

# Primary Students' Views toward STEM Education in Greece

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## ABSTRACT

This paper presents the findings from a survey conducted on primary students to map their views toward science, technology, engineering, and mathematics (STEM) education in Greece according to their urban or rural setting and gender. The sample included 281 primary students from different public schools in Attica and 69 primary students from a Greek province. A close-ended questionnaire was digitally distributed to collect the data. The findings revealed that most students, from both settings, consider themselves good at mathematics and science. At the same time, they do not report it to be very likely that they would follow a career that is related either to these subjects or engineering and technology. Regarding their personal skills, most of them stated that they have communication and cooperation skills. Concerning differences between the two settings, there were statistically significant differences in favor of rural students in whether they believed they could improve, both in mathematics and science, their belief that their knowledge in STEM subjects could be useful in their adult life, and their views on the causes and effects of environmental issues. Finally, limited gender differences emerged in favor of the boys' responses regarding future STEM careers. The implications for further research on geographical, gender, and socioeconomic disparities in STEM education are discussed.

**KEY WORDS:** Primary education; science, technology, engineering, and mathematics education; students' views

## INTRODUCTION

Science, technology, engineering, and mathematics (STEM) education is linked from its appearance to innovation in education, that is, to the need to promote reforms, the adoption of modern pedagogical approaches, and the integration of substantial changes in the teaching practice as well as the use of new teaching tools (Martín-Páez et al., 2019). According to many researchers, STEM education can help the next generation of students to solve real-world problems by applying cross-discipline concepts and to develop the important ability of critical thinking, collaboration, and creativity (Shernoff et al., 2017) as well as knowledge, reasoning, and argumentation (Wilson et al., 2009, Mandrikas et al., 2023).

The goal of STEM education, a purely student-centered approach, is to cultivate skills and connect learning to everyday life through familiarity with real problems, as well as to promote students' scientific and technological literacy (Du Plessis, 2018; Hathcock et al., 2014; Havice, 2009; NRC, 2011). Specifically, through STEM teaching, learners acquire skills that make them: (a) problem solvers, (b) innovators, (c) inventors, (d) self-reliant, (e) logical thinkers, and (f) technologically literate (Shernoff et al., 2017). The shift of interest to educational activities that include design, coding, and robotics paves the way for the development of the above skills, but also other abilities such as critical thinking, creativity, collaboration, and communication.

The literature on STEM education has become very rich over the last two decades. Many researchers have tried to

identify challenges and barriers to implement STEM in the class (Bybee, 2013; Martín-Páez et al., 2019; Margot and Kettler, 2019; Nadelson et al. 2012) or studied the possibilities of STEM integration in the school curriculum (Kelley and Knowles, 2016; Sanders, 2009). Several studies recorded teachers' views on STEM integration in schools (El-Deghaidy et al., 2017; Honey et al., 2014) or on implementing STEM activities in class (Bal and Bedir, 2021; Nuangchalerm, 2018; Toma and Greca, 2018).

Although there is a lot of literature that investigates the development of STEM education in several educational environments, there is limited literature on students' views on the STEM approach. In this line, this paper explores primary students' views on STEM education. The paper is part of a work in progress, in which students' and teachers' views on STEM education are considered to design and implement an educational program in three individual schools.

## LITERATURE REVIEW

Students' positive views on STEM education are an important component that is related to both successful STEM implementation in schools and their potential future careers (Valenti et al., 2016). It should be noted that there are numerous studies on students' views on science and technology. Johansson (2009) found that young people are interested in technological products, but their opinions about education or a career in technology are not particularly positive. Regarding general gender differences, boys are more interested in science than girls (Hoffmann et al., 1998). Research on intention

for future careers reveals that boys feel more comfortable following a career in science than girls (Weinburgh, 1995), while girls find science difficult to study (Jones et al., 2000). Research on students' views on technology gives similar findings. Male students seem to be more enthusiastic about technology (Mawson, 2010). Another factor that seems to affect students' perceptions of STEM subjects is age. According to Barmby et al. (2008), students' interest in science declines as they enter adolescence and Hoffman (2002) highlights that from that point gender differences increase in favor of boys.

