The EduFab Construction Kit

Nadine Dittert

University of Bremen

dimeb - Digital Media in Education

Bibliothekstrasse 1

28359 Bremen, Germany

ndittert@tzi.de

Eva-Sophie Katterfeldt

University of Bremen

dimeb - Digital Media in Education

Bibliothekstrasse 1

28359 Bremen, Germany

evak@tzi.de

Antje Moebus

University of Bremen

dimeb - Digital Media in Education

Bibliothekstrasse 1

28359 Bremen, Germany

moebus@uni-bremen.de

Abstract

We present the EduFab construction kit that facilitates digital fabrication activities for novices. The kit enables teachers to initiate learning environments for students to create products that are based on their own ideas and preferences using 3D printers, laser cutters, microcontrollers, etc. The kit "grows" with the educator's expertise and with each workshop. The kit consists of physical components in a modular box, a general concept on how to work with young people in a FabLab in an educational setting and examples for specific workshops that can be conducted using the kit. Further, for the specific workshops, the kit contains manuals and lists of necessary materials and machines that should be at disposal in the FabLab.

Author Keywords

DIY; FabLab; digital fabrication; laser cutting; 3D printing; concept; education; toolkit; children.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

The EduFab Construction Kit

The EduFab Construction Kit is a composition of hard- and software as well as a concept, manuals and materials that help educators to set up a learning

environment to get started working in a FabLab with young people.

The EduFab Construction Kit follows the idea of "learning by doing". As such, the teacher has to start "hands-on" herself: First of all, the box for the hardware needs to be fabricated using a laser cutter. By producing the box on their own, educators become familiar with different concepts and procedures of laser cutting (e.g. engraving, cutting, flexures) before working with young people. The hardware components are available as shopping list. Manuals and materials are at disposal digitally or printed. Further, the kit contains a written concept on how to work with young people in a FabLab in an educational setting. This general concept builds on the TechKreativ workshop concept [2]. Tutorials for specific workshops which can be conducted using the kit are part of the EduFab kit as well. One box contains materials for a workshop with a group of approximately 10 to 15 students.

Target group and experience
The EduFab Construction Kit is intended for educators and students to explore a FabLab and its technologies. The kit shows educators ways and provides examples on how to work with young people in a FabLab. The EduFab Construction Kit has been developed and evolved in a series of workshops that were conducted with teenagers.

The general workshop concept
The idea behind the TechKreativ workshop concept is that the starting point of any fabrication is the imagination of the participants rather than the technology that will be used. Following this concept, a workshop starts with the participants' fantasies before

getting to know the technology. Then, concrete ideas on what to build are generated and implemented. Finally the products are presented [2].

The modular box and tools
The tools of the EduFab kit are to be arranged in the stackable box that comes as a graphics file for the laser cutter and a description on how to build it. Once built, the box consists of different layers whereas the basic one holds a handle on which further workshop specific layers can be added or exchanged (see figure 1). Thus, the box "grows" with the educator's evolving expertise. Labels indicate the content of each layer.

Figure 1: The modular box

The base layer contains tools that are generally helpful when working in a FabLab and also necessary to build the box itself: Amongst others, a measuring tape, sandpaper, scissors, a pencil, wood glue, and a side cutter are included. At the bottom there is a drawer for A4 sized (scale) paper. The labeling of this layer is

foreseen for the name of its maker in order to personalize it.

Specific workshops
Within the project different scenarios were implemented and are described as examples for specific workshops in manuals. Therefore, further pre-build layers can be added to the box: There is a "SmartFab" layer that contains physical computing materials for workshops where "intelligent" artifacts are to be created. The "SchmuckFab" layer (jewelry layer) facilitates running a workshop in which youngsters create their own earrings, necklaces or bracelets using the laser cutter [1]. Similarly, the "StoffFab" layer (fabrics layer) contains materials for a workshop where youngsters create designs that can be plotted with the vinyl cutter to decorate bags.

For these workshops, the box holds the specific tools and most of the small expendable materials. Further, there are lists of machines and necessary materials (e.g. filament for the 3D printer, wood or acrylic glass for the laser cutter) that should be at disposal in the FabLab or need to be brought.

Importance of our submission to the digital fabrication/makers/hands-on learning communities

The EduFab kit will be specifically interesting for educators who want to create learning environments for digital fabrication, i.e. to conduct workshops for children with engraving and 3D printing technologies. It offers starting points for different digital fabrication activities and allows for modifications according to personal experiences, wishes and needs. People who are interested in acquiring the kit have the possibility to download the kit instructions.

Project presentation / demo
The construction kit is presented as shown in figure 1. Further, projects that youngsters built during the workshops will be showcased. Our demo requires one table.

Acknowledgements

References
[1] Nadine Dittert, Eva-Sophie Katterfeldt, and Sabrina Wilske. 2014. Programming Jewelry: Revealing Models behind Digital Fabrication. Short paper at FabLearn Europe: Digital Fabrication in Education Conference. Retrieved from http://fablearn.eu/wp-content/uploads/fablearn14_submission_82.pdf

[2] Eva-Sophie Katterfeldt, Nadine Dittert, and Heidi Schelhowe. 2015. Designing digital fabrication learning environments for Bildung: Implications from ten years of physical computing workshops. *International Journal of Child-Computer Interaction* 5: 3–10. http://doi.org/10.1016/j.ijcci.2015.08.001

[3] http://dimeb.informatik.uni-bremen.de/edufab/

The "SchmuckFab" layer

Components:

- different shapes made from foam rubber for the idea finding process
- leather tape for necklaces
- earring components
- small rings
- pliers
- glue

Purpose:

- design & create own jewelry by programming