"STEM≡quality - Empowering girls and young women to follow STEM (science, technology, engineering and mathematics) education and professional careers"

Study of factors related to the choice of STEM career and ways to stimulate STEM interest among girls

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Background and aims

STEM education is a broad concept encompassing teaching and learning in the fields of science, technology, engineering and mathematics across all levels of education. Besides formal learning STEM education is also used when referring to informal education such as after-school programs, summer camps, clubs and so on (Gonzalez and Kuenzi, 2012). STEM education should utilize multidisciplinary teaching and aim to develop problem-solving skills as well as students' abilities to apply scientific concepts to everyday life. To achieve that the education should be more oriented towards skill building rather than content delivery (European Schoolnet, 2018).

Stimulating more students to choose STEM careers has economic benefits. For instance, according to Williams (2011), there is a correlation between the technological development of a country and positive outcomes from the economic crisis of the 1890's, 1930's and 1980's. Other authors have found a link between achievements on standardized tests such as Programme for International Student Assessment (PISA) and the Trends in International Mathematical and Science Study (TIMSS) and GDP growth (Donovan, 2014; Hanushek et al., 2018). In addition, choosing STEM as a career brings benefits on a personal level as workers in STEM earn significantly more than their non-STEM counterparts. The returns are higher for women in STEM who earn 33% more than females in other jobs compared to men who earn 25% more (Beede et al., 2011).

Despite the positive economic and personal outcomes from STEM careers, there is still a gender gap in the field. Namely, the share of women in STEM is still lower than the share of men worldwide (UNESCO, 2019) and the enrolment of boys in advanced STEM subjects in secondary education is still higher than the enrolment of girls in the same subjects (Mullis et al., 2016). In addition, women with STEM degrees are less likely than their male counterparts to work in STEM jobs, as they tend to end up in careers related to education or healthcare (Beede et al., 2011). Therefore, it is of paramount importance to stimulate more girls to choose STEM subjects and STEM careers and to support women who choose STEM careers.

Available literature and studies show that the interventions should start in primary schools as children at those ages are at a developmentally critical period to be exposed to STEM career opportunities (San Miguel et al., 2019), since they start to consider different occupations and start developing career aspirations towards the end of primary school (Magnuson and Starr, 2000). This is especially important as studies note that stimulating STEM interest is most effective when done between the ages of 10 and 14 (Knezek et al., 2013; Almeda and Beker, 2020).

There are different factors contributing to the choice of STEM subjects, and subsequently STEM career, stemming both from individual characteristics and from the socio-cultural environment. These factors are tied to the impact of the family, the school environment, the community factors and the wider cultural milieu (Xie, 2015). Some of the important factors among 10 - 14-year-olds relate to the educators, peers and family influence for STEM activities (Nugent et al., 2015). Moreover, there is an evidence that there is a link between the socio-economic status and school achievement (Avissati et al., 2019). Therefore, it is vital to understand how students choose their career and how to help them in building their skills and confidence for choosing STEM through various educational interventions.

The above information landed the arguments for the design of the program "STEM it Like a Girl". The Program's main aim is to promote careers in the STEM field with a focus on young girls/women. Through a public campaign and lectures of successful women with STEM careers, the intent was to stimulate and encourage young girls to choose STEM education and/or career. This report provides evidence of the impact made by one component of the program - the lectures of successful women with careers in STEM. However, the impact of the overall project is probably higher, as one can expect that the public campaign (motivational messages, podcasts and video interviews) will have a larger reach of audience.

How students choose careers and how to stimulate the STEM career choice

When looking at the choices students make we need to take into consideration that the career choice will be effectuated much later that the choice made. This is especially true for youngsters who are still in primary schools. Therefore, one of the best ways of predicting future career choice is to look at intentions for career choice. The intentions are especially valuable in predicting future behaviour as it has been shown that they are longer-lasting and better predictors of behaviour than attitudes, opinions or personal characteristics (Veciana et al., 2005; Moore and Burrus, 2019). This is especially the case when looking at the STEM career choice of females (Moore and Burrus, 2019).

One theory which explains the intentions and the factors related to them is the Theory of Planned Behavior (Ajzen, 1991). According to this theory, behavior is based on intentions which are in turn result of three determinants: attitude towards behavior, social norm and perceived behavioural control. Perceived behavoiral control is linked to the extent to which people think that they will be successful in performing certain behavior success assessment. The concept encompasses self-efficacy and perceived controllability of behaviour (Ajzen, 2012). The social norm is connected to how much the individuals perceive environmental support for the chosen activity, especially by their closest environment such as family, friends and significant others (Ajzen, 1991). The attitude towards behaviour is linked to the perceived attractiveness of the outcomes of certain behaviour (Ajzen, 2012). One study found that attitudes and interests were more predictive for STEM intentions for females in comparison to males (Moore and Burrus, 2019).

There are many factors that are directly or indirectly linked to the intention to pursue a STEM career. Females, in general, show lower perceptions of the value of STEM careers, less interest and less positive perceptions of STEM professionals than males, which are all related to the influence of their social environment (Mason and Rich, 2020).

Practice and research point to a myriad of interventions that could be used to stimulate interest in STEM, especially in the light of gender differences (Zhou et al., 2019). Positive findings have been reported using project based work (Zhou et al., 2019), career scenarios and interactions with experts (Drymiotou et al., 2021) as well as summer camps (Vela et al., 2020). Some studies show an increase in interest for STEM for middle school students after viewing videos with professionals in the STEM fields (Wyss et al., 2012), indicating the usefulness of

such interventions in stimulating STEM career choice. An additional way of stimulating a STEM career choice is through development of a positive self-academic concept (Flowers and Banda, 2016), which can be achieved by supporting a students' belief that they can be successful in STEM (Ruttenberg-Rozen et al, 2021). This belief can be developed in several ways, but one of the most important is by offering a role model, a woman with a STEM career, who will bring student closer to this profession. Females are generally more swayed by other people than males in their STEM career choice proving the value of providing female role models to stimulate STEM interest among women (Mishkin et al., 2016). By getting to know female role models, a STEM career would seem more possible and tangible. Moreover, it is of utmost importance how a girl or any other student identifies with the academic STEM community where role models also play a major part. Understanding this community and seeing how one can be part of it can influence learning, but also growth and overall success in STEM environments (Ruttenberg-Rozen et al., 2021).

Methodology

The effects of "STEM it Like a Girl"[1] program were measured through a comparison of the participants' opinions, views and experiences before an intervention and after the intervention was implemented. The intervention in this research is actually a lecture in the form of motivational speech and sharing personal experience of women (from the country and the diaspora) who have successful STEM careers. Thus, the participants filled out a detailed questionnaire immediately before the lectures, and filled out a shortened version of it shortly after the lectures. Depending on a manner of attending the lectures (online/in-person), most of the participants in Macedonia (95.8%) filled out the questionnaires in a printed form. In Serbia, participants filled out the questionnaires mostly online using Google Forms. However, few students from disadvantaged groups, that didn't possess a phone, filled out the questionnaires in printed form, which were retyped to online form by the research assistant.

The questionnaires were filled out anonymously. In order to track the change in opinions before and after the intervention, and still maintain anonymity, each participant created an individual code that was entered at the beginning of both questionnaires.

Following guidelines were set for the women who participated in the intervention so they could make their talk/lecture rooted in current research about girls' motivation in STEM (Nieto, 2000; Guenaga et al, 2022). Women with a STEM career, who served as role models, were instructed to abide the following structure of the lecture: describe their own career paths, give general information about the STEM field, describe the gender barriers they or other women faced in the STEM field. In the end their task also was to spark interest, motivation and perhaps even intrigue girls to dive into STEM.

[1] STEM it Like a Girl" is a program of Macedonia2025, which promotes careers (occupations) in the STEM field (science, technology, engineering and mathematics) with a main focus on STEM education and career for young girls/women.

Table 1. Intervention - methodology guidelines

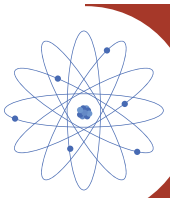
STEM role models	Present your profession and the history of your decision to work in that field (if you feel comfortable doing so, try to map your socio-cultural background, obstacles and dilemmas you have faced).
	Present women's role models, cooperation and support that have contributed to dealing with STEM areas (here it is very important to mention, if possible, women with diverse backgrounds, abilities and interests).
Gender barriers in STEM	Describe the stereotypes you have faced or continue facing in your work and how you deal with them.
Spark STEM	Explain why you have chosen this profession and what is the scientific contribution of your field to everyday life.

