

STEM it like a girl:

Challenges and recommendations for education and development of a STEM career for girls



This policy brief emphasizes the importance of the various factors related to STEM career choices for girls and the ways to improve gender equality in terms of STEM career choices, but also future professional development. The research findings emphasize the role of: a) education (school) in the development of skills that are important for a STEM choice; b) stimulating positive attitudes among girls about STEM education and career; as well as c) adequate support by the environment (mainly the family). Interventions to reduce the gender gap in STEM education and career should include formal education in terms of changing curricula and materials, as well as appropriate training of teaching staff. It is also necessary to build a favorable school climate, as well as to use extracurricular activities that would stimulate all students to equally choose a STEM career.

Why is important to stimulate girls to choose STEM education and career?

The basic component through which education contributes to economic growth is through the creation of human capital. Hence, the findings indicate that those countries with better educational achievement have higher growth in gross domestic product (GDP) compared to those with worse achievement (Hanushek et al., 2018). Certain analyses confirm that stimulating STEM education is a way to improve economic growth (Williams, 2011). STEM covers the fields of science, technology, engineering and mathematics. STEM education includes all educational activities

„STEM it like a girl“

is a program of Macedonia2025 that promotes careers (professions) in the STEM field (science, technology, engineering and mathematics) with the main focus on STEM education and career for girls.

The program aims to reduce the gap in education of young women and men, reduce the professional segregation of women in low-paid occupations and professions with low opportunities for advancement, and reduce the stereotypical division of “male” and “female” professions. This will reduce gender differences in the labor market (activity, employment and wages) and women will have a greater role in economic development and greater economic independence.

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in these areas across all levels of education. STEM education refers to both formal education and informal education (afterschool programs, optional activities) (Gonzalez and Kuenzi, 2012). What is important to note is that STEM workers earn significantly more than their non-STEM counterparts, but women are significantly less represented in STEM professions than men (Beede et al., 2011). That is why bridging the gender gap in choosing a future profession can contribute to improving gender equality and better economic growth.

Choosing a future career is a complex issue that is influenced by many different factors. When choosing a career (Aisen, 1991) the intention to build a STEM career (determination and intensity of effort invested in building a career) is important, which is related to the attractiveness of the STEM career, assessment of the opportunity of success in STEM and support by the close environment (including parents, teachers and friends). Thus, assessing skills, overall social climate, appropriate information, learning about opportunities for success by following motivational speeches, and raising girls' confidence in STEM careers are especially important (Corbertt and Hill, 2015; Moore and Burrus, 2019; Nugent et al., 2015).

That is why the "STEM as a girl" program is aimed at stimulating the STEM career choice among girls through activities related to informal and formal education, but also researching the factors related to the STEM profession choice for girls. The findings presented in the brief are part of the research conducted in support of the project activities which included motivational speeches and sharing personal experiences of women (from the country and the diaspora) with successful STEM careers in front of third- and fourth-year girls in several high schools.

