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# Sustaining Girls' Participation in STEM, Gaming and Making

**Eva-Sophie Katterfeldt**

**Nadine Dittert**

**Heidi Schelhowe**

dimeb – Digital Media in  
Education, University of  
Bremen, Germany

[evak@tzi.de](mailto:evak@tzi.de)

[ndittert@tzi.de](mailto:ndittert@tzi.de)

[schelhowe@tzi.de](mailto:schelhowe@tzi.de)

**Yasmin B. Kafai**

University of Pennsylvania  
Philadelphia, PA

[kafai@upenn.edu](mailto:kafai@upenn.edu)

**Letizia Jaccheri**

**Javier Gomez Escribano**

Department of Computer Science,  
Norwegian University of Science  
and Technology, Trondheim,  
Norway

[letizia.jaccheri@ntnu.no](mailto:letizia.jaccheri@ntnu.no)

[javier.escribano@ntnu.no](mailto:javier.escribano@ntnu.no)

## Abstract

The fields of Science, Technology, Engineering and Math (STEM), the field of computer gaming and activities with digital technologies associated with the maker movement are still dominated by a rather homogeneous group of (mostly white male) people though there are numerous initiatives and research that attempt to change this. With this workshop we aim to bring together researchers, designers, educators and practitioners in IDC to share their experience and to explore how we can shape and create (learning) environments and tools to sustainably engage girls of diverse backgrounds and all ages in STEM, gaming and Making.

## Author Keywords

Gender; intersectionality; inclusivity; diversity; girls in STEM; Making; children.

## ACM Classification Keywords

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

## Background

Information technology has become prevalent in our lives and computer scientists and engineers are in the power to shape it. The lack of girls and women engaging in STEM has long been acknowledged and

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researched. Large-scale studies point out why girls in Western countries do not take STEM careers or drop out and highlight to foster girls' interest at an early age [11][15] but numbers of women's enrolment in STEM remain low. Many promising initiatives are reported in the context of child-computer interaction that attempt to change this trend and that are initiated by the public as well as by the private sector [6][12][19][20][3][8][9][16]. Alternate and creative ways of involving in STEM through crafting materials such as e-textiles in the context of Making offer potential to widen diversity of participants [1][3][14]. On the other hand, the maker "culture" is criticized to be dominated by (white) males and may inhibit long-term engagement [2][8]. Also in the field of gaming, girls and women are widely underrepresented, while stereotypes in games persist. Besides aiming for more female developers in the gaming industry, inclusive approaches beyond pinkification are needed to prevent girls who play games from harassment and marginalization [4][13].

Various other factors have been pointed out to influence girls' (long-term) interest in STEM. It has been suggested to start early to foster girls' interest in STEM because a negative image of occupational profiles in CS seems to be manifested around the age of 14 [6]. Also, the influence of parents and teachers is discussed [21] but motivation of girls to enrol in STEM varies around the globe [15]. Many initiatives and research last only for a short period of time and are only visible on local or national level. It remains open to a large extent how to keep up girls' engagement and interest in STEM, gaming and maker activities in the long term.

Overall, gender is just one factor that affects participation in STEM, gaming and Making, which

seems to be disregarded sometimes. In this workshop, we also want to emphasize "intersectionality" [13], not just gender but also how other factors such as ethnicity, socio-economic status etc., intersect with gender. Do all girls have the same challenges or are there differences based on their background, and how can we design for inclusivity to support participation of all in STEM, gaming and Making?

### **Workshop Goals**

In this workshop, we want to invite researchers, designers and practitioners in IDC to discuss how we can shape and create (learning) environments and tools to sustainably increase inclusivity and engage girls of diverse gender, backgrounds and all ages in STEM, gaming and Making. We want to share best-practice experience of successful initiatives, discuss empirical outcomes and novel designs to build up and strengthen the community of interest in gender and inclusivity in IDC.

Besides building an international community, the workshop aims to identify challenges and opportunities related to gender and inclusivity based on presented research and experiences and related to the following questions

- How can we sustain participation of girls of diverse backgrounds in STEM, gaming and Making?
- How can we better involve the children's social environment (parents, teachers, peers, etc.)?
- How can we arise awareness for gender and intersectionality among researchers and designers of digital tools and toys for children?

## **Organizers**

**Eva-Sophie Katterfeldt** is a postdoctoral researcher at dimeb ("Digital Media in Education") at University of Bremen. She has been involved in various research projects aiming at fostering diversity in CS through alternative approaches involving computational construction kits, digital fabrication technologies and e-textiles as well as visual programming tools.

**Nadine Dittert** is a postdoctoral researcher at the group "Digital Media in Education" (dimeb). She develops and implements workshops with digital fabrication technologies for varying target groups, focussing on children. She has been involved in research projects that aim at girls and diversity in CS as well as digital fabrication technologies as tools for learning.

**Heidi Schelhowe** is Professor for Digital Media in Education (dimeb) in the Computer Science Department of the University of Bremen. She has a background in pedagogy, as well as in computing science. Leading an interdisciplinary team of 20 researchers, the group focuses on various elements of learning with digital media including the development of tangible technologies, mobiles and social media for learning, the design of educational environments, general media literacy through outreach, and conducting valid empirical social research in the field with a focus on gender and inclusion.