The project also aimed at identifying the factors that are important in choosing a STEM career by girls, seeking to provide evidence for the policymakers for the most effective interventions. For that particular reason, the long version of the questionnaire (Available in Appendix 1) was divided into several parts. The *first* part of the questionnaire contained questions related to fields that are attractive for career choice, factors that are perceived as the most important in choosing a career and a question whether the participants have ever seriously considered a career in the STEM field. The *second* part of the questionnaire covered questions related to intentions to pursue a STEM career, as well as factors related to such intentions in accordance with the Theory of Planned Behavior. The questions are adapted based on the works of Linan and Chen (2009), Moore and Burrus (2019) and Joshi and Kuhn (2011). The five-point Likert scale, ranging from "strongly disagree" to "strongly agree", was used for all questions. The questions focused on understanding the intentions to pursue a STEM career (3 questions) as long-term stable predictors of behavior, as well as elements of the theory that are important as factors related to intentions. Thus, the questionnaire examined the attitudes toward a STEM career (4 questions), perceived internal control/STEM success assessment (2 questions) and social norms/Support by the closest environment (3 questions). The *third and fourth* part of the questionnaire referred to examining the role of the school and the education system in stimulating the STEM career choice, using set of questions that were adapted based on the work of Joshi and Kuhn (2011). The five-point Likert scale was also used in this part. There were 6 questions about the general stimulation and climate in the school and 4 questions about the impact of education in general and the curriculum and subjects. The *fifth* part of the questionnaire was focused on examining the perceptions regarding the appropriateness of STEM careers for women reflecting cultural influences whereby the same scale was used for the responses. The last part contained demographic questions for the participants, but also questions about the working status of the mother, as well as whether any of the parents has a STEM career.

The short version of the questionnaire (available in Appendix 2) used after the intervention (lecture) contained the first two parts of the long questionnaire in order to see the difference in intentions to pursue a STEM career as a result of the intervention. The questionnaire also contained a combination of questions from other parts, whereby most of the questions focus on the reflection of cultural influences and the perception of STEM careers as an option for women. This questionnaire also contained an open ended question where the students could express their impressions of the lecture.

Effects

The intervention in this research was a talk/lecture where a female role model - scientist or an engineer shared personal information and experience with students in the last two grades in primary school. Because of the differences in the educational systems in Serbia and Macedonia, in Serbia, students from 7th and 8th grade were included, whereas in Macedonia studens from 8th and 9th grade participated.[2] In total, 20 schools and 560 girls from both countries were involved in the lectures and responded to the questionnaire.



Demographic characteristics of the sample (N. Macedonia)

The sample which was subject to analysis consists of 308 respondents from 10 primary schools in N. Macedonia. To ensure that the sample is representative, special attention in the selection of schools was given to the regional component and ethnicity, i.e. the selected primary schools are from Skopje and Skopje area, Stip, Kumanovo, Ohrid, Struga (v. Draslajca) and Bitola. Given that the overall project and research are focused on young girls, the sample consists only of females. The average age of students is 14 years. Students from the eighth (23%) and ninth grade (77%) were included, thus their age ranged from 13 to 16 years. Regarding the place of residence, 17.2% are from the rural areas, and 82.8% from urban areas. Examining the share of different ethnicities in the sample, 81.8% speak Macedonian language at home while 18.8% speak one of the languages of the different ethnic minorities who live in the country. Approximately eighty percent of the girls surveyed stated that their mother was employed, and only 31% of them stated that at least one of their parents has a STEM career. Of the girls who stated that at least one parent has a carrier in STEM, 15.6% stated that their father has a STEM career, 10.1% that their mother has a STEM career while 2.5% stated that both parents have STEM career.

[2] The primary education in Macedonia lasts 9 years (grades) and 8 years (grades) in Serbia. The program targeted last two years of the primary school.

Demographic characteristics of the sample (Serbia)

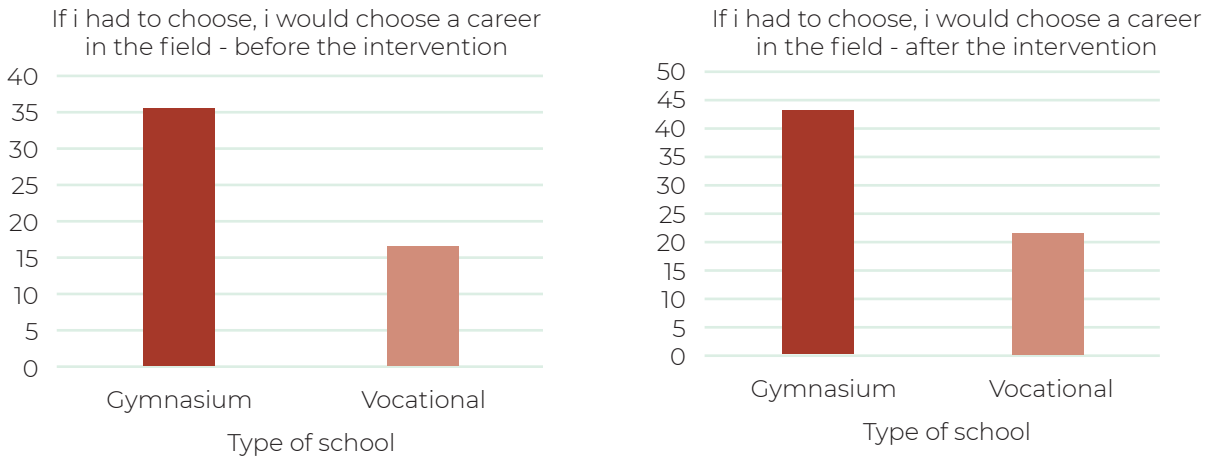
The sample in the analysis consists of 252 respondents from 10 primary schools in Serbia. The sample of before and after was unevenly distributed, and while 252 girls answered the first questionnaire, only 92 answered the second one. Hence, any comparison between these results must be considered very cautiously.

The choice of the sample of schools was done to provide wider regional coverage. Primary schools from Leskovac, Niš, Kikinda and Belgrade were covered. The average age of female students that participated is 13 years. Regarding the place of residence, 29% were from the rural areas, and 66. 7% from urban areas, the rest live in suburban areas. Great majority of girls who participated have Serbian as their mother tongue, 20.6% of them have mothers who are unemployed, and 65.9% do not have parents working in STEM, whereas those who have some parent working in STEM, 45.1% are fathers, and 26.4% are mothers, 28.6% are both.

Career choice of young girls - comparison before and after the intervention

Despite the differences in the sample, similarities in both countries are observed regarding the choice of the future career of the girls. In Macedonia (see graph 1), 43.5% of the girls would choose gymnasium over vocational high school and 59% would like to pursue a major in STEM. However, in the first questionnaire 46% of the respondents, when asked if they are seriously considering a STEM career, answered YES. That percentage increased to 52.6% in the second questionnaire. Of the students who choose gymnasium as their choice for high school, 21% choose major in non-STEM while 36 % would choose major in STEM. Of the students who would choose vocational high school, 27% would choose a major in non-STEM field, while only 17% major in STEM field. After the lecture, a second questionnaire was conducted in order to check whether the students' views had shifted. After the lecture, the share of students who opted for gymnasium and non-STEM field decreased for social sciences by 5 percentage points (pp), and the share of students who opted for vocational high school in non-STEM major, decreases by 8pp. These changes are in favor of the major in STEM field for gymnasium and vocational high school, gymnasium –major in STEM increases by 8pp and vocational high school-major in STEM increases by 5pp.

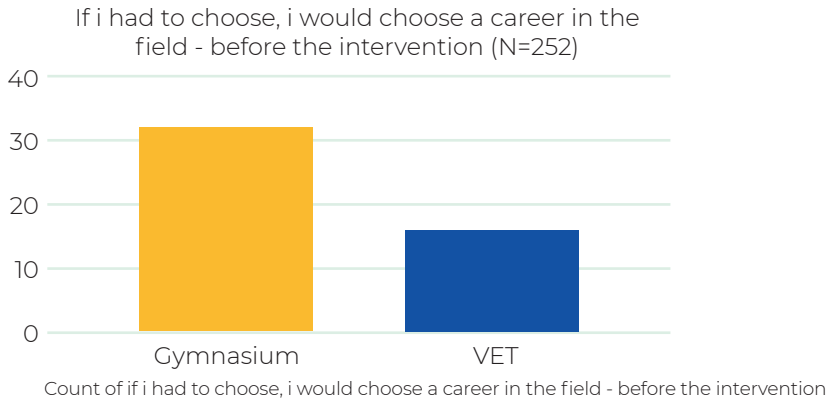
Graph 1. "If I had to choose, I would choose a career in the field - before and after the intervention"



