Chapter 36
Smart Textile as a Creative Environment to Engage Girls in Technology

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ABSTRACT

In the context of the convergening media technologies, the concept of mobile media embedded in wearable material was introduced. The terms of Wearable Computing, Fashionable Technology, and Smart Textile became key words at the intersection of media, art, design, computer science, engineering and the shaping of technology by the users themselves. Though media artists and designers explore wearable computing for some time now, only little research has been undertaken into Smart Textile in education in Germany (e.g., the after school workshop program held at DiMeB at the University of Bremen). However, Smart Textile is not common at school, especially not in the context of artistic processes in general MINT (MINT is a German acronym for the subjects of Mathematics, Computer Science, and Technology) education in classroom settings. In order to research the interplay of electronic textiles, wearable technology, hard and software tools, such as the Arduino LilyPad, a programmable board designed for stitching into clothing and flexible applications, are scrutinized. In the research project, contemporary media art works in the field of Fashionable Technology are explored to inpire interdisciplinary technology education form an artistic perspective. A learning-through-design-approach using electronic media for sewing, hacking the traditional model of technology education (Reimann, Daniela, Fütterer Werner, Biefang, & Sebastian, 2010). In the paper, the conceptual framework for the research project "Artistic approaches to Engage Girls and Young Women in Technology and Engineering in Education at School and University (Acronym: IBP-GirlsLab)" is presented. It aims to engage girls in technology and engineering by integrating artistic processes as well as a more playcentric approach to technology and engineering education in order to engage girls in shaping technology, is discussed.

INTRODUCTION

The development of the 'technical dress' in the context of art history of the past 100 years was decribed in detail by Wolter (2009). Interactive textiles, also called "smart textiles" or "wearables" form a new generation of micro computer embedded in clothing and accessories. Those media offer many opportunities for creative exploration of so-called "smart" media that can percieve their environment through sensors. In Smart textile, conductive yarn (for cable), sensors, motors, LED lights and einnähbare boards (LilyPad Arduino) are used to develop electric circuits in clothing . Smart Textiles creates a link between haptic materials, precise computational models, control and creative concepts. New interfaces - sewn, woven or embroidered - can be experienced between body, clothing and the environment. In conjunction with the open source Arduino technology, such wearables are increasingly being tested by artists, designers, computer scientists, engineers, computer nerds and musicians. For example such media include 'story-telling dresses' (Tan 2005), wearable music' (Rosales 2012), pieces of cloth worn on the body, as well as 'sounding artifacts' (Trappe 2012), which produce music through movements.

RESEARCH INITIATIVES

One of the drivers for the initiation of the research project was the dramatically low number of female students in the field of technology, engineering and computer science at university level(In 2010, at the Karlsruhe Institute of Technology KIT, the percentage of von women in engineering sciences (Ingenieur-wissenschaften) is 22%, in some faculties such as machine building (Maschinenbau) as well as electronic engineering/information technology (Elektrotechnik/ Informationstechnik) around 10%.). The hypothesis of the project claims the introduction of artistic processes linked to meaningful contexts developed by the girls themselves can be key to trigger interest and motivation to deal with technology embedded in everyday life. Artistic processes, diverse materials and media aim to mediate technology as aesthetic experience, embedded in artistic processes of shaping, designing, constructing, programming and present-ing interactive technology in individual project contexts. The paper is based on the pilot research project "Artistic Approaches to Engage Girls and Young Women in Technology and Engineering in Education at School and University" held at the KIT's Institute of Vocational and General Education(Head of IBP: Prof. Dr. Martin Fischer. The project is realized in collaboration with ZKM Karlsruhe, Center of Art and Media, department of Museum Communication (Head: Janine Burger) using a software development of the research group "Digital Media in Education" at the University of Bremen (Prof. Dr. Heidi Schel-howe). The project is applied at the Hebel-Realschule Karlsruhe (Teacher: Roland Walz), a secondary school in the city of Karlsruhe with 6th graders of class 6c.).The IBP-GirlsLab-initiative was continued in 2014 and supported by the Daimler AG Stuttgart.

The research approach looks at coupling arts, sciences, and technology in engineering education. It explores an interest driven arts learning approach to technology education at both school and university level, integrating the artistic processes into the technology curriculum as well as into the teaching culture. The paper discusses examples of more playful approaches towards ludic textile concepts and wearable interfaces for interdisciplinary media-art-science and technology education based on shapable low cost media such as Arduino. Secondly, the project aims to facilitate transdisciplinary education scenarios, in

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