

Investigation of 12th Grade Students' Interest in STEM Fields

Tuğba Dilek¹ & Medine Baran^{2,*}

¹Diyarbakır, Turkey

²Education Faculty, Department of Physics Education, Dicle University

*Corresponding author: Education Faculty, Department of Physics Education, Dicle University, Diyarbakır, Turkey

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Abstract

The main purpose of this study is to investigate the interest of 12th-grade students in the field of STEM. In the study, the survey model, one of the quantitative designs, was used. The participants of the study consisted of 12th-grade high school students in central and some districts of Diyarbakır. To determine the students' level of interest in science, technology, engineering, and mathematics, the 36-item STEM Career Interest Scale was used. To obtain the personal information of the students, a personal information questionnaire was administered to the participating students. The data obtained from the study were analyzed using descriptive analysis, independent samples t-test and one way ANOVA. As a result of the research, it was determined that the interest of the students participating in the research in STEM fields significantly varied according to gender, the type of school they attended, the presence of a role model working in science and technology fields in their environment, awareness of scientific developments, and internet use. In addition, it was found that the career interest levels of the students in the participant group differed according to their mothers' education. However, no change was determined according to their fathers' educational level. It is thought that increasing interest in STEM fields in secondary education institutions and learning environments will have significant effects for both students and teachers.

Keywords: STEM fields, interest, 12th-grade students

1. Introduction

Advances in science and technology have increased the need for individuals who can think critically, question, and follow current developments. The education system plays a crucial role at this point. To respond to changing needs, educational fields must also be updated. Along with changes in education systems, both national and international educational goals are constantly renewed, and new approaches emerge in this context. The STEM approach, one of these approaches, encompasses applications that use the disciplines of Science, Technology, Engineering, and Mathematics together. STEM is an acronym formed from the initial letters of interdisciplinary education fields such as science, technology, engineering, and mathematics, which are frequently used in the competitive modern world. It is thought that STEM applications involving these four disciplines positively affect success (Yıldırım & Selvi, 2017; Ulutan, 2018). STEM education includes all four areas necessary for modern world practices (Reeve, 2014).

1.1 Purpose of the Study

This study aims to examine the interest of 12th-grade high school students in Science, Technology, Engineering, and Mathematics (STEM) fields in terms of variables such as gender, school type, parents' educational status, internet access location, purpose of internet use, and awareness of scientific developments.

1.2 Importance of the Study

Science and technology fields play a very important role in the development of the world. Considering the 21st-century framework, it is understood that having a career in STEM fields and employment in STEM fields is very important for a country's development and economy. For this reason, it has been observed that the number of studies on STEM fields has increased. The students participating in this research are 12th-grade high school students. It is thought that the influence of social environment factors on the professional interests of students at this educational level, which is a critical period for career interest and choice as stated by Super (1990), may be significant. Considering the framework of the social cognitive career development theory, it is impossible to isolate the individual from the social environment. Interactions of individuals with the social environment can cause development and change in many areas. According to the social cognitive career development theory, the environment in which individuals live also affects their career interests and preferences. When considering this situation in terms of interest in STEM career fields, individuals' interest in STEM career fields can be affected by their parents' education/occupation status, gender roles in the society they live in, and role modeling status (Buschor, Berweger, Frei & Kappler, 2014; Saucerman & Vasquez, 2014 as cited in Mutlu & Korkut Owen, 2017; Tan-Wilson & Stamp, 2015; Liu, 2008). Furthermore, it is thought that opportunities available to individuals, such as their educational environment (school type) and internet access, are also social environment factors affecting STEM career interest. This study examined how these factors affect the interest in STEM fields of participant students who are preparing for university entrance exams and are in the 12th grade, the stage of career choice.

Looking at the relevant literature, a limited number of studies were found that were conducted with 12th-grade students, who are in a critical period for career choice, and that investigate the effect of environmental factors on interest in STEM fields. Additionally, Daşdemir, Cengiz and Aksoy (2018) noted that STEM-related studies are generally conducted with middle school students. In this context, it is thought that the results obtained in this study regarding the level of interest in STEM fields, which play a crucial role in national development, among 12th-grade students in the schools where the study was conducted, and how this interest is affected by social environment factors, will enrich and bring innovation to the relevant literature.