Source: Field research of Macedonia2025

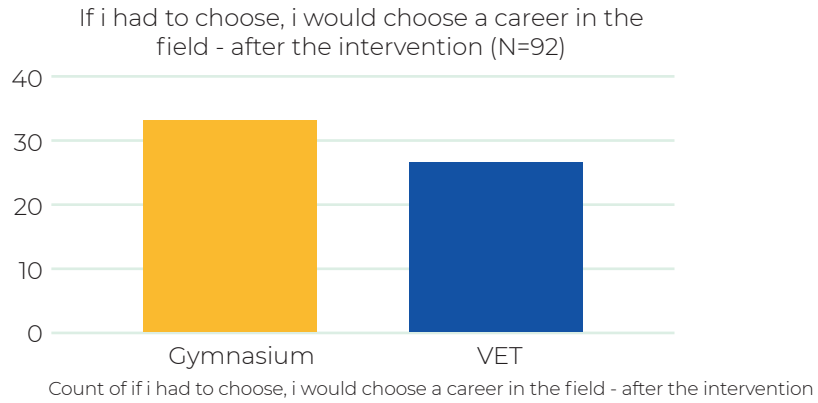
In Serbia, 44.5% of the girls would choose gymnasium over other types of schools, 21.7% of them chose gymnasium with a major in STEM. However, in the first questionnaire 38.1% of the respondents, when asked if they are seriously considering a STEM career, answered YES. That percentage increased to 48.4% after the intervention. Of the students who chose gymnasium as their choice for high school 18.3% chose a major in non-STEM, while 12.7 % would choose a major in STEM. Between those who would choose VET schools, only 6.4% chose a major in STEM. However, after the lecture, the share of students interested in pursuing a major in STEM increased to 21.7%, but also for a major in social sciences to 22.8%. Investigated in more details, of those who would choose gymnasium, 35.9%, and of those who would choose VET, 29.3% would major in STEM, whereas the rest of the sample chose a major in non-STEM (graph 2 and 3).

Graph 2. Share of students who would major in STEM before the lecture



Source: Field research of Ana and Vlade Divac foundation

Graph 3. Share of students who would major in STEM after the lecture



Source: Field research of Ana and Vlade Divac foundation

This shift in the positive direction for a major in STEM fields for both gymnasium and vocational high school in both countries points to a positive effect of lectures and motivational speeches. This provides evidence for the effectiveness of the use of motivational speeches and sharing personal experiences, as it is in line with the guidelines of Corbertt and Hill (2015), i.e. indicates thatmotivational speeches have the potential to stimulate interest and intentions in choosing a STEM career.

In order to gain insight into the role of different factors in choosing a future career, students were asked to indicate which factors influence their future career choices. Students could choose from the following factors: my interests, my abilities, parents' opinion, teachers' opinion, friends' opinion, the opportunity for good earnings offered by the profession, career counselors' opinion, influencers' opinion on social media and content in the media (TV, newspapers, movies etc.). Out of these, in both countries the interests and abilities of students have the largest importance, followed by the opportunity to earn. After the intervention, an increase of importance was found for the following factors: abilities (increase by 6 pp), interests (5 pp), and career counselors' opinion (5 pp) in Macedonia, whereas in Serbia the importance of "the opportunity to earn" increased by 5 pp.

Regarding the students' considerations on building a career in the STEM field, according to the Theory of Planned Behavior, their answers were divided into four main categories, as follows: the intention to build a STEM career, the attitude toward a STEM career, the perceived internal control (the opportunity for success in the given career) and social norms (support from the closest environment, namely parents, teachers and friends). The determination, the serious intention and the intensity of the effort that will be invested in striving for STEM career are the components of the intention to strive for STEM career. Satisfaction and attractiveness, the advantages, opportunities and resources for building a STEM career are the main components of attitude formation. Necessary skills and readiness determine the perceived internal control (the opportunity for students succeeding in STEM careers) and, finally, family, friends and teachers are the main factors supporting STEM career development. The ranking of the answers ranged on the scale from 1 to 5 according to the level of agreement with the statements (5 – "I strongly agree").

Table 2. "Considerations in relation to building a STEM career – before and after the intervention" (in %), Macedonia

		1	2	3	4	5
Intention to pursue a STEM career	Before	22.3	13.7	19.8	20.0	23.9
	After	10.6	9.3	17.6	22.9	36.6
	Difference	**-11.7pp**	**-4.4pp**	**-2.2pp**	**2.9pp**	**12.7pp**
Attitude toward a STEM career	Before	15.8	13.0	20.8	24.1	26.2
	After	8.3	8.3	15.9	23.1	41.5
	Difference	**-7.5pp**	**-4.7pp**	**-4.9pp**	**-1.0pp**	**15.3pp**
Perceived behavioural control (STEM success assessment)	Before	13.9	13.3	21.9	24.8	25.9
	After	7.7	9.3	17.1	29.7	33.3
	Difference	**-6.2pp**	**-4.0pp**	**-4.8pp**	**4.9pp**	**7.5pp**
Social norms (Support by the closest environment)	Before	7.4	7.4	19.3	20.7	44.9
	After	5.2	3.6	12.0	20.7	55.5
	Difference	**-2.2pp**	**-3.8pp**	**-7.3pp**	**0.0pp**	**10.6pp**

Source: Field research of Macedonia2025.

Table 3. "Considerations in relation to building a STEM career – before and after the intervention" (in %), Serbia

		1	2	3	4	5
Intention to pursue a STEM career	Before	33.73	15.08	17.86	9.92	23.41
	After	8.69	11.96	20.65	27.17	31.52
	Difference	**-25.03pp**	**-3.12pp**	**2.79pp**	**17.25pp**	**8.11pp**
Attitude toward a STEM career	Before	25.93	13.49	13.76	13.49	33.33
	After	7.97	10.14	15.94	25.36	40.58
	Difference	**-17.95pp**	**-3.35pp**	**2.18pp**	**14.9pp**	**7.3pp**
Perceived behavioural control (STEM success assessment)	Before	27.91	14.95	15.21	12.17	29.76
	After	9.05	10.87	20.65	27.17	32.24
	Difference	**-18.85pp**	**-4.08pp**	**5.44pp**	**15pp**	**2.48pp**
Social norms (Support by the closest environment)	Before	36.64	12.17	16.67	11.38	36.64
	After	7.61	8.33	20.29	20.65	43.12
	Difference	**-29.03pp**	**-3.84pp**	**3.62pp**	**9.27pp**	**6.48pp**

Source: Field research of Ana and Vlade Divac foundation

The data in Tables 2 and 3 show that students' considerations in all of the categories in both countries shift in a positive direction towards STEM fields. Given the small scale of the intervention (only one lecture), it can be expected that the effect would be much higher in case of a continuous exposure of young girls to role models. After the lectures, the intentions of the students to choose a STEM career became more positive, i.e. the students show greater commitment to choosing a STEM career. Regarding the factors related to the intentions for choosing a STEM career according to the Theory of Planned Behavior, students most positively assessed the social norms, i.e. the perceived support from the closest environment (parents, teachers, and friends). After the lectures, the level of perceived support increased. Students have a slightly positive attitude towards a STEM career (assessment of the positive aspects of building a STEM career) which also shifts positively after the intervention. This means that students assess the satisfaction and attractiveness of a STEM career more positively after the lectures. Out of the four factors, students gave the lowest self-assessment to the perceived internal control that is related to the assessment of the required skills and readiness for success in a STEM career. In other words, girls show suspicion that they possess the abilities and skills perceived as necessary for success in STEM career. This assessment also improves slightly after the intervention, but still remains as the weakest one, which means that in the future efforts should be focused on the enhancement of the self-esteem of girls that they possess the necessary skills. This means that in stimulating STEM career choices, efforts should be focused on building positive attitudes toward STEM, as well as increasing students' self-esteem and perception of success in STEM by developing knowledge and skills as well as enhancing the perception of students that they have the necessary knowledge and skills to succeed.

Students believe that the school does not stimulate them to develop a STEM career (Tables 4 and 5). Students positively assess the level of appreciation of women in STEM by the teaching staff (best assessment) and having good grades from STEM courses as drivers toward success in the future career. Also, students generally positively assess the support that they receive to choose a STEM career, motivating both genders in choosing a STEM career, as well as the student support system for career choice. However, these assessments are slightly positive, which leaves room for their improvement by various interventions. Students are fairly neutral when it comes to schools' climate in choosing a STEM career, developing skills for a STEM career through school subjects, and the given emphasis on development of knowledge and skills for a STEM career. On the other hand, students' assessments tend to be slightly negative when it comes to the examples of women in STEM that can be obtained during education. Namely, the students gave the lowest assessment to the examples in the textbooks and teaching materials for women with STEM careers, and the second weakest assessment is the role of teachers in giving examples of women with STEM careers.

