



UNIMORE

UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA

Dipartimento di Ingegneria “Enzo Ferrari”

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Proposal for 2021 Minerva Informatics Equality Award

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In collaboration with Prof. Michele Colajanni, creator and responsible of the UNIMORE summer camp until 2020 and Prof. Antonella Carbonaro, University of Bologna, responsible for the camps organized in Cesena since 2018

3. Abstract (100 words or less) which can be made public

“Ragazze Digitali” is a summer camp dedicated to female students of the third and fourth grade of the Italian high schools (typically, 17-18 years old). The summer camp was created by the University of Modena and Reggio Emilia and the EWMD association in 2014 and was further expanded in 2018 thanks to a collaboration with the University of Bologna. It has experienced a continuous increase of participants over the years, with more than 600 girls globally involved. Completely free for the participants and lasting 4 weeks between June and July, the initiative encourages female students to enroll in Computer Science programmes through a creative and innovative approach based on learn-by-doing and team-based activities.

4. Description of the initiative (max 2 pages)

Since 2014 the University of Modena and Reggio Emilia (UNIMORE)¹ has started a concrete action to reduce the gender gap among students in Computer Science programmes in Italy with the summer

1 <https://www.ingmo.unimore.it/site/en/home.html>



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camp ‘Ragazze Digitali’ (Digital Girls). The summer camp is dedicated to female students of the third and fourth grades of the high schools and aims at attracting them towards Computer Science through an innovative approach stimulating their digital creativity and self-confidence.

The initiative originated by an idea of Prof. Michele Colajanni of the Department of Engineering ‘Enzo Ferrari’ of UNIMORE who, in collaboration with the association European Women Management and Development (EWMD)², created and organized in 2014 in the city of Modena (Italy) the first edition of the summer camp Digital Girls. Year after year, the summer camp has experienced a continuous increase of the girls participating in the initiative and the camp has been replicated in other cities of the Emilia Romagna Italian region: in 2018 a second camp was activated in the city of Reggio Emilia and a third one in the city of Cesena. This latter was organized by the Department of Computer Science and Engineering of the University of Bologna (Prof. Antonella Carbonaro). The fruitful collaboration between the two universities and the support coming from a network of public and private institutions has allowed the Summer Camp to reach its eighth edition in 2021, involving **more than 600 girls in the past editions** and with **almost 200 participants enrolled for the current edition**.

The summer camp, which typically lasts for four **entire weeks** between June and July, is **completely free for the girls to participate**.

During the camp, girls are engaged in **laboratory activities based on a learning-by-doing and project-based approach**. In particular, they learn how to create video games in the Python language and program Arduino robots controlled by mobile apps, working in small teams, with each group developing its own project. These kinds of activities allow girls to experience a creative, multidisciplinary and attractive side of computer science. Besides acquiring basic coding competences, this approach also allows girls to develop **soft skills** such as communication, teamwork and problem solving. On the last day of the summer camp, an event is organized for the public presentation of the developed projects.

It is important to underline the inclusive nature of the summer camp because no previous competence is required in terms of coding or ICT skills to participate. In a country where computer science is absent in the large majority of high schools educational programs (Italy results as the last European countries in the 2020 Digital Economy and Society Index in terms of digital skills), this inclusivity is fundamental to give girls the opportunity to understand the nature of computer science, discover their attitude and make informed choice about future studies and professional careers.

Another important aspect of the initiative is the organization, during the summer camp, of dedicated seminars and speeches of female experts and entrepreneurs who have reached leadership positions in ICT-related fields thanks to their scientific and technological studies. These events have the goal of **promoting existing female role models**, that are disruptive with respect to the well-known social gender stereotypes, and to present the concrete opportunities that competences in computer science may offer in terms of studies and careers at the local and national level.

Promotional activities are organized every year in collaboration with the local high schools to present the project to teachers and students, with speeches focused on gender stereotypes among young generations, and interventions from girls who participated in the previous summer camp editions.



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In 2020 the Covid-19 pandemic and the consequent social distancing measures led to the impossibility of organizing the Digital Girls summer camp in presence. The 2020 edition was planned to be completely online and some adaptations were required in terms of duration and activities, even if the idea of an immersive and project-based experience was maintained. The 2020 summer camp lasted for three weeks and engaged participants in activities based on the development of Web sites and implementation of Python-based simple games.