1.3 Research Problems

1. What is the level of interest of 12th-grade students in STEM fields?
2. Does the interest of 12th-grade students in STEM fields differ according to the gender variable?
3. Does the interest of 12th-grade students in STEM fields differ according to school type?
4. Does the interest of 12th-grade students in STEM fields differ according to internet access location?
5. Does the interest of 12th-grade students in STEM fields differ according to the purpose of internet use?
6. Does the interest of 12th-grade students in STEM fields differ according to their awareness of scientific developments?
7. Does the interest of 12th-grade students in STEM fields differ according to the presence of a role model working in science and technology fields in their environment?
8. Does the interest of 12th-grade students in STEM fields differ according to parents' educational level?

2. Theoretical Framework

Science, one of these fields, is the effort to understand nature. Students understand and interpret nature and natural events by using Science, a natural science. The second field, technology, aims to design, create, and develop new products with materials found in the natural world according to human needs, through processes such as practical problem-solving, innovation, invention, and design (Dugger, 2010). The third field, engineering, is the use of science and mathematics acquired through practice and experience to find solutions to human needs (Accreditation Board for Engineering and Technology, 2007). Engineering, starting with a problem to be solved, asks questions to solve the problem and determines the necessary criteria and constraints for finding a solution (Bybee, 2011). The fourth field, mathematics, defines the relationships between numbers,

models, and shapes (The American Association for the Advancement of Science, 1993). The fields of science, technology, engineering, and mathematics that constitute STEM are real languages (Dugger, 2010).

The aim of the STEM approach is to handle education with a multidisciplinary relationship and a holistic approach (Smith & Karr-Kidwell, 2000). In this way, students can reflect the knowledge they acquire into their daily lives and develop their existing abilities. STEM education will enable the training of qualified scientists in many fields, especially in science, mathematics, engineering, and technology expertise. For this purpose, STEM applications will train mathematicians, engineers, and technology experts who will create the new ideas, products, and industries of this century (Holdren et al., 2010). In summary, STEM applications aim to raise an innovative generation (Çorlu, 2012).

2.1 Career and the STEM Approach

Several theories and models can be mentioned for defining the factors that influence interest in STEM career fields. These theories are the social cognitive career theory developed by Lent, Brown and Hackett (1994), Holland's (1973) typology theory, and Super's (1990) career development theory. The social cognitive career theory is based on Bandura's (1986) social cognitive theory. This theory asserts that individuals' desires and career preferences are a result of the influence of personal factors involving the social environment and behaviors (Maltese & Tai, 2011). According to the Social Cognitive Career Theory (Lent, Brown, & Hackett, 1994), factors arising from the individual and the living environment can affect individuals' perceptions, thus influencing their career choice processes positively or negatively (as cited in Mutlu & Korkut Owen, 2017). The career preferences of individuals, who are significantly influenced by social environment factors from birth in many areas, can also be affected by these factors. These factors can be listed as personal interests and abilities, family, gender roles, educational environment, role models, environmental opportunities, etc. When evaluated from the perspective of social cognitive career theory, it is argued that these variables affect individuals' career interests and preferences.

According to Holland (1973), career choice is compatible with personality type. According to this theory, human personality is categorized into six basic trait areas. These are realistic, investigative, artistic, social, enterprising, and conventional characteristics. Considering these characteristics, it is stated that the most suitable individuals for STEM career fields are those with realistic and investigative characteristics. In a study conducted by Chen and Simpson (2015), it was observed that investigative types prefer STEM career fields more. Looking at Super's (1990) career development theory, it is seen that the characteristics of the individual's development period are effective in career choice. He divided an individual's life into various stages starting from age four to seventy-one and beyond, and addressed the development of professional preferences during these periods. According to this theory, there are eight basic stages. These are: Growth Stage: subdivided into three periods: Fantasy (4-10 years), Interest (11-12 years), and Capacity (13-14 years). Exploration Stage: subdivided into three periods: Trial (14-18 years), Transition (19-21

years), and Trial and Monitoring (22-24 years). Establishment Stage (25-44 years). Maintenance Stage (45-64 years). Decline Stage (65 years and over), subdivided into Deceleration (65-70 years) and Full Retirement (71 years and over). According to Super's theory, the decisions of individuals between the ages of 15-17 regarding their professional preferences are variable. Therefore, it is very important to offer supportive and helpful environmental environments to young people in this period to develop or increase interest in STEM fields (Halim et al., 2018). It is extremely important to increase the number of young people interested in STEM fields, especially for countries to sustain their economies and have a say in all areas internationally.