Table 4. The share of students regarding the statements of school's stimulation for STEM career, Macedonia

	1	2	3	4	5
In my school. there is a positive climate about choosing a STEM career	5.2	5.8	22.4	26.3	39.9
In my school. both boys and girls are equally stimulated to choose a STEM career	9.1	12.0	20.5	23.7	34.4
Girls in my school get appropriate support for choosing a STEM career	5.5	4.5	15.6	26.0	48.1
In my school the emphasis is given on development of knowledge and skills for a STEM career	7.8	8.1	24.7	29.9	29.2
Teachers in my school appreciate women in STEM	4.5	2.9	6.2	18.5	67.9
School subjects develop my skills for a STEM career	8.1	10.4	16.2	27.9	37.0
In textbooks and teaching materials there are examples of girls in STEM	16.9	16.9	20.1	26.0	19.8
School teachers make sure to present examples of women with a STEM career	12.0	14.6	23.4	22.1	27.6
School teachers make sure to motivate both boys and girls in choosing a STEM career	9.4	5.5	18.8	20.1	45.8
In my school, there is student support system for career choice	9.1	12.0	17.5	18.5	42.9
If I have good grades in STEM subjects it will help me in my future career	4.5	4.2	10.4	14.0	66.9

Source: Field research of Macedonia2025

Table 5. The share of students regarding the statements of school's stimulation for STEM career, Serbia

	1	2	3	4	5
In my school, there is a positive climate about choosing a STEM career	14.29	13.89	16.27	13.49	42.06
In my school, both boys and girls are equally stimulated to choose a STEM career	17.46	9.13	15.87	13.49	44.05
Girls in my school get appropriate support for choosing a STEM career	15.08	11.51	14.68	12.69	46.03
In my school the emphasis is given on development of knowledge and skills for a STEM career	15.87	15.48	15.07	23.01	30.56
Teachers in my school appreciate women in STEM	11.51	9.52	13.49	11.9	53.57
School subjects develop my skills for a STEM career	17.46	9.92	13.49	12.7	46.43
In textbooks and teaching materials there are examples of girls in STEM	31.75	11.11	21.03	13.1	23.02
School teachers make sure to present examples of women with a STEM career	24.21	15.08	21.83	11.11	27.78
School teachers make sure to motivate both boys and girls in choosing a STEM career	16.67	12.7	16.67	17.86	36.11
In my school, there is student support system for career choice	20.24	11.11	20.24	10.71	37.7
If I have good grades in STEM subjects it will help me in my future career	15.48	9.13	14.29	12.3	48.81

Source: Field research of Ana and Vlade Divac foundation

The comparisons of attitudes regarding STEM career statements as well as the assessment of social acceptance of women with STEM careers in society are presented in Tables 6 and 7.

Table 6. Share of students regarding the following statements, before and after the lecture, Macedonia

		1	2	3	4	5
I personally know women with a STEM career	Before	39.0	8.4	9.7	11.4	31.2
	After	21.8	7.1	13.0	17.2	38.0
	Difference	**-17.2pp**	**-1.3pp**	**3.2pp**	**5.8pp**	**6.8pp**
In my country, women in STEM are appreciated a lot	Before	13.3	9.1	28.6	21.4	27.3
	After	7.8	7.1	19.5	26.3	36.4
	Difference	**-5.5pp**	**-1.9pp**	**-9.1pp**	**4.9pp**	**9.1pp**
STEM career is equally appropriate for women and man	Before	9.1	7.8	16.9	6.8	59.1
	After	6.2	5.5	12.7	13.0	59.7
	Difference	**-2.9pp**	**-2.3pp**	**-4.2pp**	**6.2pp**	**0.6pp**
Women are equally successful as men in STEM professions	Before	5.2	3.2	11.7	10.7	68.8
	After	4.2	3.2	8.1	13.0	68.5
	Difference	**-1.0pp**	**0.0pp**	**-3.6pp**	**2.3pp**	**-0.3pp**
My family appreciates women with STEM career	Before	5.8	3.9	7.8	13.6	68.2
	After	4.5	1.9	8.4	11.7	70.5
	Difference	**-1.3pp**	**-1.9pp**	**0.6pp**	**-1.9pp**	**2.3pp**

Source: Field research of Macedonia2025.

Table 7. Share of students regarding the following statements, before and after the lecture, Serbia

		1	2	3	4	5
I personally know women with a STEM career	Before	1.19	10.32	11.11	10.71	34.92
	After	17.39	9.78	10.87	16.3	48.91
	Difference	**16.2pp**	**-0.54pp**	**-0.24pp**	**5.59pp**	**13.99pp**
In my country, women in STEM are appreciated a lot	Before	15.48	13.49	21.43	15.87	29.76
	After	8.7	13.04	15.22	23.91	39.13
	Difference	**-6.78pp**	**-0.45pp**	**-6.21pp**	**8.04pp**	**9.37pp**
STEM career is equally appropriate for women and man	Before	10.32	7.14	9.92	9.92	62.7
	After	4.35	4.35	6.52	9.78	75
	Difference	**-5.97pp**	**-2.79pp**	**-3.4pp**	**-0.14pp**	**12.3pp**
Women are equally successful as men in STEM professions	Before	11.11	6.75	9.13	9.13	63.89
	After	4.35	3.26	4.35	13.04	75
	Difference	**-6.76pp**	**-3.49pp**	**-4.78pp**	**3.91pp**	**11.11pp**
My family appreciates women with STEM career	Before	12.3	8.33	11.9	7.94	59.52
	After	6.52	3.26	9.78	18.48	61.96
	Difference	**-5.78pp**	**-5.07pp**	**-2.12pp**	**10.54pp**	**2.44pp**

Source: Field research of Ana and Vlade Divac foundation

Students in both countries strongly agree that STEM careers are equally appropriate for women and men, that women are equally successful as men in STEM professions and there is appreciation of their families of women with STEM careers. A positive shift in all these factors was achieved after the lecture. Students in Macedonia least agree that women with STEM careers in their country are appreciated a lot. An indicator of students' lack of information about someone's successful career, especially of women, is shown by their neutral responses to statements that they personally know women with STEM careers. Expectedly, after the intervention, there is a positive shift in terms of how many women with STEM careers they know. These findings support the need for various informal interventions of presenting a more positive picture of the role of women with a STEM career in the society, as well as the support that women can receive in building a STEM career. The latter can be confirmed by the following Tables 8 and 9 in which the level of satisfaction for the several statements regarding the lecture are presented.

Table 8. Share of students regarding the following statements after the lecture, Macedonia

	1	2	3	4	5
I enjoyed the lecture	2.9	2.6	3.9	11.7	76.0
The lecture was really interesting	1.9	3.9	4.9	11.0	75.3
The lecture offered me a useful information	1.9	4.2	5.5	16.6	68.8
I would like to attend more of this type of lectures in the future	5.2	4.2	7.1	11.0	69.5
The lecture motivated me to consider a STEM career	5.5	6.5	11.0	19.5	54.2

Source: Field research of Macedonia2025.

Table 9. Share of students regarding the following statements after the lecture, Serbia

	1	2	3	4	5
I enjoyed the lecture	4.35	2.17	6.52	50	36.96
The lecture was really interesting	5.43	2.17	7.61	48.91	35.87
The lecture offered me a useful information	5.43	3.26	5.43	50	38.04
I would like to attend more of this type of lectures in the future	7.61	5.43	13.04	42.39	31.52
The lecture motivated me to consider a STEM career	10.86	11.95	9.78	32.61	35.87

Source: Field research of Ana and Vlade Divac foundation

Quotations of students related to their impressions of the lectures

The positive impressions of the girls related to the lectures that they attended were visible in their comments to the open-ended question in the second questionnaire. Some of them were positively surprised by the lectures as the very lectures proved to be unexpected and quite enjoyable. They offered new perspectives about the presence of women in STEM: ***I enjoyed the lecture. I was surprised how many women are in STEM. Before the lecture, I used to think that there were much less (Serbia)***. For others the lecture was an eye-opening experience that clarified many issues about what STEM actually entails: ***This lecture opened new horizons for me. So far, I have perceived STEM quite differently. Thank you for the lecture, I really enjoyed it. I feel motivated to do whatever I want (Macedonia)***. Many of the girls commented that the lectures actually managed to break the stereotypes that they had about STEM careers as either male jobs or something where women cannot find their place, by showing positive examples of women in STEM. The most important aspects were that they started perceiving STEM careers in a more positive light and offered them instigation to start considering STEM as their career choice or not giving up on their dreams to pursue STEM career: ***The lecture was great. In the future, I want to pursue a STEM career, but I didn't think I could because it's more a job for boys. I was surprised by the support provided, that I can do STEM as well when I grow up (Serbia).*** In certain instances, the girls were motivated to persevere in their following their dreams and not giving up on their STEM career in spite of societal pressures: ***Honestly, I really liked the lecture. I am certain that I want to go to a VET school – mechanical technician, but there is lot of prejudice about that. Now I know, I just need to persevere (Macedonia)***. Most importantly, the lectures were not only found to be inspiring and motivating, but were also seen as something that have built their self-confidence: ***At first, I thought it would just be a lecture about choosing STEM, but then I was surprised by the level of self-confidence they have instigated. I learnt that I should never give up on my dreams. I was surprised by the approach of the women that gave us the lecture and the positive atmosphere (Macedonia***). The views expressed by the students once again accentuate the role that providing the girls with role models of successful women in STEM can be used to stimulate or strengthen their intentions to pursue STEM career, by changing their perceptions of STEM as a career of choice in a positive direction and instigating motivation and self-esteem related to STEM.

