This is representative of a single module of the planned multi-day camp. It is important to note that this exercise does not yet have the larp context for the activity and the use of the device, which will come later. In the camp itself, cooperative making periods will result in social wearables that campers can then use in the larp setting.

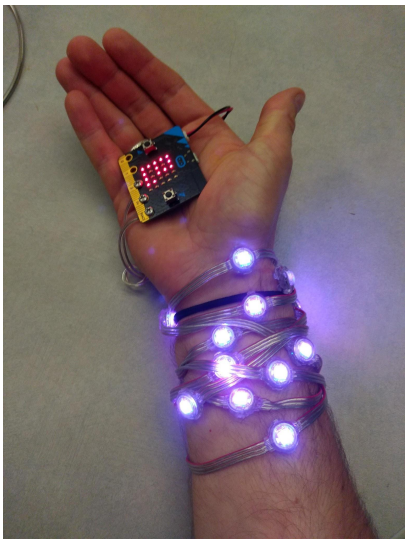

Figure 2. An additional form factor

By demoing this project and discussing our work with the FabLearn community, we are seeking to validate and gather design feedback for our prototype Maker kit and exercise. Will other attendees with expertise in this area see this kit as useful in promoting feelings of self-efficacy towards technical/making subjects in middle school-age girls? Will they agree that this kit is accessible to users who have little to no technical background? Will other conference attendees agree that after going through the tutorial, users are likely to be more interested in pursuing making outside of the kit? If not, what might we improve and how?

Our hope is to use the information and creative ideas gained from demoing this smaller-scale activity, along with other workshopping opportunities, to inform the design of the larger-scale Edu-larp. The desired outcome is inspiration, mechanics, and flexible ideas rather than a rigidly designed experience to fit within the larp context. Larp always involves participatory improvisation on the part of the larpers, so it is not the same as enacting a structured script (such as in a theater context). Larp is a long-standing format of collective play, with many genres and participants from around the world that attracts robust numbers of both (self-identified) women and men—in a 2014 global census of larpers 10,486 women and 18,265 men responded, as well as 399 non-binary people and 427 people who preferred not to identify their gender [16]. Edu-larp has been used in therapeutic contexts and in training exercises, as well as to form the basis of an entire school curriculum in Denmark, teaching the full range of subjects [2]. Bowman points out that larp allows for "active engagement, problem solving, agency, and participation" [2]. Larpers already make extensive use of technology in their role-play, creating custom props, accessories, and tools to support their immersion [15]. When larp designers use technology, they emphasize the value of supporting the social engagement of the group, rather than supporting individuals [14]. In general, larp designers value the experience of the group and work to create a compelling shared experience that is emotionally and socially engaging for all participants. Girls report caring more about computing when it allows them to address socially meaningful problems and situations [1][5]. For all of these reasons, we see Edu-larp as a very promising framing experience for deepening middle school girls' interest and engagement in computation.

1.2 Target Audience

Through the continued development of this kit, we aim to reach educators and organizers of extracurricular activities that focus on teaching girls technical and ubicomp design skills. Women are still drastically underrepresented in computing careers as compared to their proportion in the general population [1]. The struggle to create and maintain a robust pipeline of women in computation begins early. Middle school is a time when many girls lose interest and confidence in pursuing technical education and careers [5]. For our initial camp deployment plans we will not turn away any campers (per Title IX guidance), but we will develop the camp with girls' issues and interests in mind, to address the above-mentioned pipeline challenges.

The eTextiles community (such as Lilypad) is more gender-balanced than the general Arduino hardware community [3], supporting the notion that girls may more readily find an extended community of computational participation using these platforms. Yet in a close analysis of projects and activities in these programs, we found that girls typically create individual projects that are novelty interactive items—e.g. toys, interactive wearables, musical instruments, etc. While these exercises are engaging craft skills, they are not taking advantage of the interest that girls have in creating things that have social meaning and value[1][5][7][8].

This project seeks to combine the collaborative and social nature of these different areas with the belief that tasking girls to create wearables with a social function, in the context of larp activities, will more deeply tap their engagement and interest. Girls will be building technology in the service of social actions and tasks via wearables designed to make interacting with one another more interesting and fun. Rather than designing only for themselves, they will be designing for the engagement and pleasure of the entire group. In this regard, they will also be taking part in ubicomp design [9][13], working together to brainstorm, prototype, iterate, and refine the technology to support peoples' interactions in a free-ranging use context. We believe the combination of Edu-larp with building social wearable technology will encourage a greater sense of what Kafai terms 'computational community' [7][8], leading to more persistent gains in interest, engagement, and likeliness to pursue computation in the future.