Another factor that seems to attract researchers' interest is the difference between urban and rural students' views on STEM subjects. Sarfo et al. (2011) studied the gender differences in urban and rural students' views on information and computer technology in Ghana. The findings of their research indicated that there is no statistical difference between rural and urban students regarding their views on the use of information and communications technology (ICT) and the utilization of ICT in teaching and learning. However, their research showed that male students from rural areas have more positive attitudes toward using ICT in teaching and learning. Recently, Saw and Agger (2021) studied differences between rural and small-town students regarding opportunities to learn STEM subjects and to follow college studies in the US. The findings of that research showed that during high school, rural students shifted away from STEM fields, because of geographical disparities.

The above literature highlights the complexity of the factors that affect students' views and interest in STEM education, as well as their intention to follow a STEM career pathway. Independently of the particular social, cultural, and financial factors that may vary from country to country, some patterns could be identified. According to the European Institute for Gender Equity (EIGE) in most countries, male students of STEM disciplines are 4 or 5 times more likely than female students (2021). Particularly in Greece, 5.9% of the university populations are men studying ICT while women are only 1.3%. The situation is similar in mathematics (Verdugo-Castro et al., 2022). Taking related studies into account, the aim of the present study was to map primary students' views on STEM education in Greece. The results will be discussed in the context of other studies.

## METHODOLOGY

### Research Question

The research questions of the present study were as follows: (1) What are Greek primary students' views toward STEM education, (2) What are the differences, if any, in these views according to rural or urban settings, and (3) What are the differences, if any, in these views according to gender.

Specifically, the first question is analyzed regarding:

1. Mathematics and science
2. Engineering and technology
3. Environmental issues, and
4. Personal skills.

### Sample

The research sample was convenient due to time and cost circumstances. It consisted of 350 primary students. Demographic characteristics of the participants are given in Table 1, to give a more complete impression of the qualitative characteristics.

According to the Greek primary education curriculum, mathematics is introduced in K-1 (first grade of primary education in Greece which corresponds to 6-year-old students). Regarding science, during the first four grades science subjects are provided in a subject called "Study of the Environment" which incorporates issues from natural and cultural environment. During the two last grades of primary education (K-5 and K-6, which corresponds to 11- and 12-years old students), it is offered as a subject called "natural sciences", which includes the content of all science disciplines, such as physics, chemistry, biology, except geography which is offered separately. Regardless of the student's home region, all schools follow the national curriculum, using the same textbooks, which are distributed to students for free.

### Data Collection

The students' views were collected using a questionnaire consisting of 35 Likert-Scale closed-ended questions. The questionnaire was structured in five categories, according to the above-mentioned axes of the research question: six questions explored students' views on mathematics, six on science, 11 on engineering, technology and their use in solving everyday problems, five referred to environmental problems, and seven on students' personal skills. These categories were formed based on corresponding taxonomies in similar studies (Gatan et al., 2021) and on the questionnaire developed by North Carolina State University (Friday Institute for Educational Innovation, 2012). Data were collected from February to March 2022.

Regarding the validity of the questionnaires, it is provided by the fact that all questions are related to students' views on STEM education (content validity) and vice versa, the questionnaires include all aspects of STEM education, as they are classified into the five categories mentioned above (Gay et al., 2012). Moreover, the questionnaires are thoroughly tested by two experts, experienced schoolteachers. They both agreed on the content validity of all items. Finally, it was followed by clear instructions, written for primary school students to explain them how to complete the questionnaire. Questionnaires were created and distributed in digital form.