Conclusions and open questions

Women having a STEM career is still a concept that requires attention in both countries. The study found that the interests and desires of young girls are the most important factors influencing the choice of their careers, followed by the economic aspects. Support that they get in schools mostly comes from their STEM teachers, whereas the textbooks and school career counseling services/programs are not supporting the STEM career choice. Teachers are the main role models for STEM careers for girls showing that they are not exposed to successful stories and role models in STEM in the environment or out of school. In the samples, 25.6% of girls in Serbia and 31% of the girls in Macedonia have both parents working in STEM. Unfortunately, no additional in-depth information was collected from the participants as to learn more about the specific type of STEM careers that their parents are involved in.

It is surprising how little influence media and especially social media influencers are perceived to have on choosing careers (less than 5%), and this might be an interesting field for future research. Schools remain the primary provider of career counseling and information about the STEM field. Generally, students received a lot of new information during the lectures and broadened their understanding and views about STEM careers, and for many of them the lecture was the first opportunity to get to know successful women in STEM. Such intervention proved to be useful in stimulating interest in STEM career among the girls. Positive changes were noted in intentions to pursue STEM career, attitudes towards STEM, perceived internal control (STEM success assessment) and social norm (perceived support by the closest environment). The results also show that more work is needed in supporting the girls in their appraisal that they have the skills and knowledge needed for STEM career. There is scope for improvement within the educational systems related to the support and stimulation they can offer to girls when it comes to choosing a career in STEM.

Creating a space or counterspace where in a safe environment STEM identity can be sparked and nurtured is proven to be a very valuable intervention (Ruttenberg-Rozen et al, 2021). Women that participated in the interventions managed to slightly change the students' beliefs for the STEM careers, but also their intention to choose STEM and in certain cases their views of themselves.

Recommendations

The evidence and findings provided by the project implementation and assessment provide a basis for development of recommendations. The main general recommendation is that the education systems should play proactive roles in stimulating the development of necessary STEM skills, enhancing motivation to choose STEM careers and providing bigger support for girls to choose STEM careers. Within the formal education, the school climate, more inclusive classrooms and workplaces that value female opinions, textbooks, study materials and teaching methods need to build skills and confidence among girls for STEM subjects. Equally important, young girls need to be exposed and have a possibility for interaction with women with successful careers in STEM.

On the state level, the study has developed the following recommendations:

- Enhance the school curriculum with broad range of subjects and support activities that can stimulate the development of skills and interest in STEM;
- Make changes to the teaching and learning materials (textbooks, support materials, digital resources) to provide a more balanced representation of male and female STEM role models;
- Enhance the skills of teachers to be able to utilize the teaching and learning materials in a stimulating manner to enhance the development of skills and interest for STEM;
- Develop a network of STEM role models – including cooperation between community, businesses, parents and schools – as a support system for young girls that would like to pursue a STEM career, to help build young girls' confidence that they can succeed in STEM;
- Develop a comprehensive system of support for those who choose a STEM career like scholarships, mentoring support, internships, etc. with a particular focus on girls. The support system needs to be clearly communicated with the students;
- Future programs for developing motivation and interest for STEM among girls should be of longer duration and consist of multiple related interventions.

On the school level:

- Create a school climate that will be conducive to stimulating all students to choose a STEM career regardless of gender and socio-economic background. Utilize the lectures as well as the extra-curricular activities to develop school environment that will help the students to freely explore their interests;

- Utilize the teaching and learning processes within the classroom to develop STEM skills and build confidence related to STEM equally among boys and girls;
- Use the extracurricular activities (like motivational speeches, school visits, workshops) to stimulate all students equally to choose a STEM career, by providing positive examples of women in STEM;
- Strengthen the role of career counselors and career centers in schools so that students, and especially female students, can receive adequate career choice support.

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Appendix 1

Questionnaire conducted in research in primary schools in Macedonia (before the intervention)

Драга ученичке,

Пред тебе се наоѓа еден прашалник во врска со твоите размислувања за идна професија. Она што ни е од особен интерес се твоите размислувања за професија во специфично поле кое накратко се нарекува СТЕМ. СТЕМ ги опфаќа областите на наука, математика, технологија и инжењерство. Примери за професии од СТЕМ се: софтверски инжењер, машински инжењер, биолог, биохемичар, технолог, научник и слично.

Те молиме сите прашања да ги одговориш искрено. Нема точни и неточни одговори. Важни ни се твоите размислувања и идеи. Одговорите се анонимни и сите информации се доверливи и ќе бидат внимателно чувани.

Те молиме наведи код за идентификација. Кодот нека биде твојот омилен лик од книга или филм и првата буква од твоето име.

Впиши го кодот тука: _____

Те молиме внимателно прочитај ги следните прашања и одговори со означување на одговорот или одговорите кои се однесуваат на тебе.

1. По завршувањето на основното училиште своето образование планирам да го продолжам во:
   - Гимназија
     - Општествено хуманистички смер
     - Природно математички смер
   - Средно стручно училиште
     - Геолошко-рударска и металуршки смер
     - Графички смер
     - Градежно геодетски смер
     - Економско правен и трговски смер

- Електротехнички смер
- Здравствен смер
- Земјоделско-ветеринарен смер
- Машински смер
- Текстилно кожарски смер
- Сообраќаен смер
- Угостителско туристички смер
- Хемиско-технолошки смер
- Шумарско-дрвнопреработувачки смер

2. При избор на мојата идна кариера најбитни ми се (можни се повеќе одговори):
   - Да одберам нешто што ми е интересно (Моите интереси)
   - Да одберам нешто во што сум добра (Моите способности)
   - Мислењето на родителите
   - Мислењето на наставниците
   - Мислењето на другарите
   - Можноста за добра заработка што ја нуди професијата
   - Мислењето на кариерни советници
   - Мислењето на инфлуенсерите и инфлуенсерките на социјалните мрежи (YouTube, TikTok, Instagram...)
   - Содржините од медиумите (Телевизија, весници, филмови)
   - Друго (наведи што) _____

3. Дали некогаш сериозно си размислувала во иднина да се одбереш професија од CTEM (наука, технологија, инжењерство и математика)

   ДА/НЕ

4. Следниве изјави се однесуваат на твоите размислувања во врска со избор на училишта и програми, а можеби идна професија поврзана со CTEM. CTEM е кратенка од наука, математика, технологија и инжењерство. Наведи го степенот на согласување со следниве изјави. Нема точни и погрешни одговори. Твоето мислење е најважно при одговарање на прашањата.

   Одбери

   - 1 доколку воопшто не се согласуваш со изјавата,
   - 2 доколку не се сложуваш со изјавата
   - 3 доколку делумно не се согласуваш со изјавата,
   - 4 доколку ниту не се согласуваш ниту се согласуваш,
   - 5 доколку делумно се согласуваш со изјавата,
   - 6 доколку се сложуваш со изјавата
   - 7 доколку потполно се согласуваш со изјавата.

	1	2	3	4	5
Сакам да се запишам на насока/училиште кое дава основа за професија во СТЕМ					
Би сакала да имам професија во СТЕМ					
Многу ќе се трудам за да се запишам на насока/училиште каде што ќе учам повеќе СТЕМ					
СТЕМ предметите се навистина интересни					
Професија во СТЕМ би ми била уживање					
Професија во СТЕМ ми изгледа примамлива					
Ако имам можности ќе одберам професија од СТЕМ					
Имам знаење и вештини за понатамошно школување и професија во СТЕМ					
Добра сум по предметите кои се поврзани со СТЕМ					
Знам дека ќе бидам успешна во професија од СТЕМ					
Моето семејство смета дека професија во СТЕМ е добар избор					
Моите другари/другарки сметаат дека професија во СТЕМ е добар избор					
Моите наставници сметаат дека професија во СТЕМ е добар избор					

5. Следниве изјави се однесуваат на твоите размислувања во врска со поширокатa околина и жените во СТЕМ. СТЕМ е кратенка од наука, математика, технологија и инжењерство. Те молиме наведи го степенот на согласување со следниве изјави. Нема точни и погрешни одговори. Твоето мислење е најважно при одговарање на прашањата.