2.2 STEM Career Interest in Turkey

An analysis of the career choices made by students who achieved high rankings in quantitative fields during university entrance exams in Turkey between 2000 and 2014 reveals a decline in interest in STEM-related programs (Pekbay, 2017). This decline is particularly notable among students with high quantitative aptitude—theoretically the most likely candidates for STEM careers—who are increasingly gravitating toward non-STEM fields such as medicine, law, or business, which are perceived to offer greater job security and social prestige. These findings indicate a need to boost student interest in STEM fields in Türkiye (Akgündüz et al., 2015). Various factors have been proposed to explain this downward trend: the exam-oriented nature of the Turkish education system, which encourages students to select fields based on university entrance scores rather than genuine interests, and the lack of adequate career guidance and STEM role models in schools (Pekbay, 2017; Daşdemir et al., 2018). If a developing country like Turkey fails to achieve the necessary innovation in STEM fields, it risks falling behind nations that are active in these areas across various sectors, particularly the economy. This concern is echoed in national reports emphasizing the need for Türkiye to expand its STEM workforce to remain competitive in the global economy and achieve sustainable development (Akgündüz et al., 2015). Therefore, understanding the factors that influence students' interest in STEM fields during their secondary education is of critical importance for policymakers, educators, and researchers.

3. Method

3.1 Research Model

In this study, data were collected using the survey model, which is a design of quantitative research. "Survey models are suitable models for research aiming to describe a past or present situation as it exists" (Karasar, 1999 as cited in Yıldız, 2004). In this study, the descriptive survey model was used because it aimed to analyze the interest status of 12th-grade high school students in STEM career fields in terms of certain variables.

3.2 Participants

The participants in this study were determined based on stratified sampling. This sampling "is

formed from subgroups to show the characteristics of certain subgroups of interest, to describe them, and to make comparisons between them" (Çokluk, Şekercioğlu & Büyüköztürk, 2012). In this research, the schools where 12th-grade students were educated were examined, and three school types (Anatolian High School, Science High School, and Vocational High School) were decided upon. Three schools were selected from each type, ensuring a mix of high, medium, and low achievement levels based on an analysis of their entrance exam scores. This approach aimed to ensure that various school types and achievement levels were represented in the sample.

The participants of the study consisted of a total of 818 12th-grade students. The personal and socio-demographic characteristics of the participating 12th-grade students are presented in Table 1.

Table 1. Socio-Demographic Characteristics of Participants

Variables	Number (n)
School Type	
A Science High School	43
B Anatolian High School	163
C Anatolian High School	146
D Vocational and Technical Anatolian High School	57
E Science High School	22
F Vocational and Technical Anatolian High School	22
G Anatolian High School	22
H Anatolian High School	105
I Vocational and Technical Anatolian High School	89
Competition Authority Cumhuriyet Science High School	74
İMKB Science High School	75
Gender	
Male	396
Female	421
Internet Access Location	
I don't use it at all	72
At home	664
At school	28
Internet café	54

Table 1. Socio-Demographic Characteristics of Participants (continued)

Variables	Number (n)
Purpose of Internet Use	
Education	293
Social Networks	328
Communication	197
Awareness of Scientific Developments	
Not at all	46
TV	182
Internet	394
Social Environment	130
Immediate Surroundings	66
Presence of a Role Model in the Environment	
Yes	188
No	630
Mother's Education Level	
None	248
Primary School	258
Middle School	115
High School	120
Bachelor's Degree	73
Master's Degree and above	4
Father's Education Level	
None	53
Primary School	175
Middle School	190
High School	212
Bachelor's Degree	169
Master's Degree and above	19
Total	818

Table 1 presents the demographic characteristics of the students participating in the study. The literature states that the number of participants should be at least 15 to perform a qualified analysis (Pallant, 2007). Therefore, demographic characteristics not meeting this condition in the table were recategorized for analysis.