### Ethical Statement

Ethical approval was waived for this study under the decision of the Regional Directorate of Primary and Secondary Education (in Greece) since during the design and implementation

**Table 1: Demographic characteristics of the sample**

Sample	K-5	K-6	Male	Female	Urban	Rural
Number of students	179	171	170	180	281	69
Total				350		

procedures were followed to ensure ethical standards regarding anonymity, parents' consent, and password-protected data storage. Particularly, regarding the anonymity: The sample of the research consists of primary students, who voluntarily completed a questionnaire in "Google Form" format. Particularly, the link for the questionnaires was distributed to students with the help of their teachers. A setting in the Google Form supported the anonymity of the participants, regarding both their names and email addresses. Regarding parents' consent: all parents were informed and consented to their children's voluntary participation in completing the questionnaires. Finally, regarding data storage and protection: all data are saved exclusively in two researchers'/authors' locked laptops, in password-protected folders.

### Data Analysis

Regarding the closed-ended questions, they were sorted based on the pre-determined answer grades for each question and recorded in tables. Students' answers were analyzed comparatively, according to their regional setting (urban/rural) and their gender. To determine statistically significant differences, an independent t-test was implemented, with an alpha level of 0.05 for all tests.

### Limitations

Data for this research were collected from a limited number of primary education students. The inherent bias in convenience sampling (Hedt and Pagano, 2011), due to the under-representation of subgroups in the sample, does not allow trustworthy inferences to be made about the intended population.

## RESULTS

### Students' Views on Mathematics

Rural and urban students' views on mathematics are presented in Table 2. Most students responded that they were good at mathematics ( $M = 4.03$ ,  $Mdn = 4$ ) without statistically significant differences according to the geographical setting. Regarding students' views on the use of mathematics in their future jobs, both groups were moderate ( $M = 3.19$ ,  $Mdn = 3$ ) with statistically significant differences in favor of rural students ( $M = 3.51$ ,  $Mdn = 3$ ,  $SD = 1.36$ ) related to urban students ( $M = 3.11$ ,  $Mdn = 3$ ,  $SD = 1.42$ ,  $t(348)$ ,  $p < 0.05$ ). Students think more positively about using their mathematics in surpassing daily difficulties ( $M = 4.08$ ,  $Mdn = 5$ ), while rural students seem to be even more positive ( $M = 4.45$ ,  $Mdn = 5$ ,  $SD = 0.93$ ) than urban ( $M = 3.99$ ,  $Mdn = 4$ ,  $SD = 1.18$ ,  $t(348) = 3.02$ ,  $p < 0.05$ ).

### Students Views on Science

Regarding students' views on science (Table 3), most students responded that they were capable in class ( $M = 4.08$ ,  $Mdn = 4$ ) with no statistically significant differences between rural and urban students. However, when asking them about combining any future job with science, they were less enthusiastic ( $M = 2.91$ ,  $Mdn = 3$ ) with rural students being more positive about considering their future job related to science ( $M = 3.36$ ,  $Mdn = 4$ ,  $SD = 1.51$ ) than urban students ( $M = 2.8$ ,  $Mdn = 3$ ,  $SD = 1.38$ ,  $t(348) = 2.95$ ,  $p < 0.05$ ). Rural students were more willing to utilize their scientific knowledge in solving daily issues. Finally, a statistically significant bigger percentage of rural students believed that they could improve their performance in both mathematics and science.

**Table 2: Students' views on mathematics**

Students' views on mathematics	Urban		Rural		Male		Female		Total	
	M	Mdn	M	Mdn	M	Mdn	M	Mdn	M	Mdn
1 The subject is difficult for me	2.23	2	1.96	2	2.12	2	2.24	2	2.1	2
2 I am good at mathematics	4	4	4.12	4	4.09	4	3.96	4	4.03	4
3 I am good at all subjects but mathematics	2.08	1	1.75	1	1.94	1	2.08	1	2.02	1
4 I am sure I can improve on mathematics	4.15	5	4.58	5	4.18	5	4.29	5	3.19	5
5 The job I am thinking of when I grow up requires the use of mathematics	3.11	3	3.51	3	3.31	3	3.07	3	3.19	3
6 I would like to use my knowledge in solving practical problems of everyday life that require mathematics	3.99	4	4.45	5	4.07	5	4.10	5	4.08	5

