Colored Raindrops —
A Fiction-Driven Workshop for Girls

Jessica Broscheit

Department of Computer Science
Hamburg University of Applied
Science (HAW)
jessica.broscheit@haw-
hamburg.de

André Jeworutzki

Department of Computer Science
Hamburg University of Applied
Science (HAW)
andre.jeworutzki@haw-
hamburg.de

Susanne Draheim

Department of Computer Science
Hamburg University of Applied
Science (HAW)
susanne.draheim@haw-
hamburg.de

Kai von Luck

Department of Computer Science
Hamburg University of Applied
Science (HAW)
luck@informatik.haw-
hamburg.de

Abstract
This paper presents the idea of a fiction-driven workshop with a smart umbrella. For this we created a construction kit to perceive environmental data in a different way, by converting an ordinary umbrella into a tangible interface. With this approach we would like to empower young women to play an active role in developing innovative technology, and to spark a debate about environmental issues. This paper describes the framework and the workshop design, which seek to inspire female high-school students to enter a STEM profession such as computer science.

Author Keywords
Fiction-Driven Workshop; Knowledge Transfer; Gender Equality; Tangible Interface; Information Interface; Perception of Data; Eco-Sensitivity.

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

Introduction
Self-efficacy and a confident handling of digital media are essential for digital transformation [1]. For this purpose, fields such as Science, Technology, Engineering and Math (STEM) are important to ensure that an algorithm-driven world is not only lived, but

also deliberately designed. Women are still under-represented in the classic STEM professions. In order to address and empower this target group, creative ways are needed to avoid gender bias, support diversity and open the door for the next generation [1]–[3]. But what creative methods and technological frameworks can be used to attract young women to enter a STEM profession such as a career in computer science?

As part of Girls'Day a pilot study was conceived and implemented by an interdisciplinary team, a computer scientist and a designer, at the /* Creative Space for Technical Innovations */ (//CSTI). The //CSTI is a platform for applied research and knowledge transfer at the Hamburg University of Applied Science (HAW). As part of the Faculty of Engineering and Computer Science the lab covers four fields of research:

- Interactive Virtual / Augmented Reality
- Smart Object & User Interface
- Machine Learning / Data Mining
- Science & Technology Studies

The research field 'Smart Object & User Interface' includes studies on ubiquitous computing [4], and uses tangible user interfaces (TUI) [5] to facilitate knowledge transfer [6], [7]. For this purpose, the //CSTI encourages open source hard- and software [8] and agile prototyping methods such as 'Lifelong Kindergarten' [9] and fiction-driven design [10]–[13]. In this paper, a fiction-driven workshop with a smart umbrella was developed to inspire young women to enter a STEM profession such as computer science and to address relevant issues through the practice-oriented experience.