3.3 Data Collection Tools

To determine the interest of the students participating in the research in STEM fields, the scale originally named "STEM Career Interest Survey (STEM-CIS)" and adapted into Turkish as "STEM Alanlarına İlgi Ölçeği (STEM-AİÖ)" (Interest in STEM Fields Scale) was used. The scale, initially consisting of 44 items, was reduced to 36 items as a result of the adaptation by Pekbay (2017). The STEM Interest Scale consists of four sub-dimensions. There are nine items for each sub-dimension. The scale, consisting of 36 items in total, is a 5-point Likert type: Strongly Disagree (1), Disagree (2), Undecided (3), Agree (4), Strongly Agree (5). Each sub-dimension measured ranges between 9 and 45 points. According to the analyses conducted by Pekbay (2017), the Cronbach's α value of the scale was found to be 0.94. Additionally, the internal consistency coefficient was calculated for each sub-dimension. Accordingly, the Cronbach's α value was calculated as 0.85 for the science dimension, 0.86 for the technology dimension, 0.87 for the mathematics dimension, and 0.90 for the engineering dimension. The researchers conducting this study also performed a reliability study for the scale. At the end of the research, before performing statistical analyses for the sub-problems, the overall reliability coefficient of the scale was calculated as 0.93 as a result of the reliability analysis. Furthermore, for the sub-dimensions, the reliability coefficient was calculated as 0.89 for the science dimension, 0.89 for the mathematics dimension, 0.88 for the technology dimension, and 0.94 for the engineering dimension.

3.4 Application Process

The data obtained in this research were collected by administering the STEM Interest Scale to 12th-grade students attending Science, Anatolian, and Vocational high schools in the Sur, Kayapınar, Yenişehir, and Bağlar districts of Diyarbakır province. Necessary permissions for administering the data collection tools to the students were obtained from the relevant units of Dicle University. A copy of the permission letter was delivered to the administrations of the high schools where the scale would be administered, and the process of administering the quantitative scale began. The first researcher, who conducted the application, maintained an impartial attitude throughout the application. The researcher's impartial behavior and non-intervention during the data collection process are very important for the reliability of the results (Büyüköztürk et al., 2014).

3.5 Data Analysis

In this research, initially conducted as a thesis project, non-parametric analysis methods were employed in the first stage because the assumption of normality was not met (Shapiro-Wilk test $p < .05$; skewness and kurtosis coefficients falling outside the acceptable range). However, during

the process of converting the study into an article, the analyses were re-run using parametric methods to test the robustness of the findings, in line with reviewers' feedback and methodological suggestions. Accordingly, a logarithmic transformation was applied to the dependent variables to improve normality, and parametric tests (independent samples t-test, one-way ANOVA) were repeated. The results obtained from both analysis methods were compared, and the findings were found to be consistent with the non-parametric analyses results. The results presented in the article reflect the findings obtained through this re-analysis process.

4. Findings

This section presents the findings obtained from the analysis of the data and their interpretations.

The analyses conducted for the first research problem, "What is the level of interest of 12th-grade students in STEM fields?" are presented in Table 2.

Table 2. Descriptive Analysis Results Regarding STEM Career Interest Mean Scores of High School Students

	Science	Technology	Engineering	Mathematics	General Interest
Mean	34.01	34.52	33.11	27.96	129.61
Minimum	9.00	9.00	9.00	9.00	36
Maximum	45.00	45.00	45.00	45.00	180

According to the findings in Table 2, it was observed that the mean scores of the participant students were 34.01 for science (out of 45 points), 34.52 for technology, 33.11 for engineering, 27.96 for mathematics, and 129.61 for the total general interest score (out of 180 points).

The analysis results for the 2nd research problem, "Does the interest of 12th-grade students in STEM fields differ according to the gender variable?" are presented in Table 3.

According to the findings in Table 3, it was determined that the mean scores of female participants for mathematics, engineering, and general career interest were significantly lower than the mean scores of male students ($p < 0.05$).

Table 3. Comparison of Students' STEM Interest Mean Scores According to Gender Variable

	Gender	N	Mean±SD	t	p
Science	Female	421	34,40±7,98	1,388	,165
	Male	396	33,60±8,53	1,386	
Technology	Female	421	34,30±8,10	-,771	,441
	Male	396	34,75±8,71	-,769	
Engineering	Female	421	31,43±8,50	-5,863	,000
	Male	396	34,89±8,38	-5,866	
Mathematics	Female	421	25,24±10,78	-7,663	,000
	Male	396	30,84±10,03	-7,680	
Total	Female	421	125,38±25,47	-4,789	,000
	Male	396	134,10±26,53	-4,783	

*p<.05

The results for the 3rd research problem, "Does the interest of 12th-grade students in STEM fields differ according to school type?" are presented in Table 4.