**Table 3: Students' views on science**

Students' views on science	Urban		Rural		Male		Female		Total	
	M	Mdn	M	Mdn	M	Mdn	M	Mdn	M	Mdn
1 The subject is difficult for me	2.11	2	2.03	2	2.08	3	2.1	2	2.10	2
2 I am good at mathematics	4.09	4	4	4	3.97	4	4.18	4	4.08	4
3 I am good at all subjects but mathematics	1.74	1	1.87	1	1.89	1	1.65	1	1.77	1
4 I am sure I can improve on mathematics	4.06	5	4.51	5	4.2	5	4.11	5	4.15	5
5 The job I am thinking of when I grow up requires the use of mathematics	2.80	3	3.36	4	2.91	3	2.93	3	2.91	3
6 I would like to use my knowledge in solving practical problems of everyday life that require mathematics	3.63	4	3.94	4	3.64	4	3.74	4	3.69	4

No statistically significant differences were seen in the mean and median scores between male and female students, regarding their views on mathematics (Table 2) and science (Table 3) and how they think about using either in their future jobs or in daily life problem-solving.

### Students' Views on Engineering and Technology

Table 4 presents students' views on engineering and technology and their importance in future jobs and daily life problems. Students responded moderately to the item "I am good at building and repairing various devices" ( $M = 3.27$ ,  $Mdn = 3$ ), and most of them were interested in learning how different machines ( $M = 3.54$ ,  $Mdn = 4$ ) and electronic devices ( $M = 3.90$ ,  $Mdn = 4$ ) worked. Regarding their intentions for the future, rural students gave statistically significant higher scores in using engineering and technology for daily life purposes ( $M = 4.09$ ,  $Mdn = 4$ ,  $SD = 1.13$ ) than urban students ( $M = 3.51$ ,  $Mdn = 4$ ,  $SD = 1.28$ ,  $t(348) = 3.41$ ,  $p < 0.05$ ). Similar differences were observed regarding students' intention to follow a job requiring creativity. It seems that students expressed limited intention to follow jobs that included designing and constructing products (i.e., engineering), with rural students less willing than urban. Most students felt comfortable with combining mathematics and science to create new things and solve practical problems. Rural students seemed to be statistically significantly more optimistic ( $M = 4.09$ ,  $Mdn = 4$ ,  $SD = 1.07$ ) in combining mathematical and scientific knowledge to create new ideas than urban students ( $M = 3.55$ ,  $Mdn = 4$ ,  $SD = 1.19$ ,  $t(348) = 3.45$ ,  $p < 0.05$ ). Finally, most students responded that they could find information easily through the internet ( $M = 4.55$ ,  $Mdn = 5$ ), while students responded moderately to the question asking if they were familiar with computer programming ( $M = 3.29$ ,  $Mdn = 3$ ).

Most students' responses did not reveal any noticeable differences between males and females, except in two fields. Particularly, male students were statistically significantly more

interested ( $M = 4.04$ ,  $Mdn = 4$ ,  $SD = 1.22$ ) than female students ( $M = 3.77$ ,  $Mdn = 4$ ,  $SD = 1.26$ ,  $t(348) = 2.11$ ,  $p < 0.05$ ) in knowing how electronic devices work. Moreover, female students showed significantly lower willingness to follow either a career including construction ( $M = 1.72$ ,  $Mdn = 1$ ,  $SD = 1.12$ ) or to become engineers ( $M = 2.16$ ,  $Mdn = 2$ ,  $SD = 1.22$ ) than males ( $M = 2.15$ ,  $Mdn = 1$ ,  $SD = 1.35$ ,  $t(348) = 3.30$ ,  $p < 0.01$  and  $M = 2.85$ ,  $Mdn = 2$ ,  $SD = 1.39$ ,  $t(348) = 4.99$ ,  $p < 0.05$ ).