Smart Umbrella

Because of the rapid environmental and digital technological changes, it makes sense to create models of knowledge transfer through artefacts of future. Like Anthony Dunne and Fiona Raby, we are interested in using these artefacts as tools to better understand the present and to discuss a desirable future [10]. Therefore, the development of the case study started by defining a simplified what-if question in the science fiction method tradition [7], [10], [13]. With this method we like to approach key issues in a more imaginative way and guide the participants into a future scenario of sensing and exploring the environment with technology [7]. In order to make the future scenario graspable, a tangible interface is used as ice breaker and as an object for debate [10]. The aim of the workshop was not only to convey technical concepts, but also to enhance awareness of the role of technology [7], [10].
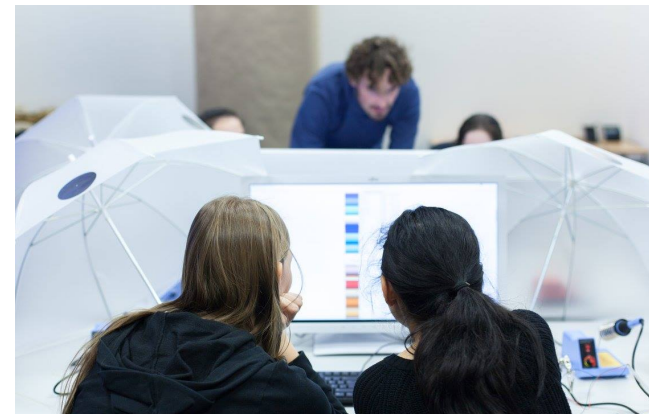
Figure 1: The participants consider a color concept for the umbrella. Image: Jessica Broscheit.
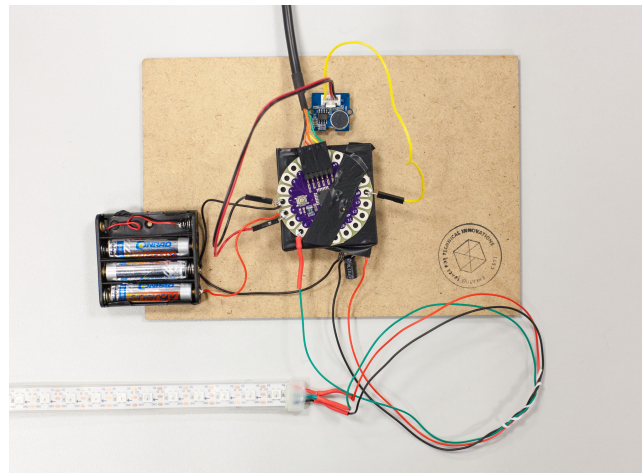
Figure 2: The Construction kit. Image: Jessica Broscheit.

As part of the //CSTI research 'Making Sense of Urban Data', the case study is dedicated to the global and socially relevant issue of Smart City. Because of the increasing population, cities have become a problem for humans and the environment. That requires solutions, not only for the cities, but also for the citizens and their needs [14]. Therefore, the research design was developed to address the urban environment of Hamburg. The city of Hamburg is known for its rainy days and so-called 'Schietwetter'. This phrase is used as a narrative framework to confront the participants with issues such as environmental data, extended senses and eco-sensitivity by using the following hypothesis: Rainy days can be depressing. But what if we could extend our senses through technology and perceive raindrops as colored light? In order to conduct this thesis, an umbrella is used to cover different aspects of the workshop design. Visually, the umbrella provides a gender-neutral key visual for the public

announcement and stages an aesthetic workshop setting (Figure 1). Technically, the umbrella is converted by the participants to extend the physical world with digital information through a tangible interface [5].

Figure 3: The participants solder the construction kit together. Image: André Jeworutzki.

As a physical object, the umbrella becomes a haptic representation of the environment. For this, a construction kit [2], [8] was created to enable human-computer-interaction. The construction kit included a microcontroller 'LilyPad Arduino' [8], a sound sensor, NeoPixel stripes, batteries and an umbrella (Figure 2). The aim was to create a colorful interaction based on the sound of the rain that falls on the umbrella. The sound sensor detects the audio frequency of the rain and the microcontroller transforms the information into RGB light so the environment can be visually explored and perceived. As an additional task, the participants have to consider a color concept for the sound of the raindrops and create an individual experience by

programming the microcontroller in the Arduino IDE [8]. Finally, the umbrella is used as an object for debate to analyze the attitudes of the participants towards future issues such as sensor technology as "personal digital data assemblage" [15].

Pilot Study

Ten female high-school students (aged 13-16) signed up for the pilot study following the public announcement on the Girls'Day website in April 2017. Participants did not need to have any experience of programming to join the workshop. The pilot study lasted four hours. First the participants were introduced to the //CSTI lab and confronted with the what-if question. Subsequently, a functional prototype of a smart umbrella was demonstrated and all components of the construction kit were explained. In order to assemble the construction kit, the participants had to solder all components together and do a functional test (Figure 3). Then they were introduced to the open source Arduino IDE. To provide a basic introduction into programming, the code was simplified and included comments to explain the different functions. The interfaces for the sensor and actuators were already pre-developed so that the participants could concentrate on the interaction by simply modifying the code (Figure 1). At the end of the pilot study, the construction kit was attached to the umbrella and certificates of participation were handed out to the young women (Figure 4).