   Одбери

   - 1 доколку воопшто не се согласуваш со изјавата,
   - 2 доколку не се сложуваш со изјавата
   - 3 доколку делумно не се согласуваш со изјавата,
   - 4 доколку ниту не се согласуваш ниту се согласуваш,
   - 5 доколку делумно се согласуваш со изјавата,
   - 6 доколку се сложуваш со изјавата
   - 7 доколку потполно се согласуваш со изјавата.

	1	2	3	4	5
Лично познавам жени со професија од СТЕМ					
Во мојата земја жените со кариера во СТЕМ се многу ценети					
СТЕМ професиите се подеднакво и машки и женски					
Жените се подеднакво успешни како и мажите во СТЕМ професиите					
Моето семејство ги цени жените со СТЕМ професија					

6. Следниве изјави се однесуваат на твоите искуства и размислувања во врска со училиштето и кариера во СТЕМ. СТЕМ е кратенка од наука, математика, технологија и инжењерство. Те молиме наведи го степенот на согласување со следниве изјави. Нема точни и погрешни одговори. Твоето мислење е најважно при одговарање на прашањата.

   Одбери

   - 1 доколку воопшто не се согласуваш со изјавата,
   - 2 доколку не се сложуваш со изјавата
   - 3 доколку делумно не се согласуваш со изјавата,
   - 4 доколку ниту не се согласуваш ниту се согласуваш,
   - 5 доколку делумно се согласуваш со изјавата,
   - 6 доколку се сложуваш со изјавата
   - 7 доколку потполно се согласуваш со изјавата.

	1	2	3	4	5
Во моето училиште постои позитивна клима за избор на професија во СТЕМ					
Во моето училиште и машките и женските подеднакво се поттикнуваат да изберат професија во СТЕМ					
Девојките во моето училиште добиваат соодветна поддршка за избор на професија во СТЕМ					
Во моето училиште акцентот е на развој на знаења и вештини за професија во СТЕМ					
Наставниците во моето училиште ги ценат жените во СТЕМ					
Предметите на училиште ги развиваат моите вештини за кариера во СТЕМ					
Во учебниците и наставните материјали има примери на жени во СТЕМ					
Наставниците во училиштето се грижат да презентираат примери на жени со кариера во СТЕМ					
Наставниците во училиштето се грижат да ги мотивираат и момчињата и девојчињата за избор на кариера во СТЕМ					
Во моето училиште постои систем на поддршка на учениците за избор на кариера					
Ако имам добри оценки по СТЕМ предметите тоа ќе ми помогне во мојата идна професија					

7. Кога ќе се споменат СТЕМ областите кој личноста прво ти паѓа на памет (на кого прво се сеќаваш) _____.

8. Сега замисли се себе си како личност која се има кариера во СТЕМ. Те молиме да ни опишеш како изгледа твојата работа, со што се занимаваш, со кого соработуваш, како се чувствуваш.

   _____

   _____

9. Колку години имаш? _____

10. Кое одделение си? (избери од опциите дадени подолу)
    - 8-мо одделение
    - 9-то одделение
11. Место на живеење: (избери од опциите дадени подолу)
    - Град
    - Село

12. На кој јазик говорите по дома? _____

13. Дали твојата мајка е вработена?

    ДА/НЕ

14. Дали барем еден од твоите родители/старатели има кариера во СТЕМ?

    ДА/НЕ

15. Ако одговори со ДА на претходното прашање те молиме наведи кој родител има кариера во СТЕМ?
    - Мајка ми
    - Татко ми

Appendix 2

Questionnaire conducted in research in primary schools in Macedonia (after the intervention)

Драга ученичке,

Пред тебе се наоѓа еден прашалник во врска со твоите размислувања за идна професија. Она што ни е од особен интерес се твоите размислувања за професија во специфично поле кое накратко се нарекува СТЕМ. СТЕМ ги опфаќа областите на наука, математика, технологија и инжењерство. Примери за професии од СТЕМ се: софтверски инжењер, машински инжењер, биолог, биохемичар, технолог, научник и слично.

Те молиме сите прашања да ги одговориш искрено. Нема точни и неточни одговори. Важни ни се твоите размислувања и идеи. Одговорите се анонимни и сите информации се доверливи и ќе бидат внимателно чувани.

Те молиме наведи код за идентификација. Кодот нека биде твојот омилен лик од книга или филм и првата буква од твоето име. Те молиме наведи го кодот што го наведе и во претходниот прашалник што го пополнуваше.

Впиши го кодот тука: _____

Те молиме внимателно прочитај ги следните прашања и одговори со означување на одговорот или одговорите кои се однесуваат на тебе.

1. Следниве изјави се однесуваат на предавањето на кое присуствуваше.

   Одбери

   - 1 доколку воопшто не се согласуваш со изјавата,
   - 2 доколку малку не се согласуваш со изјавата,
   - 3 доколку ниту не се согласуваш ниту се согласуваш,
   - 4 доколку малку се согласуваш со изјавата,
   - 5 доколку потполно се согласуваш со изјавата.

	1	2	3	4	5
Уживав во предавањето					
Предавањето беше навистина интересно					
Предавањето ми понуди корисни информации					
Би сакала да присуствувам на повеќе вакви предавања во иднина					
Предавањето ме поттикна да размислувам за СТЕМ					

2. По завршувањето на основното училиште своето образование пранирам да го продолжам во:
   - Гимназија
     - Општествено хуманистички смер
     - Природно-математички смер
   - Средно стручно училиште
     - Геолошко-рударска и металуршки смер
     - Графички смер
     - Градежно геодетски смер
     - Економско правен и трговски смер
     - Електротехнички смер
     - Здравствен смер
     - Земјоделско-ветеринарен смер
     - Машински смер
     - Текстилно кожарски смер
     - Сообраќаен смер
     - Угостителско туристички смер
     - Хемиско-технолошки смер
     - Шумарско-дрвнопреработувачки смер

3. При избор на средно училиште и насока најважни ми се (можни се повеќе одговори):
   - Да одберам нешто што ми е интересно (Моите интереси)
   - Да одберам нешто во што сум добра (Моите способности)
   - Мислењето на родителите
   - Мислењето на наставниците
   - Мислењето на другарите
   - Можноста за добра заработка што ја нуди професијата
   - Мислењето на кариерни советници
   - Мислењето на инфлуенсерите и инфлуенсерките на социјалните мрежи (YouTube, TikTok, Instagram...)
   - Содржините од медиумите (Телевизија, весници, филмови)
   - Друго (наведи што) _____

4. Дали некогаш сериозно си размислувала во иднина да се одбереш професија од СТЕМ (наука, технологија, инжењерство и математика)

   ДА/НЕ

5. Следниве изјави се однесуваат на твоите размислувања во врска со избор на училишта и програми, а можеби идна професија поврзана со СТЕМ. СТЕМ е кратенка од наука, математика, технологија и инжењерство. Наведи го степенот на согласување со следниве изјави. Нема точни и погрешни одговори. Твоето мислење е најважно при одговарање на прашањата.

   Одбери

   - 1 доколку воопшто не се согласуваш со изјавата,
   - 2 доколку не се сложуваш со изјавата
   - 3 доколку делумно не се согласуваш со изјавата,
   - 4 доколку ниту не се согласуваш ниту се согласуваш,
   - 5 доколку делумно се согласуваш со изјавата,
   - 6 доколку се сложуваш со изјавата
   - 7 доколку потполно се согласуваш со изјавата.

	1	2	3	4	5
Сакам да се запишам на насока/училиште кое дава основа за професија во СТЕМ					
Би сакала да имам професија во СТЕМ					
Многу ќе се трудам за да се запишам на насока/училиште каде што ќе учам повеќе СТЕМ					
СТЕМ предметите се навистина интересни					
Професија во СТЕМ би ми била уживање					
Професија во СТЕМ ми изгледа примамлива					
Ако имам можности ќе одберам професија од СТЕМ					
Имам знаење и вештини за понатамошно школување и професија во СТЕМ					
Добра сум по предметите кои се поврзани со СТЕМ					
Знам дека ќе бидам успешна во професија од СТЕМ					
Моето семејство смета дека професија во СТЕМ е добар избор					
Моите другари/другарки сметаат дека професија во СТЕМ е добар избор					
Моите наставници сметаат дека професија во СТЕМ е добар избор					
Лично познавам жени со професија од СТЕМ					
Во мојата земја жените во СТЕМ се многу ценети					
СТЕМ професиите се подеднакво и машки и женски					
Жените се подеднакво успешни како и мажите во СТЕМ професиите					
Моето семејство ги цени жените со СТЕМ професија					
Ако имам добри оценки по СТЕМ предметите тоа ќе ми помогне во мојата идна професија					

6. Опиши ни ги твоите размислувања по ова предавање. Кои прашања или дилеми ти се отворија? Што те изненади и зошто?

