

Using Technology Toolkits in E-Textiles Education

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Introducing interactive functionalities to arts to textile teaching poses challenges to both students and teachers. While students have to engage in new technologies and tasks such as programming, teachers have to find a good way to introduce the novel topics and find the right balance between level of complexity and design freedom. In this position paper, we present our experiences from introducing technology toolkits for e-textiles education with design students.

CCS Concepts: • **Applied computing** → **Arts and humanities**; • **Human-centered computing** → *Interaction design process and methods*.

Additional Key Words and Phrases: art, technology, teaching, experience

1 INTRODUCTION

The potential in the integration of arts, design and technology has been recognized across both disciplines [2], and universities are forming more and more cross-disciplinary courses and programs both in technical faculties and art schools. Combining two fields with such different traditions, practices and knowledge domain is not an easy task, and possess challenges both for students and teachers. In this position paper, we present our experiences from introducing prototyping towards interactive artifacts to the context of teaching art and design at our university.

2 TEACHING E-TEXTILES

Teaching of the e-textiles started in the University of Lapland from the mutual interest of developing textile design studies in 2015. The courses are co-taught (i.e. collaborative teaching, team-teaching) with the university teacher in design technology and the lecturer in textile design. The aim of the e-textile studies is that students learn the basics of the electronic textiles in the context of interior and textile design, and are able to combine electronics into their designs. The desired outcome from the course is a designed and assembled interactive prototype. Given tasks have been related to the arctic design [3], and the outcomes have been presented at an annual exhibition and in the Instagram account @e_tekstiilit. The course has been compulsory for the master students since 2015. In 2018, it was included to a new, optional minor studies on Creative Technologies, and has since gained a growing amount of participants from multidisciplinary fields of design.

Feedback and experience from previous courses shaped the courses throughout the years. Starting from the Arduino Uno, chosen for its relative simplicity (see Figure 1), we proceeded to LilyPad Arduino and utilized resources such as Arduino communities and Instructables.com. Often we observed that many students had too complex ideas to realize with their knowledge [4]. Thus, we decided to allow students to focus more on the design and introduced them to DIY Toolkits: Bare Conductive's Touch Board and Light Up Board (see Figure 2), where both boards have built-in touch sensors. The technology was introduced in the beginning of the course in workshops where students could rapidly turn their first ideas into working prototypes (see Figures 3, 4, and 5). However, the technology limitations became obvious soon, and students were allowed to combine boards together.

In the anonymous feedback after the recent course, 4/10 (out of the total 14 participants) mentioned that they would have liked to learn programming in this course. Taken the prior feedback where the course had often perceived

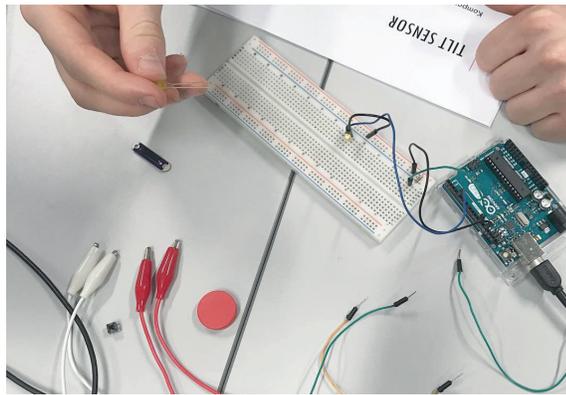


Fig. 1. Students learned about electronics and programming in the workshops where they lighted led with different sensors.

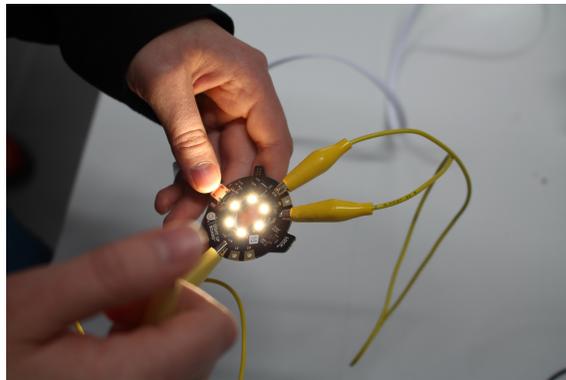


Fig. 2. Bare Conductive's Light Up Board has six built-in leds. Those could be set to six different modes depending on how the electrodes are connected.

technically challenging, these comments were a surprise. The main challenges from the teacher's point of view have been 1) how to guide the design process when totally new elements such as coding and building electronics are included, and 2) how to set the level of difficulty in used technology.

3 LESSONS LEARNED

The teaming up and co-teaching has developed not only the students' skill but also the ones of the teachers. The use of different applications, software and technologies, as well as different working methods, and sharing and networking in the the field [5]. The teachers of the creative technologies have background in different fields, including interaction design, computer science, industrial design, textile design and clothing design. Integration has given more opportunities for the teachers to conduct co-teaching and develop their know-how in the intersection of design and technology. For instance, in the field of e-textiles, it has been pointed out that the textile knowledge is essential, but when the aim is to develop textile as a product, interdisciplinary teams are needed [6]. A larger set of teachers and creative technology courses has also given students a fruitful opportunity to continue the design process further with different professionals. This approach has aligned well with the demands for an iterative approach in creative processes [1].



Fig. 3. In the workshops students made rapid prototypes and tested how the electronics could be integrated with the textile materials. Piritta Mettovaara had the idea of a wall textile which welcomes you home. She used the Light Up Board in prototyping, but used the Touch Board in the final work Come Well, 2019.



Fig. 4. Eveliina Muotkavaara had an idea of a textile that lightens up and shows a message. She tested the idea in the workshop with a very quick prototype.

Additionally, students have continued developing their works for the annual exhibitions in the faculty, and some have been presented at international design events [3]. Expanding the visibility of the creative technologies studies through exhibitions and social media has gained also wider interested, and resulted networking and co-operations.



Fig. 5. The final work includes two sets of Bare Conductive's Light Up Board. One is in the other and the second is in the other "stone". One could send a message from a felted stone to another. Secret message by Eveliina Muotkavaara, 2019.



Fig. 6. Early design of the Linn Dress using electrochromic displays [7] for a hide-and-reveal feature, prototyped with LilyPad Arduino toolkit.

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