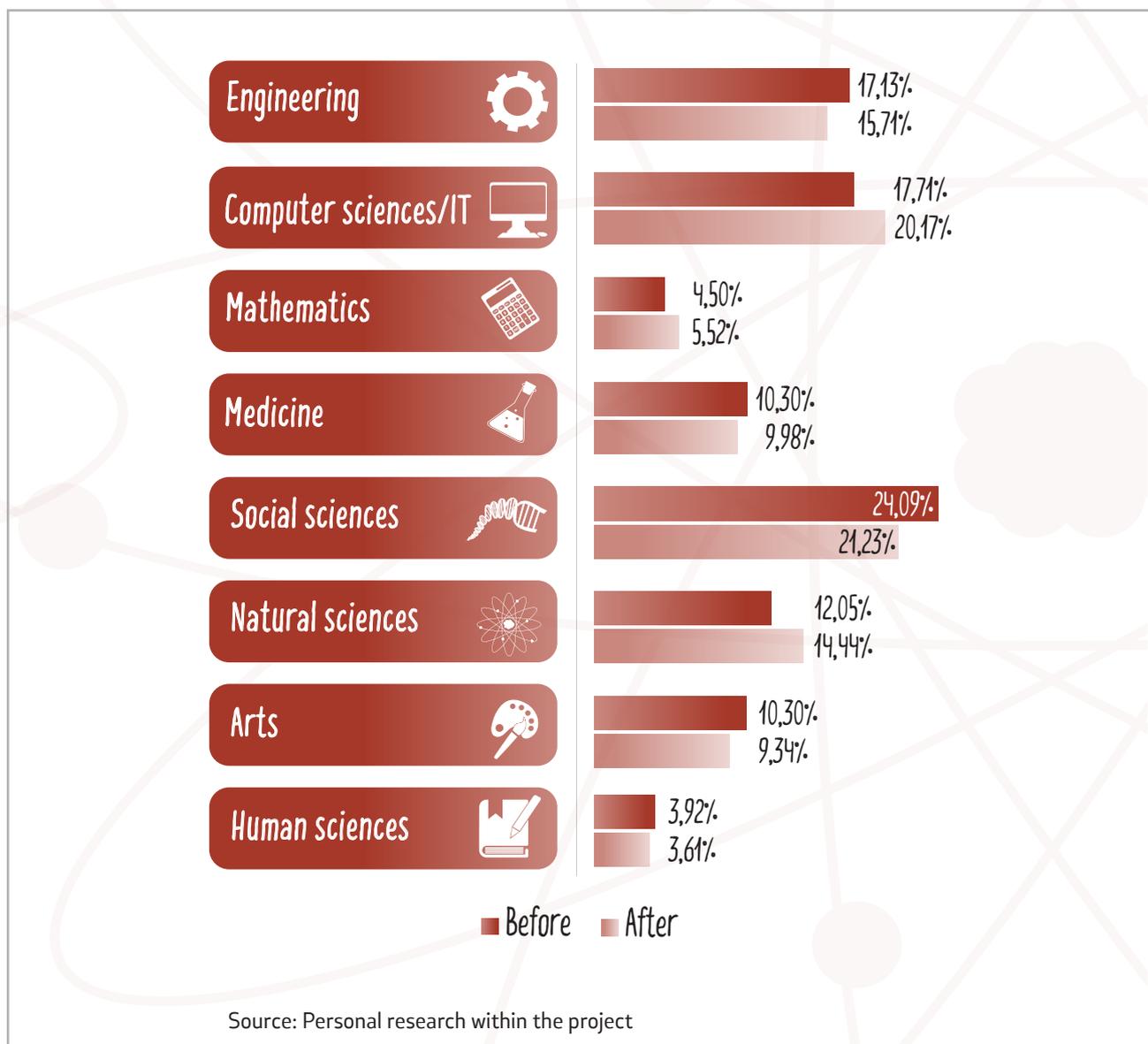
Methodology

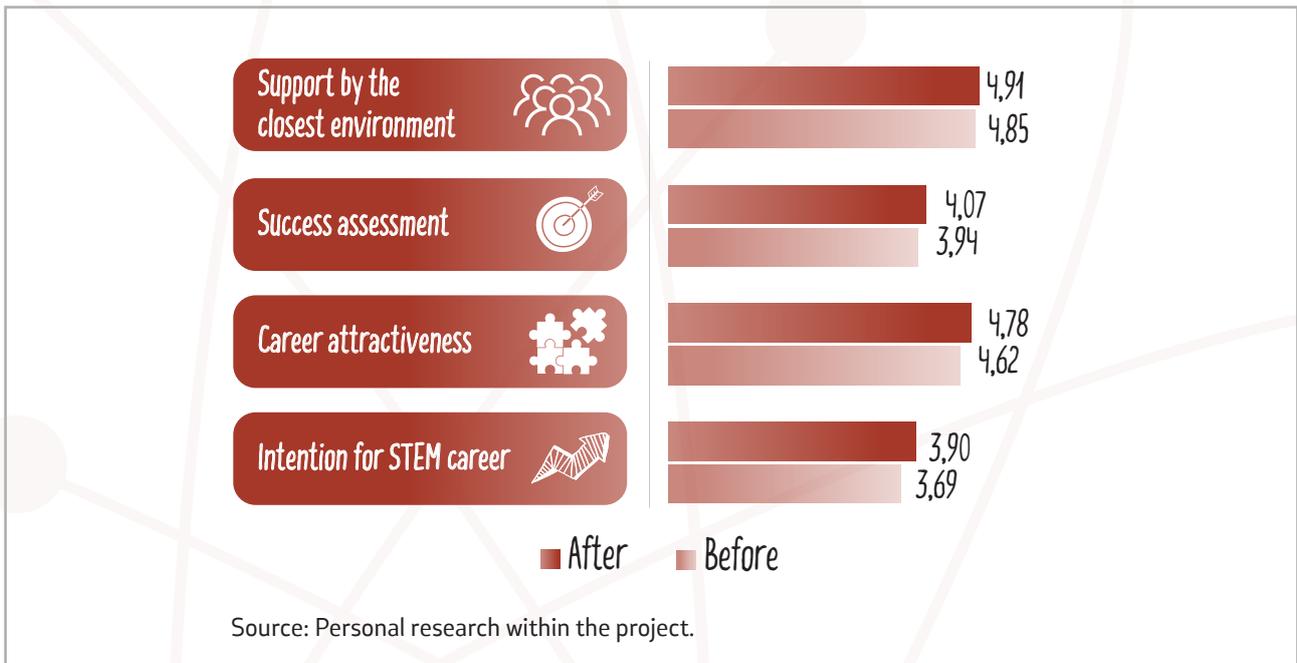


The sample used for the analysis consists of 450 respondents from 8 high schools in Macedonia from different regions. The sample intentionally covers more girls (86%) than boys, and the average age is 17 years (age range is 16-18 years). Data were collected using two questionnaires that were filled out anonymously. The first questionnaire is longer and it was filled out before the motivational speeches, and the second one is a short version that was filled out after the motivational speeches. Hence, the areas that could be career choice, intentions for STEM career choice, as well as related factors, such as attitude towards a STEM career, personal assessment of success in the STEM area and support by the environment were researched. Additionally, perceptions of STEM career stimulation by the education system and schools as well as the overall social climate and cultural influences for STEM career choice were examined. The questions were answered on a 7-point scale (1 - strongly disagree, 7 - strongly agree).