Table 4. Comparison of Students' STEM Career Interest Mean Scores According to School Type

		Sum of Squares	Df	Mean of Squares	F	p	Differences
Science	Between Groups	6851,247	2	3425,623	57,143	,000	1<2 1>3
	Within groups	48857,605	815	59,948			2>3
Technology	Between Groups	5637,625	2	2818,813	44,201	,000	1<2 1>3
	Within groups	51974,479	815	63,772			2>3
Engineering	Between Groups	627,756	2	313,878	4,266	,014	2>3
	Within groups	59969,120	815	73,582			
Mathematics	Between Groups	1580,747	2	790,373	6,885	,001	2>3
	Between Groups	93561,362	815	114,799			
Total	Within groups	49244,664	2	24622,332	38,819	,000	1<2 1>3 2>3

1: Science High school 2: Anatolian High school 3: vocational high school

According to the findings in Table 4, it was found that the mean scores of students attending Science and Anatolian high schools for science, technology, engineering, and general STEM career interest were significantly higher than the mean scores of vocational high school students ($p < 0.05$). On the other hand, it was determined that the mean scores of Science high school students for science, technology, and general career interest were lower than those of students attending Anatolian high schools ($p < 0.05$).

The analysis results for the 4th research problem, "Does the interest of 12th-grade students in STEM fields differ according to internet access location?" are presented in Table 5.

Table 5. Comparison of Students' STEM Career Interest Mean Scores According to Internet Access Location

		Sum of Squares	Df	Mean of Squares	F	p	Differences
Science	Between Groups	900,216	3	300,072	4,457	,004	1>4
	Within groups	54808,636	814	67,332			
Technology	Between Groups	160,365	3	53,455	,757	,518	-
	Within groups	57451,739	814	70,580			
Engineering	Between Groups	29,910	3	9,970	,134	,940	-
	Within groups	60566,967	814	74,407			
Mathematics	Between Groups	786,850	3	262,283	2,263	,080	-
	Within groups	94355,258	814	115,916			
Total	Between Groups	2065,924	3	688,641	,994	,395	-
	Within groups	564116,002	814	693,017			

1: None user 2: Uses at home 3: uses at school 4: uses at internet cafe

According to the findings in Table 6, it was found that the mean scores of participants who do not use the internet for the science career field were significantly higher than those of participants who use the internet in internet cafes ($p < 0.05$). In contrast, the mean scores of participants for mathematics, technology, engineering, and general interest did not show statistically significant

differences according to internet access location ($p>0.05$).

The analysis results for the 5th research problem, "Does the interest of 12th-grade students in STEM fields differ according to the purpose of internet use?" are presented in Table 6.

Table 6. Comparison of Students' STEM Career Interest Mean Scores According to Purpose of Internet Use

		Sum of Squares	Df	Maen of Squares	F	p	Differences
Science	Between Groups	398,249	2	199,124	2,934	,054	-
	Within groups	55310,603	815	67,866			
Technology	Between Groups	493,590	2	246,795	3,521	,030	1>2
	Within groups	57118,514	815	70,084			
Engineering	Between Groups	341,685	2	170,843	2,311	,100	-
	Within groups	60255,191	815	73,933			
Mathematics	Between Groups	252,625	2	126,313	1,085	,338	-
	Within groups	94889,483	815	116,429			
Total	Between Groups	294,215	2	147,107	,212	,809	-
	Within groups	565887,712	815	694,341			

1: Education 2: using social networks 3: communication

Looking at the findings in Table 6, it was determined that the mean scores for the technology career field of participant students who use the internet for educational purposes were significantly higher than those of students who use the internet for social networking purposes ($p<0.05$).

The analysis results for the 6th research problem, "Does the interest of 12th-grade students in STEM fields differ according to their awareness of scientific developments?" are presented in Table 7.

Table 7. Comparison of Students' STEM Career Interest Mean Scores According to Method of Following Scientific Developments

		Sum of Squares	Df	Mean of Squares	F	p	Differences
Science	Between Groups	1496,628	4	374,157	5,611	,000	1<2 1<3
	Within groups	54212,224	813	66,682			1<5
Technology	Between Groups	485,231	4	121,308	1,726	,142	-
	Within groups	57126,873	813	70,267			
Engineering	Between Groups	1175,572	4	293,893	4,021	,003	1<3
	Within groups	59421,305	813	73,089			
Mathematics	Between Groups	1148,640	4	287,160	2,484	,042	3<5
	Within groups	93993,469	813	115,613			
Total	Between Groups	9063,439	4	2265,860	3,307	,011	1<3
	Within groups	557118,488	813	685,263			

1: Does not follow 2: TV 3: Internet 4: Social environment 5: Immediate surroundings

When Table 8 is examined, it is seen that the mean science interest scores of participants who do not follow scientific developments at all are lower than those of participants who follow scientific developments via TV, Internet, and immediate surroundings ($P<.05$). Similarly, it was determined that the mean engineering and general interest career scores of participants who do not follow scientific developments at all are significantly lower than those of participants who follow scientific developments via the Internet ($P<.05$). Furthermore, it was found that the significant difference in mean interest scores for the mathematics field was in favor of the internet compared to the immediate surroundings variable ($p<.05$).