2. CONCLUSION

2.1 Lessons Learned

While developing this project, we had to approach Making culture and educational material from the perspective of a person trying to enter the Maker space. To accomplish this we looked at the web presence and communities of a broad array of Maker Ecosystems to identify resources and hardware that supported the desired outcome. Through this, we identified key variables for the selection of Maker Ecosystems used for an initial introduction to Making. These variables include: whether the ecosystem is open and works with other ecosystems or closed and functions purely within their defined space, how they present onboarding materials that help users learn the platform, whether there is a growth path that supports continued learning and development, and what they require or expect from users to participate (gatekeeping). These variables have given us insight into how best to approach different kinds of Maker hardware when designing for complete beginners.

From a fabrication standpoint, for the development of the current prototype activity, we have sought out alternatives to soldering and traditional breadboard-based connection methods. This has previously been a point of failure with our wearable designs. Traditionally soldering can be the weak link in a wearable design, breadboard based connections lack the sturdy, consistent connection needed for wearables as well, other options like conductive thread are a good option in some cases but require a commitment to form factor that limits creativity in rapid prototyping. For this project, we have explored bolt-based connection options which work by crimping the wire to the circuit board. This removes the skill and material gatekeeping factors that come from soldering while affording a flexible form factor and strong connection. Development boards such as the Adafruit Circuit Playground, Lilypad and the Micro:Bit feature large circular pads that allow for this method of connection.

Additionally, This has also been an opportunity to practice designing activities for others and leading instruction. Moving from designing hardware for specific user groups and applications to designing an educational activity has been a new experience. Designing for a specific population requires establishing a set of requirements, iterating the design with feedback from the stakeholders and deploying it for observation and study. In this case, the process has been different. The affordances of the kit are chosen and iterated to present a set of verbs to the participants that they can then use to create their own work and projects. Combined with the pedagogical process of presenting these affordances in a way that is accessible and actionable to the participants, the development of this kit has required advancing skills in areas beyond fabrication.

2.2 Broader Value

The Edu-larp camp aims to develop not only the skills and interests of its campers but also serve as a model for playful informal education. Previous research into social wearables in the larp space has shown their adaptability within these playful contexts as both game mechanics and expressive tools [14]. Later work within larp contexts has shown that the affordances of social wearables shape player interactions within the game to be supportive and constructive even in broadly competitive settings [4]. Afterschool programs, camps, and other informal learning environments increasingly incorporate ‘Maker Spaces’ [11][12], and continue to need quality, evidence-based pedagogical resources to support their programming [10].

Designing and deploying this camp will contribute to understanding and refining mechanisms of formation of computational community, and how these in turn link to the theoretically conjectured outcomes of enhancing girls’ interest, perceived competence, and involvement in computation and ubicomp design. The project will contribute to a shared understanding of how to build computational communities of practice, as well as an understanding of how design thinking develops in a ubicomp context. Results from research on camp effects can have a benefit to others designing informal computational learning experiences aimed at raising girls’ participation, and those interested in design mechanisms that support the formation of computational communities.

2.3 Relevance to Theme

Through this work, we aim to offer a safe, collaborative introduction to Making and technology, with the goal of increasing interest and feelings of self-efficacy with girls at a pivotal age for identity development. We aim to develop computational communities of practice which support the individual’s passion, drive, and resilience. We are working with partners who interface with lower-income communities and historically underrepresented groups in tech to continue to broaden the community of makers and the empowerment that comes from the ability to create technology. We see this broadening of the overall community and attitude towards inclusion as key to Making as activism.

3. REQUIREMENTS

This project does not require any special accommodations beyond occasional access to an electrical outlet for charging hardware and laptops.

4. BIOS

James Fey is a Ph.D. student in Katherine Isbister’s Social Emotional Technology Lab at the University of California Santa Cruz. His previous work in creating social wearables for use in live action role play has led to exploring how the act of making social wearables in this context can be used to facilitate informal learning. Katherine Isbister is a full professor of Computational Media in UCSC’s

Engineering School. She directs the Social Emotional Technology Lab (http://setlab.soe.ucsc.edu) and the Center for Computational Experience (https://cce.ucsc.edu/).

5. ACKNOWLEDGEMENTS

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