Due to the current health situation, also the 2021 edition has been organized online. It will follow the same format of the previous edition with a novelty that has been included because of the excessive number of requests. This year the maximum number of 100 participants (suddenly extended to 110) was reached a few days after opening of the registrations. The limit is due to the number of available and well-prepared young tutors (typically, young graduated, PhD students and PostDoc) that represent the most precious resource but even the most difficult to find.

To this purpose, for the first time in 2021 we organized a parallel event that is based on interactive seminars of experts covering innovative topics in computer science, ranging from AI to cybersecurity to quantum computing. This session allows us to offer an alternative (awareness more than learning) and even a broader participation.

Summarizing, the main objectives of the Digital Girls initiative are the following.

- To increase girls' inclination to enrol in Computer Science programmes, that is particularly important in a country that suffers a severe under representation of women in this academic fields (the percentage of female students in Computer Science programmes in Italy typically ranges between 10% and 15%)
- To attract girls towards technologies and informatics to facilitate their inclusion in working environments related to the ICT field, providing them with technical skills and showing them the career opportunities available in this field at the local and national level.
- To continue to increase the number of female students participating with respect to the past editions
- To attract an increasing number of girls from outside the Emilia Romagna region
- To create a format for a summer camp in computer science that could be used to replicate the project in other universities and cities to extend the benefits of the initiatives at the national level.

5. Evidence of its impact (max 2 pages)

The summer camp Digital Girls has been **recognized as a best practice** to reduce the gender gap among the student population of ICT disciplines in the context of the two European projects: 1) Horizon 2020 Project EQUAL-IST “Gender Equality Plans for Information Sciences and Technology Research Institutions” (<https://equal-ist.eu/>); 2) Erasmus+ project Gender4STEM “Gender aware education and teaching” (<https://www.gender4stem-project.eu/>).

A first important result of the summer camp is about the **number of participants** that continuously increased during the years: starting from the 35 girls of the first edition in 2014, we reached the

number of 165 participants in 2019 (last edition in presence) and for the 2021 we have almost 200 girls enrolled. Globally, over 650 girls participated during the past editions.

Furthermore, every year different promotional events are organized to present the summer camp to high schools students and teachers: from 2014 up to now, more than 5000 students of the high schools have been involved in the promotional events.

In terms of **impacts on the participants**, several editions of the Digital Girls allowed us to collect a significant amount of data over the years. Here we report the main results of the summer camp considering **short-term impacts and long-term impacts**.

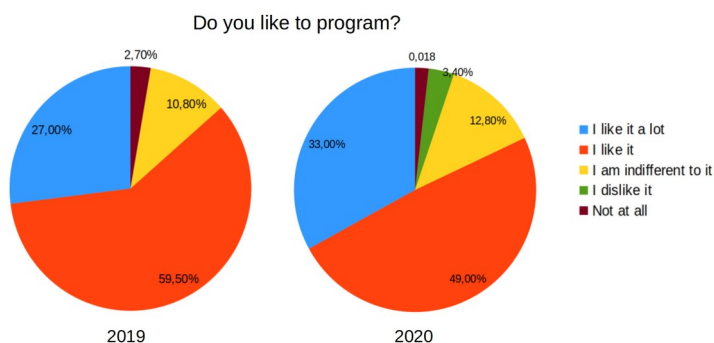
Short-term impacts have been monitored during the Digital Girls editions through the submission to the participants of anonymous surveys before and after the summer camp activities. The purpose of these surveys was to collect information about participants' background and observe the level of satisfaction and the effect of the camp experience on the girls attitude and vision of future choices. For space reason, here we present some results from the last two editions.

Overall, feedbacks from participants were highly positive, especially considering that their skills in programming before the Summer Camp were rather poor: 70% of the participants in 2019 and 67% in 2020 weren't able to program at all before this experience.

After the camp, 81% of the girls in 2019 and almost 70% in 2020 stated they had definitely understood more clearly what computer science actually means. However, what makes us proud about this project is that 97% of the girls in 2019 and 93% in 2020 declared they had acquired new technical and coding skills thanks to the Camp's activities.

Both in 2019 and 2020, 90% of the participants rated the team working and the collaborative projects carried out within the summer camp very positively.

Finally, after the camp the girls declared a high appreciation for programming, as shown in the graph.