The analysis results for the 7th research problem, "Does the interest of 12th-grade students in STEM fields differ according to the presence of a role model working in science and technology fields in their environment?" are presented in Table 8.

Table 8. Comparison of Students' STEM Career Interest Mean Scores According to Presence of a Role Model

	Role model	n	Mean±SD	T	p
Science	Yes	188	37,16±6,97	6,051	,000
	No	627	33,09±8,39	6,679	
Technology	Yes	188	36,12±7,79	2,979	,002
	No	627	34,04±8,53	3,127	
Engineering	Yes	188	35,65±8,36	4,650	,000
	No	627	32,36±8,56	4,707	
Mathematics	Yes	188	30,79±10,73	4,163	,000
	No	627	27,09±10,68	4,154	
Total	Yes	188	139,74±24,66	6,127	,000
	No	627	126,60±26,12	6,319	

According to the findings in Table 8, it was determined that the STEM career interest levels of participant students who have a role model in their environment are higher for all sub-dimensions and general career interest compared to those who do not have a role model ($p < 0.05$).

The analysis results regarding the comparison of participant students' STEM career interest mean scores according to mother's education level are presented in Table 9.

The results of the one-way ANOVA conducted based on maternal education level revealed statistically significant differences in scores for Science, Engineering, and general STEM interest ($p < .05$). However, no significant differences were found in the fields of Technology and Mathematics ($P > .05$). All significant differences favored higher levels of maternal education; specifically, as maternal education level increased, children's scores for Science, Engineering, and general STEM interest also increased. Notably, students of mothers with no schooling or only a primary school education scored significantly lower than students of mothers with high school, bachelor's, or master's degrees.

Table 9. Comparison of Students' STEM Career Interest Mean Scores According to Mother's Education Level

		Sum of Squares	Df	Mean of Squares	F	P	Differences
Science	Between Groups	763,069	5	152,614	2,255	,047	1<5
							1<6
							2<5
	Within groups	54945,783	812	67,667			2<6
							3<6
Technology	Between Groups	328,571	5	65,714	,932	,460	-
	Within groups	57283,533	812	70,546			
Engineering	Between Groups	887,468	5	177,494	2,414	,035	1<4
	Within groups	59709,409	812	73,534			2<4
							2<5
Mathematics	Between Groups	1039,400	5	207,880	1,794	,112	-
	Within groups	94102,709	812	115,890			
Total	Between Groups	9335,967	5	1867,193	2,723	,019	1<4
	Within groups	556845,959	812	685,771			1<5
							2<4

1: Never attended school 2: Primary school 3: High School 4: Bachelor's and post graduate

The analysis results regarding the comparison of participant students' STEM career interest mean scores according to father's education level are presented in Table 10.

According to the findings in Table 10, it was determined that there is no statistically significant difference among the groups based on fathers' education levels regarding these variables. In other words, the father's education level does not have a significant effect on students' scores in STEM fields ($p>0.05$).

Table 10. Comparison of Students' STEM Career Interest Mean Scores According to Father's Education Level

		Sum of Squares	Df	Mean of Squares	F	p	Differences
Science	Between Groups	271,182	5	54,236	,794	,554	-
	Within groups	55437,670	812	68,273			
Technology	Between Groups	407,566	5	81,513	1,157	,329	-
	Within groups	57204,538	812	70,449			
Engineering	Between Groups	744,203	5	148,841	2,019	,074	-
	Within groups	59852,673	812	73,710			
Mathematics	Between Groups	1096,294	5	219,259	1,893	,093	-
	Within groups	94045,815	812	115,820			
Total	Between Groups	5955,889	5	1191,178	1,727	,126	-
	Within groups	560226,037	812	689,934			

1: Never attended school 2: Primary school 3: High School 4: Bachelor's and post graduate 6: Master and above

5. Discussion

According to the findings obtained from the research, it was determined that the interest levels of the participating 12th-grade students in STEM fields were not high, and the lowest average was in the dimension of interest in mathematics. When the relevant literature is examined, it has been found that there are various findings on this subject. For example, Çiftçi and Çınar (2017) found in their study that interest in science, technology, and mathematics was lower than interest in engineering. On the other hand, Gülhan and Şahin (2018) found in their research that interest in science and mathematics was high. Based on the finding obtained from this research, it is thought that increasing STEM education activities in learning environments might be beneficial to improve the interest levels of the participating students in STEM fields.

