

How to support girls' participation at projects in makerspace settings. Overview on current recommendations

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Abstract. Several bias and thresholds challenge the reach of girls in technology-related activities. For this contribution we collected and structured existing research and good practices on how to reach girls within projects in the field educational robotics, makerspaces, coding and STEM in general. The contribution presents general guidelines for future activities with a potential higher rate of participating girls in makerspace settings.

Keywords: Girls, participation, maker education, STEM, makerspace, robotics.

1 Introduction

Several biases challenge the work with girls, e.g.: teachers have perceptions that boys are more interested in technology [1] or that makerspaces are not safe for girls [2]. Catalanian boys from 11 to 13 reach higher self-efficacy for doing tasks with computers than girls [3]. Already in the age of kindergarten children, they begin to decide “which technology and engineering activities and materials are better suited to boys or girls” [4]. These biases - and other framework conditions - result in the fact, that girls are typically underrepresented in activities from the field of educational robotics, makerspaces and coding and that women are underrepresented amongst engineers, scientists, IT experts and related domain. There are a wide variety of approaches to influence this and to gain higher share of females, this is amongst others one of the sustainable development goals of the UNESCO [5]. For the authors and their work fields it is important to reach girls within their maker activities: The Horizon 2020 project “DOIT- Entrepreneurial skills for young social innovators in an open digital world“ (2017-2020) co-financed by the European Commission builds upon the consideration that social innovations in makerspace settings allow authentic learning experiences fostering future entrepreneurial spirit and ambition to co-create a (better) world (see <http://DOIT-Europe.net>). Graz University of Technology (TU Graz) as well takes socio-political aims seriously and therefore highlights and facilitates diversity (cf. Office for Gender Equality and Equal Opportunity at TU Graz).

2 Research issue

For our future activities we looked for relevant literature that give us advice on how we can reach (more) girls within our activities within makerspaces as they are currently underrepresented. This includes answers on the following sub-questions: What do others do to reach girls? What do they recommend? Therefore we collected existing experiences from projects and research (including literature on girls and maker education, girls in makerspaces, girls and robotics from the last five years in the ERIC database; 2013-2018).

3 Recommendations from literature and projects

3.1 Approach and overview

For the condensed recommendations we used recommendations building upon research (e.g. [7]) as well as the experiences collected in the Gender Action Guidelines” of the EU project Phalabs 4.0 [8]. Figure 1 gives an overview about stages within the project / activity development that need a special awareness concerning gender.

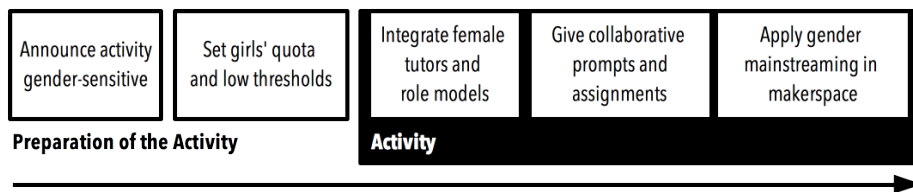


Figure 1. Overview: Guidelines to reach girls in makerspace settings

3.2 The guidelines

The following is a condensed description with further references to the sources.

Announce activity gender-sensitive. Girls tend to get (more) motivated if a title of the event or activity includes not only what something is, e.g. “Robotics with kids” but to get a sense of value of the activity, e.g. “Robotics for gardeners” or “Robotics within the book sector”. It is recommended to highlight the value of the activity already in the title, e.g. the impact to the world [8]. When marketing a measure, it is also helpful to ensure that it is not advertised to (future) engineers, scientists, and mathematicians. There is evidence to suggest that such professional identities are less common among girls [9], especially, if they are from minorities, and can therefore be less appealing. Gender-sensitive language and gender-sensitive illustration are known as important to girls [8] which includes e.g. that girls are shown as active participants in the marketing materials.

Set girls’ quota and low thresholds. If it is planned that children have to be registered for an event, the proportion of girls may be smaller - at least the participation of

boys in technology-related offers is rather supported by (grand) parents, as experience at the Maker Days has shown [11]. On the other hand, an enrolment procedure and confirmation of enrolment also allows a quota to be set for girls. Macdonald [8] gives the advice to always insist on the 50:50 schools, if mixed school are partnering (p. 8).

Integrate female tutors and role models. A same-sex role model seems to be a strong supporter to help girls to get in touch with technology. The "Maker Days for Kids" was for example a creative digital workshop that was open for four days in April 2015 for children aged 10 to 14. 44 percent of the participants were girls (no registration, no selection, no fees, N=69) [11] [12]. All participants could decide what to do in the open makerspace, including to participate at short workshops, e.g. in the devlab area. One female tutor and three males tutors hosted workshops in the field of coding and 3D modelling. As expected, girls chose more workshops offered by the female tutor than boys (31 vs. 24%, 189 workshop participations in devlab, p. 98) [12]. Role models are great, especially if they can as well tell stories how they failed or other personal stories [8].

Give collaborative prompts and assignments. Girls prefer activities that are collaborative. Collaborative assignments lead to a higher future interest in STEM-related fields [7, p. 124). Females will prefer activities that are collaborative, that means that they have a positive outcome for all that are involved - and are not a competition [8]. Practical examples are available [11].

Apply gender mainstreaming in makerspace. Practically, teachers or tutors can contribute to gender disparities in makerspace settings as well [1]. Active gender mainstreaming in maker activities could therefore include gender mainstreaming along the whole activity: "If supervising a school group, ensure you spend as much time talking to the females as talking to the males. Males often demand more of teacher's attention (often by doing silly things) while females get on with the task in hand. Females then perceive that they are of less value in STEM as teacher didn't talk to them very much or ask how they were getting on." [8] Gender mainstreaming in project activities includes e.g. considerations such as give girls the same attention as boys, girls should be similarly participating e.g. at presentations of group work. It should be noted here that such a conscious - but not compulsive - proposal does not necessarily meet with public approval [13].

4 Discussion and open issues

There is still need to consolidate, reflect and share experiences and results on how to deal with girls' participation. This analysis e.g. ignored diverse backgrounds of culture and educational systems of studies and literature.

Within our own projects we aim to get deeper insights how e.g. design decisions and the availability of female role models will influence girls' participation and will establish fitting research. In DOIT, therefore an evaluation of activities with about 1.000 children in 10 regions all over Europe is planned and available in future. As well we will promote the girls' issues in maker education [15].

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