The data indicate that half of the participants in the program are seriously considering a STEM career. Consequently, **53%** of students, when asked if they are seriously considering a STEM career, answered "YES", and the percentage increases to **56%** after the motivational speeches. When considering the individual fields of education and career, before the program, the most popular career choice is the social sciences, but after the motivational speeches their popularity decreases, and the popularity of computer and natural sciences increases.





Participants show moderate intentions for a STEM career, as well as neutrality (average score on a scale of 1 to 7) regarding the attractiveness of a STEM career, the opportunity for success in a STEM career and the support by the environment (family, friends, teachers). After **the motivational speeches**, there is a slightly positive trend in all aspects. This indicates that such interventions **have the potential to stimulate interest in a STEM career**.

The research findings indicate the need for more comprehensive interventions in the education system. According to the students, **the school does not stimulate them to develop a STEM career**. Students generally **positively** assess the level of appreciation of women in STEM by the teaching staff (best assessment), as well as the equality in stimulating male and female students to choose a STEM career and the adequacy of the support that women receive for choosing a STEM career. However, there is room for their improvement by various interventions. Students are fairly **neutral** when it comes to assessing the role of education in developing STEM career knowledge and skills, as well as the motivation for choosing a STEM career and the support system that schools offer when choosing a career. On the other hand, students' assessments are **slightly negative** when it comes to the examples of women in STEM that can be obtained during education (in textbooks and lectures).

Assessment of stimulating a STEM career in school (responses on a scale of 1 to 7)	
Examples in textbooks	3,10
Examples by teaching staff	3,26
Motivation for STEM career	4,17
Development of knowledge and skills in school	4,33
Development of knowledge and skills through subjects	4,36
Career support system	4,51
Positive climate for STEM	4,63
Appropriate support for girls	4,67
Equal stimulation for both male and female	4,95
Appreciation of women in STEM	5,39

Source: Personal research within the project

The findings support the **need for various informal interventions** in terms of **presenting a more positive picture of the role of women with STEM careers** in the society, as well as the support that women can receive when building a STEM career. An indicator of the **students' lack of information** are their neutral responses to the statements that they personally know women with STEM careers who are appreciated and recognized in the society. In other words, they do not have the role models of successful women in the STEM environment that they would like to associate with. They also neither agree nor disagree with the statements that there are appropriate STEM career development programs, as well as publicly available information related to it. Students consider that career development in this area requires a lot of effort. What is important to note is that after the intervention **there is a slight positive shift** in terms of how many women with STEM careers they know and the general awareness of support programs for women in STEM. Also, after the motivational speeches, the students had a more neutral assessment of the level of effort required to build a STEM career.

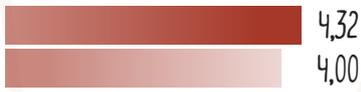
STEM career requires a lot of effort



Equal success for both men and women



Women in STEM are appreciated a lot



Information about stimulating women in STEM



Knowledge of support programs for women



Personally know women with a STEM career



Difficult to combine with family obligations



STEM professions are male professions



STEM career is more appropriate for men



■ After ■ Before

Source: Personal research within the project.

Recommendations

- ▶ Stronger interventions are needed for fulfilling the goals of the strategic documents and action plans for increasing gender equality, especially aimed at young girls. In this regard, the role of schools must be also strengthened.
- ▶ Formal education should focus on developing skills important for choosing STEM and building a successful STEM career through curricula, teaching materials and teacher readiness to stimulate the development of students' knowledge and skills.
- ▶ The education system should play a proactive role in stimulating the development of the necessary STEM skills, whereas extracurricular activities and the overall school climate should stimulate all students equally to choose a STEM career.
- ▶ Students should be exposed to successful female models with a STEM career (in addition to male models). Programs for using motivational speeches to stimulate interest in STEM should be part of the overall efforts to raise interest in STEM careers among women and they should be implemented regularly in schools.
- ▶ Future programs for stimulating a STEM career for girls should be long-lasting, with more events and a more comprehensive program.
- ▶ Students, especially girls, should be informed about the support they can receive when choosing a STEM career. Thus, more comprehensive programs can be developed to support those who choose to build a STEM career, such as scholarships, mentoring support, internships, etc.
- ▶ In the education system, the role of career counselors and career centers in schools should be strengthened so that students, and especially female students, can receive adequate career choice support;



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