   _____

   _____

Appendix 3

Questionnaire conducted in research in primary schools in Serbia (before the intervention)

Драга ученице,

Пред тобом је упитник који испитује размишљања о твојој будућој професији. Оно што нас посебно занима су твоја размишљања о професији у одређеној области која се скраћено зове СТЕМ. СТЕМ покрива природне науке, математику, технологију и инжењерство и у школама ове области се обрађују кроз предмете као што су математика, физика, хемија, биологија и информатика. Примери СТЕМ професија су: софтверска инжењерка, машинска инжењерка, биолошкиња, биохемичарка, технолошкиња, математичарка, програмерка и сл.

Молимо те да на сва питања одговориш искрено. У овом упитнику не постоје тачни или погрешни одговори, важне су нам твоје мисли и идеје. Твоји одговори су анонимни, ми нећемо знати твоје име и све информације које поделиш са нама су поверљиве и користимо их искључиво за потребе истраживања које ће помоћи да се што више девојчица бави науком, технологијом и инжењерством.

Како би упитник био анониман и омогућио поређење резултата пре и након предавања у ком ћете учествовати, направи лични код следећи упутство: напиши прва два слова имена омиљене певачице, затим прва два слова имена омиљеног школског предмета, и два различита једноцифрена броја. На пример: име омиљене певачице: Аријана; име омиљеног школског предмета: ликовно; два броја: 12; следи да је код: АРЛИ12.

Унеси код овде: _____

1. По завршетку основне школе, где желиш да наставиш школовање:
   - o Гимназија - природно-математички смер
   - o Гимназија - друштвено-језички смер
   - o Гимназија - ИТ смер
   - o Рачунарска или Математичка гимназија
   - o Средња стручна школа - Геолошке, рударске и металуршке школе
   - o Средња стручна школа - Шумарске и дрвно-прерађивачке школе
   - o Средња стручна школа - Машинске и металске школе

- o Средња стручна школа - Електротехничке школе
- o Средња стручна школа - Текстилне и кожарске школе
- o Средња стручна школа - Школе за хемију, неметале и графичарство
- o Средња стручна школа - Геодетске и грађевинске школе
- o Средња стручна школа - Саобраћајне школе
- o Средња стручна школа - Школе за пољопривреду, производњу и прераду хране
- o Средња стручна школа - Трговачке, туристичке и угоститељске школе
- o Средња стручна школа - Школе за личне услуге
- o Средња стручна школа - Школе за здравство и социјалну заштиту
- o Средња стручна школа - Економске и административно-правне школе
- o Средња стручна школа - Уметничке школе
- o Средња стручна школа - Верске школе
- o Средња стручна школа - Војне и полицијске школе
- o Друго:

1. Приликом одабира моје будуће каријере, најважније ми је (могуће је више одговора):
   - Да изаберем нешто што ми је интересантно
   - Да одаберем нешто у чему сам добра
   - Мишљење родитеља
   - Мишљење наставника/ца
   - Мишљење пријатеља/ица
   - Прилика за добру зараду
   - Мишљење каријерних саветника/ца
   - Мишљење инфлуенсера/ки на друштвеним мрежама (YouTube, TikTok, Instagram...)
   - Медији (Телевизија, новине, филмови...)

2. Да ли си икада озбиљно размишљала о будућој каријери у некој од CTEM (наука, технологија, инжењерство и математика) области?

   ДА/НЕ

3. Следеће изјаве се односе на твоја размишљања о избору школа и програма, а можда и будуће професије везане за CTEM. Не постоје тачни или погрешни одговори желимо да чујемо шта мислите о овим темама.

   Изаберите

   – 1 ако се уопште не слажете са изјавом,
   – 2 ако се делимично не слажете са изјавом,
   – 3 ако се нити слажете нити не слажете,
   – 4 ако се делимично слажете са изјавом,
   – 5 ако се потпуно слажете са изјавом.

	1	2	3	4	5
Желим да упишем одељење/школу која даје основу за СТЕМ занимање					
Волео бих да имам професију у СТЕМ					
Потрудићу се да упишем смер/школу у којој ћу више учити о СТЕМ областима					
СТЕМ предмети су заиста занимљиви					
Уживала бих да је моја професија у СТЕМ-у					
Професија у СТЕМ области ми се чини примамљивом					
Ако будем у прилици, изабрaћу професију из СТЕМ области					
Поседујем знања и вештине за даље образовање и професију у СТЕМ					
Добра сам у СТЕМ предметима					
Знам да ћу бити успешна у СТЕМ професији					
Моја породица сматра да је СТЕМ професија добар избор					
Моји пријатељи сматрају да је СТЕМ професија добар избор					
Моји наставници/е сматрају да је професија у СТЕМ-у добар избор за мене					

4. Следеће изјаве се односе на твоја размишљања о ширем окружењу и женама у СТЕМ-у. Наведи степен слагања са следећим тврдњама. Изабери 1 ако се уопште не слажеш са изјавом, 2 ако се не слажеш са изјавом, 3 ако се делимично не слажеш са изјавом, 4 ако се нити слажеш нити не слажеш, 5 ако се делимично слажеш са изјавом, 6 ако се слажеш са тврдњом и 7 ако се потпуно слажеш са изјавом.

   Изаберите

   - 1 ако се уопште не слажете са изјавом,
   - 2 ако се делимично не слажете са изјавом,
   - 3 ако се нити слажете нити не слажете,
   - 4 ако се делимично слажете са изјавом,
   - 5 ако се потпуно слажете са изјавом.

	1	2	3	4	5
Лично познајем жене са професијом у некој од СТЕМ области					
У мојој земљи су жене са каријером у СТЕМ областима доста цењене					
СТЕМ професије су и мушке и женске					
Жене су подједнако успешне као и мушкарци у СТЕМ професијама					
Моја породица цени жене са СТЕМ професијом					

5. Следеће изјаве се односе на твоја искуства и размишљања у вези са СТЕМ-ом у школом и каријером.

   Изаберите

   - 1 ако се уопште не слажете са изјавом,
   - 2 ако се делимично не слажете са изјавом,
   - 3 ако се нити слажете нити не слажете,
   - 4 ако се делимично слажете са изјавом,
   - 5 ако се потпуно слажете са изјавом.

	1	2	3	4	5
У мојој школи постоји позитивно се односе према избору каријере у СТЕМ области					
У мојој школи, и дечаци и девојчице су подједнако охрабрени да се баве СТЕМ-ом					
Девојчице у мојој школи имају адекватну подршку да изаберу СТЕМ професије					
У мојој школи акценат је на развоју знања и вештина за СТЕМ професије					
Наставници/це у мојој школи цене жене у СТЕМ областима					
Школски предмети развијају моје СТЕМ вештине					
У уџбеницима и наставним материјалима постоје примери жена у СТЕМ-у					
Наставници/це у школи воде рачуна да представе примере жена са каријером у СТЕМ-у					
Наставници/це у школи воде рачуна да мотивишу и дечаке и девојчице да изаберу каријеру у СТЕМ					
У мојој школи постоји систем подршке ученицима при избору занимања					
Ако будем имао добре оцене из СТЕМ предмета, то ће ми помоћи у будућој професији					

6. Када се помену СТЕМ области ко је прва особа која ти пада на памет?

   _____.

7. Молимо те да сада замислиш себе као особу која се бави СТЕМ каријером. Опиши нам како изгледа твој посао, чиме се бавиш, са ким сарађујеш, како се осећаш.

   _____

   _____

8. Колико имаш година?_____

9. У који разред идеш?
   - шести
   - седми
   - осми
10. Где живиш:
   - У граду
   - На селу

11. Који језик говориш када си код куће? _____

12. Да ли је твоја мајка/старатељка запослена?

    ДА/НЕ

13. Да ли бар један од твојих родитеља/старатеља има каријеру у СТЕМ области?

    ДА/НЕ

14. Ако си одговорила са ДА на претходно питање, наведи који родитељ има каријеру у СТЕМ?
   - Мама/старатељка
   - Тата/старатељ
   - Оба родитеља

Appendix 4

Questionnaire conducted in research in primary schools in Serbia (after the intervention)

Драга ученице,

Пред тобом је упитник који испитује размишљања о твојој будућој професији. Оно што нас посебно занима су твоја размишљања о професији у одређеној области која се скраћено зове СТЕМ. СТЕМ покрива природне науке, математику, технологију и инжењерство и у школама ове области се обрађују кроз предмете као што су математика, физика, хемија, биологија и информатика. Примери СТЕМ професија су: софтверска инжењерка, машинска инжењерка, биолошкиња, биохемичарка, технолошкиња, математичарка, програмерка и сл.