### Students' Views on Environmental Issues

Table 5 presents students' views on environmental issues as they are often integrated in STEM education. Most students showed increased interest in issues related to environmental protection, and rural students showed statistically significantly more interest ( $M = 4.49$ ,  $Mdn = 5$ ,  $SD = 0.8$ ) than urban students ( $M = 4.23$ ,  $Mdn = 5$ ,  $SD = 0.96$ ,  $t(348) = 2.12$ ,  $p < 0.05$ ) and consider environmental problems of utmost importance. According to the results, students were better informed about the consequences of such problems than the causes. Rural students were statistically significantly more informed about the consequences of environmental problems ( $M = 4.29$ ,  $Mdn = 5$ ,  $SD = 0.96$ ) than urban students ( $M = 3.94$ ,  $Mdn = 4$ ,  $SD = 1.17$ ,  $t(348) = 2.33$ ,  $p < 0.05$ ). Finally, most students disagreed with the phrase that humanity has the right to use animals and the natural environment as much as possible ( $M = 2.48$ ,  $M = 2$ ).

Regarding gender differences, a statistically significant difference was found between female students who considered environmental issues more important ( $M = 4.71$ ,  $Mdn = 5$ ,  $SD = 0.67$ ) than male students ( $M = 4.51$ ,  $Mdn = 5$ ,  $SD = 0.93$ ,  $t(348) = 2.27$ ,  $p < 0.05$ ). Moreover, female students declared to be more informed both for the causes of environmental issues ( $M = 4.02$ ,  $Mdn = 4$ ,  $SD = 1.01$ ) and the consequences ( $M = 4.13$ ,  $Mdn = 4$ ,  $SD = 1.09$ ) than the male participants ( $M = 3.76$ ,  $Mdn = 4$ ,  $SD = 1.09$ ,  $t(348) = 2.30$ ,  $p < 0.05$  and  $M = 3.87$ ,  $Mdn = 4$ ,  $SD = 1.17$ ,  $t(348) = 2.13$ ,  $p < 0.05$ ), Table 5.

**Table 4: Students' views on engineering and technology**

Students' views on engineering and technology		Urban		Rural		Male		Female		Total	
		M	Mdn	M	Mdn	M	Mdn	M	Mdn	M	Mdn
1	I am good at constructing and repairing various devices	3.26	3	3.35	4	3.41	3	3.16	3	3.27	3
2	I am interested in knowing how different machines work	3.52	4	3.65	4	3.69	4	3.41	4	3.54	4
3	I am interested in knowing how different electronic devices work	3.85	4	4.12	5	4.04	4	3.77	4	3.90	4
4	I believe that if I acquire engineering knowledge, I could use it to solve technical problems in the future	3.51	4	4.09	4	3.74	4	3.52	4	3.63	4
5	The job I am thinking of when I grow up requires creativity and new ideas	3.39	3	4.06	5	3.57	4	3.48	4	3.52	4
6	The job I am thinking of when I grow up includes the design of products or constructions (houses, bridges, etc)	1.99	1	1.71	1	2.15	1	1.72	1	1.94	1
7	I think I could become a successful engineer	2.52	2	2.41	2	2.86	2	2.16	2	2.50	2
8	By knowing how to combine mathematics and science I could create new things	3.55	4	4.09	4	3.7	4	3.62	4	3.65	4
9	I believe that I am able to solve practical problems of everyday life by using the principles of science and mathematics and by trying different solutions to choose the best	3.52	4	3.7	4	3.56	4	3.53	4	3.55	4
10	I can easily find information on the internet about various topics that interest me	4.53	5	4.65	5	4.52	5	4.59	5	4.55	5
11	I consider myself familiar with computer programming	3.3	3	3.25	3	3.3	3	3.26	3	3.28	3