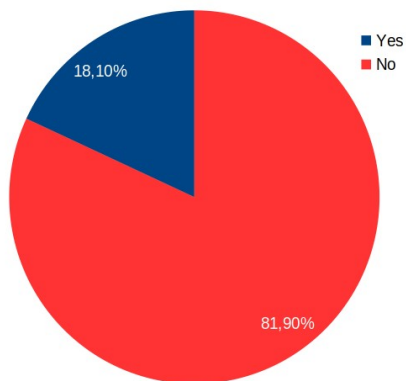


To evaluate short-term impact on participants' future choice of studies, we included in both questionnaires submitted before and after the summer camp a specific question about the intention of continuing the studies in Information and Communication Technologies (ICT).

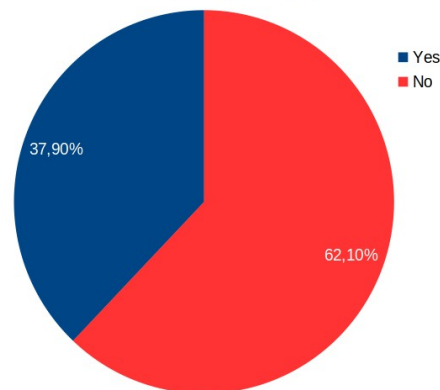
A very interesting result emerges from the answers to this question (we report the results collected during the last two editions of Digital Girls). In particular, the figure below shows the comparison between the answers given before (left part of the graph) and after (right part of the graph) the summer camp with respect to the intention to continue the studies in ICT fields. After having experienced the summer camp, the percentage of girls declaring their intention of choosing studies related to computer science increased from 18.1% to 37.9%. The results seem to confirm that the experience had a significant positive impact on girls' future choices of studies. Another interesting observation is that there is no significant difference in these

data between the 2019 edition, which was in presence, and the 2020 edition, which was carried out completely online, suggesting that the summer camp has a similar positive effect regardless of how it was implemented.

Before the camp: Keep Studying in ICT?



After the camp: Keep Studying in ICT?



To evaluate the **long-term impact of the summer camp on the participants' choice of studies**, we conducted a survey over the participants to the first 5 editions. Among the respondents, girls who got their high school diploma and enrolled at the university indicated the following choices:

- 31,6% chose a degree course from the Information Technology area (that is, Information Engineering or Computer Science)
- 15,8% chose a degree course from the Engineering area other than Computer Engineering
- 15,8% chose a scientific degree course not belonging to the Information Technology area
- 36,8% opted for a degree course from different areas

One of the most significant answers to the questionnaire was about the influence of the Summer Camp on the girls' decisions about their future studies: 50% of those who have chosen an academic course of the Information Technology area declared that the Summer Camp experience had a major influence on their choice.

Finally, we registered a positive trend regarding the **enrollment of female students in the course of Information Engineering** offered by the Department of Engineering 'Enzo Ferrari' of the University of Modena and Reggio Emilia. While in 2014 (first edition of the summer camp) the percentage of enrolled women was about 13%, in the last two years we reached a percentage of female students between 19% and 20%, with an increase of almost 7 percentage points. This result is particularly interesting if compared to the data on the percentage of women globally enrolled at the Engineering Department courses (including various engineering disciplines) that remained quite stable, with just small annual fluctuations, around 15% from 2014 until now.



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6. Reference list and supporting material

Letters of support from:

- Prof. Michela Meo, full professor of Telecommunication Engineering at Politecnico di Torino, Italy
- Laura Valentini, Digital Girls participant in 2014 (first edition), now student at Master Degree in Computer Engineering at the University of Modena and Reggio Emilia

References and URLs of supporting material

- Web site of the initiative www.ragazzedigitali.it
- Facebook Page www.facebook.com/ragazzedigitali/
- Past Projects developed by Digital Girls <https://www.ragazzedigitali.it/category/progetti/>
- Best practice at Horizon 2020 European Project EQUAL-IST “Gender Equality Plans for Information Sciences and Technology Research Institutions” <https://equal-ist.eu/equal-ist-at-ragazze-digitali-run4future/>
- Italian Association for Informatics and Automatic Calculation <https://www.aicanet.it/-/ragazze-digitali>

7. Indication of whether the nomination can be considered as a runner up (if it does not win the award) and be included as an exemplar of best practice in future Informatics Europe publications.

Yes