Conclusion and Future Work

This paper introduced a concept of a fiction-driven workshop designed for young women that was held at the //CSTI as part of Girls'Day. The presented vision of a smart umbrella and the combination of issue,

programming, environmental data and aesthetics were appreciated by the young women. Technically the prototype was somewhat fragile, and difficulties arose during soldering. The soldering task itself posed no problem for the participants. Due to the short time frame, we could not arrange a discussion and did not use the umbrella as an object for debate. However, to combine environmental and digital technology issues in a fiction-driven workshop is a promising method for knowledge transfer. The next step will be to improve the construction kit and time schedule, so that a scientific evaluation can be carried out.

Figure 4: Group photo. Image: André Jeworutzki.

References

[1]   E.-S. Katterfeldt, N. Dittert, and H. Schelhowe, "Designing Digital Fabrication Learning Environments for Bildung," *Int J Child-Comp Interact*, vol. 5, no. C, pp. 3–10, Sep. 2015.

[2]   N. Dittert, K. Wajda, and H. Schelhowe, *Kreative Zugänge zur Informatik: Praxis und Evaluation von Technologie-Workshops für Junge Menschen*. Bremen, 2016.

[3]   K. Dammann, N. Grust, and C. Ziehm, "Perspektive MINT," Bundesministerium für Bildung und Forschung (BMBF), 2012.

[4]   M. Weiser, "The Computer for the 21st Century," *SIGMOBILE Mob Comput Commun Rev*, vol. 3, no. 3, pp. 3–11, Jul. 1999.

[5]   H. Ishii, "Tangible Bits: Beyond Pixels," in *Proceedings of the 2Nd International Conference on Tangible and Embedded Interaction*, New York, NY, USA, 2008, pp. xv–xxv.

[6]   A. Jeworutzki, "Adapting agile methods to support creativity in interdisciplinary projects," Hamburg University of Applied Sciences (HAW), 2013.

[7]   J. Broscheit, "D/A/R/E – Sichtbarkeit durch datenbasierte Zukunftsbilder," Hamburg University of Applied Sciences (HAW), 2017.

[8]   L. Buechley, M. Eisenberg, J. Catchen, and A. Crockett, "The LilyPad Arduino: Using Computational Textiles to Investigate Engagement, Aesthetics, and Diversity in Computer Science Education," in *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, New York, NY, USA, 2008, pp. 423–432.

[9]   M. Resnick, "All I Really Need to Know (About Creative Thinking) I Learned (by Studying How Children Learn) in Kindergarten," in *Proceedings of the 6th ACM SIGCHI Conference on Creativity & Cognition*, New York, NY, USA, 2007, pp. 1–6.

[10]   A. Dunne and F. Raby, *Speculative Everything: Design, Fiction, and Social Dreaming*. Cambridge, Massachusetts ; London: The MIT Press, 2014.

[11]   A. Dunne, *Hertzian Tales: Electronic Products, Aesthetic Experience, and Critical Design*. MIT University Press Group Ltd, 2008.

[12]   J. Bleeker, "Design Fiction. A short essay on design, science, fact and fiction.," Mar-2009. [Online]. Available: http://bit.ly/1sm4hdR. [Accessed: 10-Dec-2016].

[13]   R. Schäfer, *Design Fiction*. Berlin: Institut Futur, Freie Universität Berlin, 2014.

[14]   J. Gabrys, "Programmieren von Umgebungen," in *Internet der Dinge*, F. Sprenger and C. Engemann, Eds. Transcript, 2015.

[15]   D. Lupton, "Feeling your data: Touch and making sense of personal digital data," *New Media Soc.*, vol. 19, no. 10, pp. 1599–1614, Oct. 2017.