## Students' Views on Personal Skills

Students' views on their personal skills regarding cooperation and teamwork are presented in Table 6. Both groups stated that they possess skills of cooperation, mutual support, and decision-making. Rural students stated statistically significantly higher scores in helping classmates ( $M = 4.75$ ,  $Mdn = 5$ ,  $SD = 0.55$ ) and taking into account their opinions ( $M = 4.32$ ,  $Mdn = 5$ ,  $SD = 0.9$ ) than urban students ( $M = 4.32$ ,  $Mdn = 5$ ,  $SD = 0.84$ ,  $t(349) = 4.04$ ,  $p < 0.05$  and  $M = 3.98$ ,  $Mdn = 4$ ,  $SD = 1.08$ ,  $t(348) = 2.42$ ,  $p < 0.05$ ). Findings also showed that percentages regarding the use of relevant content knowledge in everyday life problem-solving were relatively high ( $M = 4.14$ ,  $Mdn = 4$ ). Students believed that when they finished school, they would be able to conduct mathematical computations, to evaluate science topics published in the news and social media, and to solve practical problems using technology. Rural students remained more optimistic in this field as well, although differences were not statistically significant.

Regarding gender differences, female participants reported statistically significantly more willing to take others' opinions into account ( $M = 4.23$ ,  $Mdn = 4$ ,  $SD = 1.01$ ) and cooperate with their classmates ( $M = 4.52$ ,  $Mdn = 5$ ,  $SD = 0.84$ ) than male students ( $M = 3.86$ ,  $Mdn = 4$ ,  $SD = 1.06$ ,  $t(348) = 3.28$ ,  $p < 0.01$  and  $M = 4.33$ ,  $Mdn = 5$ ,  $SD = 0.93$ ,  $t(348) = 2.08$ ,  $p < 0.05$ ).

## DISCUSSION AND CONCLUSION

This study investigated students' views on STEM education and any possible regional or gender differences. The findings revealed that based on students' views there seems to be a fertile base for STEM, since according to their answers, most of them were self-confident regarding STEM disciplines and would like to use such knowledge in solving everyday life problems. A possible explanation for these encouraging findings is that in primary education there are more and better chances of increasing the spontaneous interest that science and mathematics evoke. In contrast, in secondary education, individual STEM disciplines are approached by more abstract and demanding mathematical formalism and computation which often disappoints students, especially those of low performance (Barmby et al., 2008).

Students from rural settings reported much more willingness to apply mathematics to real-life problems than urban students. Regarding how students consider the relationship between their knowledge of mathematics and science and any future jobs, students' responses showed a cautious attitude, with rural students more optimistic in applying mathematics and science in their future careers than urban students. These findings are in contrast with the study of Verdugo-Castro et al. (2022). In this study, it was found that students living in urban settings had higher expectations about science and science careers

**Table 5: Students' views on the environment**

Item	Students' views on environment	Urban		Rural		Male		Female		Total	
		M	Mdn	M	Mdn	M	Mdn	M	Mdn	M	Mdn
1	I am very interested in issues related to environmental protection	4.23	5	4.49	5	4.23	5	4.32	5	4.28	5
2	I think environmental problems (air pollution, soil pollution, water pollution, enhancement of the greenhouse effect, lack of water, reduction of forests, etc.) are important	4.59	5	4.67	5	4.51	5	4.71	5	4.61	5
3	I am informed about the causes of several environmental problems	3.84	4	4.67	4	3.76	4	4.02	4	3.90	4
4	I am informed about the consequences of several environmental problems	3.94	4	4.29	5	3.87	4	4.13	4	4.01	4
5	"Man has the right to use to his advantage the animals, plants, minerals, water and all living and non-living elements of the planet as much as possible"	2.47	2	2.49	2	2.59	2	2.38	2	2.48	2