When the STEM career interest mean scores of the participating high school students were examined based on the gender variable, significant differences were found in favor of male

students in the total mean scores of STEM career interest, the sub-dimensions of mathematics and engineering, and general career interest. In contrast, no significant differences were found between the mean scores of female and male students for science and technology career interest. Considering the socio-cultural structure of the society where the study was conducted, it is possible to say that there are certain roles assigned to women. Aydın (2010) stated that in patriarchal societies, the roles of women within the family and society are often considered within the framework of childcare and fertility, and it is common in such societies to think that women cannot be equal to men due to their biological characteristics (as cited in Yazıcı, 2016). This situation can negatively affect the professional preferences of women living in this society. Considering that women are generally directed towards professions seen as classical female occupations, such as teaching, which have long holidays and term breaks (Ramaci, et al., 2017), that they have to work both at home and in the workplace, and that they are at the forefront of childcare, this result is not surprising. According to this result, it can be said that female students are influenced by their families and environment, and they tend towards professional fields where they do not fear unemployment after graduating from university, thus avoiding anxiety about appointment. In another study conducted with university students, female students stated that they thought STEM career choices would negatively affect the balance between family and work life and cause them to spend less time with their children (Tan-Wilson & Stamp, 2015). Liu (2008) stated in his study that female students have more knowledge of mathematics in the classroom environment than male students, but male students get higher grades on exams. He noted that this result is because female students are more interested in mathematics lessons and the classroom environment is social (Knezek et al., 2013). On the other hand, Knezek et al. (2011) found in their study that although male students consider making a career in STEM fields more than female students, their achievements in science, technology, mathematics, and engineering are lower than female students. Similarly, Kong et al. (2014) examined students' interest in making a career in STEM-related professions before a STEM camp and found that female students' career interest in STEM fields was lower than that of male students.

When the analysis results based on the school type variable of the students participating in the research are examined, it was found that the science, technology, and mathematics career interests of students attending science high schools were significantly lower than those of students attending Anatolian high schools. However, the mean scores of science, technology, and general career interest of students attending science high schools and Anatolian high schools were found to be significantly higher than the mean scores of students attending vocational high schools. In the field of engineering, this significant difference was found between Anatolian and vocational high school students, in favor of Anatolian high school students. In this research, it was surprising that the interest of science high school students in STEM fields was lower than that of Anatolian high school students. However, considering the university preparation process of students, it is thought that they study based on an exam-oriented system and make their career choices according to the scores they get on this exam. In this case, it can be said that successful students tend towards faculties that accept students with high scores, rather than the field they are interested in. It is

thought that this situation may explain why the interest level of participating science high school students in STEM fields is lower than that of students in Anatolian high schools. Looking at the findings regarding the differences between vocational high school and other school types, the obtained result is not surprising. Indeed, it can be said that among the three school types where the research was conducted, vocational high schools have the lowest average achievement. Considering the region where the research was conducted, it is thought that students who prefer vocational high schools cannot be placed in other school types and choose these schools as a last resort. It is thought that this situation may be related to the low career interest of the participating students, as it can be with many areas. Looking at the relevant literature, similar studies are seen. For example, similar results were obtained in a study examining the irrational beliefs of students graduating from different school types regarding career choice. Kepir-Savoly and Korkut Owen (2015) reported that the irrational beliefs regarding career choice of vocational high school students or graduates were higher than those of other high school students or graduates. In another study, Öner and Capraro (2016) conducted a long-term comparison of the academic achievements of T-STEM schools and other schools, comparing the science and mathematics achievements of similar schools using the hierarchical linear modeling method. According to the study results, no significant difference was found between the science and mathematics achievements of the two school types. On the other hand, Mahoney (2009) investigated whether there is a difference between students' attitudes towards STEM fields and school type and grade level, and observed no significant difference between student attitudes and school type and grade level.