Молимо те да на сва питања одговориш искрено. У овом упитнику не постоје тачни или погрешни одговори, важне су нам твоје мисли и идеје. Твоји одговори су анонимни, ми нећемо знати твоје име и све информације које поделиш са нама су поверљиве и користимо их искључиво за потребе истраживања које ће помоћи да се што више девојчица бави науком, технологијом и инжењерством.

Како би упитник био анониман и омогућио поређење резултата пре и након предавања у ком ћете учествовати, направи лични код следећи упутство: напиши прва два слова имена омиљене певачице, затим прва два слова имена омиљеног школског предмета, и два различита једноцифрена броја. На пример: име омиљене певачице: Аријана; име омиљеног школског предмета: ликовно; два броја: 12; следи да је код: АРЛИ12.

Унеси код овде: _____

1. Следеће изјаве се односе на предавање којем си управо присуствовала.

   Изабери

   - 1 ако се уопште не слажеш са изјавом,
   - 2 ако се не слажеш са изјавом,
   - 3 ако се нити слажеш нити не слажеш,
   - 4 ако се делимично слажеш,
   - 5 ако се потпуно слажеш са изјавом.

	1	2	3	4	5
Уживала сам у предавању					
Предавање је заиста било интересантно					
Предавање ми је пружило корисне информације					
Радо бих присуствовала оваквим предавањима у будућности					
Предавање ме подстакло да размишљам о СТЕМ областима					

2. По завршетку основне школе, где желиш да наставиш школовање:

- Гимназија - природно-математички смер
- Гимназија - друштвено-језички смер
- Гимназија - ИТ смер
- Рачунарска или Математичка гимназија
- Средња стручна школа - Геолошке, рударске и металуршке школе
- Средња стручна школа - Шумарске и дрвно-прерађивачке школе
- Средња стручна школа - Машинске и металске школе
- Средња стручна школа - Електротехничке школе
- Средња стручна школа - Текстилне и кожарске школе
- Средња стручна школа - Школе за хемију, неметале и графичарство
- Средња стручна школа - Геодетске и грађевинске школе
- Средња стручна школа - Саобраћајне школе
- Средња стручна школа - Школе за пољопривреду, производњу и прераду хране
- Средња стручна школа - Трговачке, туристичке и угоститељске школе
- Средња стручна школа - Школе за личне услуге
- Средња стручна школа - Школе за здравство и социјалну заштиту
- Средња стручна школа - Економске и административно-правне школе
- Средња стручна школа - Уметничке школе
- Средња стручна школа - Верске школе
- Средња стручна школа - Војне и полицијске школе
- Друго:

3. У избору средње школе најбитније ми је (можеш означити више одговора):

- Да одаберем нешто што ме занима
- Да одаберем нешто у чему сам добра
- Мишљења мојих родитеља
- Мишљења мојих наставника/ца
- Мишљење мојих пријатеља/ца
- Мишљење каријерних саветника/ца
- Прилика за добру зараду коју нуди струка
- Мишљење инфлуенсера на друштвеним мрежама (Youtube, TikTok, Инстаграм...)
- Медијски садржаји (телевизија, новине, филмови)
- Друго _____

4. Да ли си икада озбиљно размишљала о будућој каријери у СТЕМ (наука, технологија, инжењеринг и математика)?

ДА/НЕ

5. Следеће изјаве се односе на твоја размишљања о избору школа и програма, а можда и будуће професије везане за СТЕМ. Не постоје тачни или погрешни одговори желимо да чујемо шта мислите о овим темама.

   Изабери

   - 1 ако се уопште не слажеш са изјавом,
   - 2 ако се не слажеш са изјавом,
   - 3 ако се нити слажеш нити не слажеш,
   - 4 ако се делимично слажеш,
   - 5 ако се потпуно слажеш са изјавом.

	1	2	3	4	5
Желим да упишем одељење/школу која даје основу за СТЕМ занимање					
Волео бих да имам професију у СТЕМ					
Потрудићу се да упишем смер/школу у којој ћу више учити о СТЕМ областима					
СТЕМ предмети су заиста занимљиви					
Уживала бих да је моја професија у СТЕМ-у					
Професија у СТЕМ области ми се чини примамљивом					
Ако будем у прилици, изабрaћу професију из СТЕМ области					
Поседујем знања и вештине за даље образовање и професију у СТЕМ					
Добра сам у СТЕМ предметима					
Знам да ћу бити успешна у СТЕМ професији					
Моја породица сматра да је СТЕМ професија добар избор					
Моји пријатељи сматрају да је СТЕМ професија добар избор					
Моји наставници/е сматрају да је професија у СТЕМ-у добар избор за мене					
Лично познајем жене са професијом у некој од СТЕМ области					
У мојој земљи су жене са каријером у СТЕМ областима доста цењене					
СТЕМ професије су и мушке и женске					
Жене су једнако успешне као и мушкарци у СТЕМ професијама					
Моја породица цени жене у СТЕМ професијама					
Ако имам добре оцене из СТЕМ предмета то ће ми помоћи у будућој професији					

6. Опиши нам твоја размишљања након овог предавања. Која питања или дилеме су ти се отвориле? Шта те је изненадило и зашто?

   _____

   _____

Хвала најлепше на одговорима, користићемо их да помогнемо другим девојчицама да се баве СТЕМ-ом.

Photoes - Lectures in primary schools









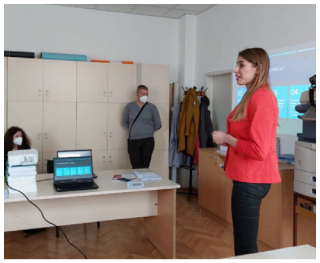


СТЕМувај
како девојка
АЈДЕ ЗАЕДНИЧКИ
ДА ИНСПИРИРАМЕ
ПОВЕЌЕ


СТЕМувај
како девојка
АЈДЕ ЗАЕДНИЧКИ
ДА ИНСПИРИРАМЕ
ПОВЕЌЕ


MACEDONIA
2025
DIVAC


Zoom Meeting
Vesna Popadino...
Зошто е важна СТЕМ едукацијата:
1. СТЕМ Работните места се иднината за нашата економија
2. СТЕМ не учи на критичко размислување и иновации
3. СТЕМ часевите обезбедуваат единствени можности за тимска работа
4. СТЕМ наставната програма им помага на студентите да развијат вештини за управување со проекти
5. Ковид ситуацијата ги направи технолошките вештини поважни
March 31, 2022
WomenInStem
Chat
Me to Everyone
првиот прашалник - анонимно истражување за главните бариери со кои се соочуваат младите ученички за да развијат желба и аспирација кон кариерен развој во СТЕМ области
Me to Everyone
првиот прашалник - анонимно истражување за главните бариери со кои се соочуваат младите ученички за да развијат желба и аспирација кон кариерен развој во СТЕМ области
Who can see your messages?
Type message here...
17°C Cloudy
12:33 PM
3/31/2022



About the Project

The project “STEM≡quality - Empowering girls and young women to follow STEM (science, technology, engineering and mathematics) education and professional careers” was supported by Canadian Fund for Local Initiatives.

STEM≡quality is a project that will promote education and professional careers in the STEM field (science, technology, engineering and math) of girls/young women. That will enhance the career opportunities for young women, reduce gender inequalities and will increase women empowerment. The early age differences and choices have a long-term effect on the women’s transition from education to labor market, on their careers and professional development, on wages (adding to the persisting gender wage gaps), but also to the general gender equality and economic and social position of women in the society. The project aims at closing the current gender gaps in the share of women and men STEM graduates among the population. The interventions (activities) within the project should increase the aspiration of young women for STEM education and career, mitigate stereotypes in the society about the gender roles and female- and male-jobs. The gender stereotypes are deeply rooted in the society and start from an early age so that young girls are being raised as to seek security, find a job preferably in a “female” occupation (health, social work, education, or public administration) and not to “dream big”.

The project was implemented on the territory of two neighboring countries, North Macedonia and Serbia. The proposed initiative will contribute to improving the environment in North Macedonia and Serbia for sustainable socio-economic development and greater use of the potential of young women.

Project partnering organizations are Macedonia2025 and Ana and Vlade Divac Foundation.

MACEDONIA 2025
Helping Build a Stronger Nation

FOUNDATION ANA AND VLADE DIVAC

October 2022

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The views, findings, and conclusions or recommendations resulting from this project do not necessarily reflect those of funding partners or their respective governments.

www.macedonia2025.com

www.divac.com