**Table 6: Students' views on their personal skills**

Item	Students' views on personal skills	Urban		Rural		Male		Female		Total	
		M	Mdn	M	Mdn	M	Mdn	M	Mdn	M	Mdn
1	I can help my classmates when doing a task	4.32	5	4.75	5	4.35	5	4.46	5	4.41	5
2	I can take the opinions of others into account when taking a decision	3.98	4	4.32	5	3.86	4	4.23	4	4.05	4
3	I can readjust my plans when something goes wrong	3.92	4	4.12	4	3.86	4	4.04	4	3.96	4
4	I can cooperate with my classmates to do a project	4.38	5	4.58	5	4.33	5	4.52	5	4.42	5
5	I believe that by graduating from primary school I will be able to perform the mathematical calculations that are necessary for me in my daily life	4.09	4	4.33	5	4.17	4	4.11	4	4.14	4
6	I believe that by graduating from primary school I will be able to evaluate the various scientific topics that are published in the press and social networks	3.54	4	3.66	4	3.57	4	3.54	4	3.56	4
7	I believe that by graduating from primary school I will be able to solve practical problems of everyday life using technology	3.73	4	3.96	4	3.85	4	3.69	4	3.77	4

than those living in rural areas. Such differences could be attributed either to different cultures or to the limited scale of the surveys. Different findings on the issue may be attributed to the lack of research on STEM education in rural areas (Harris and Hodges, 2018). No gender differences were observed regarding students' views on their interests and performance in mathematics and science.

Regarding primary students' views on technology and engineering, although they reported increased interest in machines, electronic devices, and how they worked and believed they knew how to combine mathematics and science to create new ideas, they seemed disinclined to follow jobs that included design, engineering, or constructing. A possible explanation of this reluctance could be a lack of self-confidence which may be related to the lack of the teaching strategies that enhance applications of STEM disciplines in real life. Rural students seemed to be again significantly more optimistic about combining mathematical and scientific knowledge to create new ideas than urban students. Although this finding is in contrast with the study of Sarfo et al. (2011) according to which students from urban settings are more optimistic toward technology than students from rural settings (Sarfo et al., 2011), it is worth mentioning that no extended research has been implemented on the field. Gender differences are limited in this field too. This is in line with related studies, such as Hoffman's (2002) and Valenti et al., (2016) that highlighted that before adolescence gender differences are not sound. In adolescence, there is an increase in favor of boys. In our study, male students were significantly more interested only in knowing how electronic devices work and were more willing to follow either a career including construction or become engineers, although both male and female students showed increased interest in technology issues.

Regarding environmental issues, students showed an increased interest, especially in consequences in comparison with the causes of environmental problems, probably because consequences are more discussed in public discourse in contrast with the causes that either are not discussed publicly to such extent or are discussed only between scientists. In addition, rural and female students in our study seemed to be more interested and informed. This finding is in contrast with another related study implemented by Tikka et al. (2000) concluding that students who live in big and crowded cities are much more exposed to environmental problems than their peers from villages and smaller cities. Therefore, urban students could develop a deeper interest and willingness to be informed on environmental issues, as a solution to their daily problems. Contradictions in findings show that students' views might be affected by many more factors than their hometown, such as nationality, socioeconomic status, their parents' education, as well as many others (Tuncer et al., 2004). Regarding gender differences, our findings are in line with related studies, such as Xiao and McCright (2015) who also revealed modest gender differences in environmental concern, with female students consistently environmentally

friendlier and reporting greater concern about environmental problems, than male students did.

Although the findings of this study cannot be inferred to the national level, they give basic directions for designing and implementing STEM education in the classroom. To this respect, the present study gives rise to further research on primary students, expanding the geographical range but also the range of different social groups to identify and tackle gender, geographical, and socioeconomic disparities in STEM education access.

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## ETHICS STATEMENT

The present study was conducted as a non-interventional study with minimal or no intrusiveness, aiming at mapping students' views on STEM, without including any personal details. Ethical approval was waived under the decision of the Regional Directorate of Primary and Secondary Education (in Greece) since during the design and implementation procedures were followed to ensure ethical standards regarding the anonymity of the participants, parents' consent, and password-protected data storage.

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