**Yasmin B. Kafai**, the Lori and Michael Milken President's Distinguished Professor, is learning scientist and designer of online tools and communities to promote coding, crafting, and creativity across K-

16. Her research empowers students to use computer programming to design games, sew electronic textiles, and grow applications in biology with the goal of supporting creative expression, building social connections, and broadening participation in computing. She helped develop with MIT colleagues the popular programming tool Scratch ([scratch.mit.edu](http://scratch.mit.edu)), called the YouTube of interactive media, where millions of kids create and share their programs. With her pioneering research of children's learning when programming digital games, she was an early contributor to the field of serious gaming. More recently, she's developing a high school curriculum with electronic textile that introduces students to computer science. She is also creating new fabrication tools and activities that bring biomaking into classrooms. Her award-winning work has received generous funding from the National Science Foundation, the Spencer Foundation, and the MacArthur Foundation.

**Letizia Jaccheri** is Professor of software engineering at IDI and Department Head from 2013 to 2017. Her research interests are in software engineering, computing education, and entertainment computing. Jaccheri has worked in the Italian IT industry for several years, and in academic institutions covering different positions for 25 years, in collaboration with industry and public sector. She is independent director of "Reply S.p.A. She has published over 100 refereed papers in journals, books and archival proceedings. Jaccheri's ongoing research projects include: (a) H2020 SOCRATIC (b) H2020 UMI-Sci-Ed, (c) H2020 Initiate (2018-2019). She has supervised and/or evaluated over 40 young researchers (PhD/Postdoc). She has been the general chair of the IFIP International Conference of Entertainment Computing in 2015. She

will be co-chair of IDC 2018 and program chair of the European Computer Science Summit of Informatics Europe in 2018. Letizia has worked for many years to recruit and retain female talents in Computer Science from students, to researchers.

**Javier Gomez** is an ERCIM postdoctoral fellow at IDI, NTNU. He obtained his PhD. in Computer Science and Telecommunications at the Universidad Autónoma de Madrid, where he held a lecturer position at the Computer Engineering Department. His research interests include mobile assistive technologies for people with cognitive disabilities, inclusive design and technologies for education. As a result of his work, he had published articles in relevant conferences and journals. He had also participated in different projects in collaboration with the public and private sector.

### **Website**

All relevant information about the workshop, including the Call for Participations, workshops submissions, practical information and workshop outcomes will be published on the workshop's website (in preparation) at <http://dimeb.de/idc2018-workshop>

### **Pre-Workshop Plans**

All relevant workshop information will be shared with participants on the workshop website (see below). We will be in contact via email with presenters of position papers prior to the workshop to assist them preparing their presentations. To recruit participants the workshop will also be announced on social media channels and mailing lists.

### **Workshop Structure**

#### *Activities and timing*

The workshop will be organized as full-day event with the following schedule:

- Welcome, introduction to workshop agenda and goals
- Invited talk by Line Berg, Project Manager the Girl Project Ada, NTNU
- Participants present their position papers (extended abstracts) followed by short Q&A and discussions 10 min each to identify challenges and contribution for later team work
- Lunch break
- Group work discussing key challenges and summarizing ideas on posters (to be exhibited at IDC)
- Coffee break
- Presentation of group work, creation of joint summary of challenges, future plans

#### *Resources required*

No special equipment required, material and space for capturing ideas and creating posters during the workshop would be appreciated. We would like to limit the number of workshop participants to 25.

### **Post-Workshop Plans**

The outcomes (posters) of the group work session are to be exhibited at IDC poster sessions (if possible). As follow up, the workshop organizers will summarize outcomes in a paper, preferably to be published at IDC or International Journal of Child-Computer Interaction. Through the workshop, we also want to collect a list of relevant literature and

successful initiatives to be shared on the workshop's website.

### Call for Participation

The workshop "Sustaining Girls' Participation in STEM, gaming and Making" brings together researchers, educators, designers and practitioners in IDC to explore how we can shape and create (learning) environments and tools to sustainably engage girls of diverse backgrounds and all ages in STEM, gaming and Making. At the workshop, participants will share their experience with relevant initiatives, identify challenges and discuss empirical outcomes and novel designs to build up and strengthen the international community of interest in gender and inclusivity in IDC.

We invite participants to submit position papers (max. four pages in SIGCH Extended Abstract Format) that report on their research, experience, (local) initiatives and/or designs for supporting gender and inclusivity in STEM, gaming and/or Making. Submissions should include a short bio of their authors.

Position papers should be submitted by 15<sup>th</sup> April 2018 via email to [evak@tzi.de](mailto:evak@tzi.de). Submissions will be reviewed by workshop organizers and selected based on their contribution and how they fit to the workshop's theme and goals. We also encourage participants to report on non-successful initiatives and research we can learn from.

Accepted submissions and practical information will be available at the workshop's webpage: <http://dimeb.de/idc2018-workshop>

It is required that at least one author of each accepted position paper attends the workshop and all participants must register for both the workshop and the main conference.

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