When the mean scores of STEM career interest of the participating students were examined according to internet access location, no significant differences were found in technology, engineering, mathematics, and general interest levels. However, the career interest levels in science of participant students who do not use the internet were found to be significantly higher than those of participants who use the internet in cafes. It is possible to say that students who prefer internet cafes use the internet intensively. Yetim and Güler (2000) found in their study that students use internet cafes primarily for finding friends by chatting, secondly for surfing on the computer, flirting with girl/boy friends via chat, and communicating via e-mail. It is an undeniable reality that students use the internet in cafes for games and entertainment, not for educational purposes. It is thought that this situation may have reduced the interest of participants using the internet in cafes in the field of science. In a study that will be indirectly related to this finding, it was determined that non-educational internet use reduces the school success of high school students (Cao & Su, 2007).

When the students participating in the research were examined according to their purpose of internet use, it was found that the career interest level in engineering of individuals who use the internet for educational purposes was significantly higher than those who use it for social networks. However, interest levels in science, technology, mathematics, and general interest did not show significant differences according to the purpose of internet use. Today, many websites help students with career planning. Websites that assist with career planning are listed

on www.ncda.org. This site is just one example of how internet use can be effective in career planning. Furthermore, many studies in the literature have reported that media tools such as books, scientific journals, films, newspapers, programs on science, television, and the internet affect students' interest in STEM-related professions and career planning (Halim et al., 2018). In our age, the internet is frequently used by students in the field of education, as in many other fields. It has been reported that conscious internet use positively affects students' interest in STEM fields (Hossain & Robinson, 2012).

When the STEM career interest levels of the students participating in the study were examined according to their awareness of scientific developments, it was seen that the mean science interest scores of participants who do not follow scientific developments at all were lower than those who follow scientific developments via TV, internet, and immediate surroundings. Similarly, it was determined that the mean engineering and general career interest scores of participants who do not follow scientific developments at all were significantly lower than those who follow scientific developments via the internet. Furthermore, it was found that the significant difference in mean interest scores for the mathematics field was in favor of the internet compared to the immediate surroundings variable. Based on these findings, it can be said that participant students who follow scientific developments are more engaged with STEM fields and more aware of these fields. It is thought that this situation may have affected the STEM career interest of the participating students.

Looking at the mean scores of the participating students' STEM career interest, it was observed that having a role model in their environment was effective in having higher career interest levels in STEM general, science, technology, engineering, and mathematics. It is known that the environment in which a person lives plays an important role in the choices they make and will make. Considering the framework of social cognitive theory (Bandura, 1986), one of the most important theories put forward in the field of education today, it can be said that a person cognitively processes events, phenomena, and behaviors of people they interact with in their environment throughout their life through observation. Individuals, especially those in the developmental period, can sometimes imitate the behaviors of people they process in their minds through observation. One of these imitation areas is the professions of family members around the individual. According to Bandura's social cognitive theory, family members in a person's environment play an active role in career choice (Halim et al., 2018). Considering that the participant group in this study is still in the developmental period, it is among the expected results of the research that their interest in STEM fields could be affected by the presence of role models working in these fields in their environment. Indeed, the conducted research supports this finding of the study. For example, Cridge and Cridge (2015) stated that educators whom students see as role models can increase students' career interest in STEM fields. Similarly, Shin, Levy, and London (2016) found in their study that students' interest in STEM fields is positively affected by the presence of a role model in their environment. Baran (2016) stated in her study that the female students participating in the research emphasized the lack of someone to look up to in their environment as a reason for their disinterest in physics, an important subfield of science. In

developed countries, many activities are carried out to encourage young people to turn to STEM fields, which are the key to development, both in and out of educational institutions. The website <http://www.stemrolemodels.org/>, which serves this purpose, aims to increase young people's career interest in STEM fields by offering options such as finding role models in STEM fields or becoming a role model in these fields.

In the study, it was determined that the mother's education level positively affected the level of STEM career interest in many dimensions. On the other hand, it was found that the father's education level did not cause a significant difference in the interest levels of the participant students in STEM fields. Furthermore, considering the socio-cultural structure of the region where the research was conducted, it is thought that the mother's education level may be more prominent in affecting interest in STEM fields compared to the father's. Because, considering the patriarchal societal structure where the research was conducted, a woman's high level of education are seen as advantages for changing women's social roles. In connection with this situation, it is thought that the positive personality traits of educated, such as being social, outgoing, and having high self-confidence, brought about by their economic independence, may also positively reflect on their children's educational fields. It is also possible to say that these mothers may have a high level of awareness and consciousness on educational issues. In parallel, it can be said that the fact that responsibilities for children are mostly given to mothers in the society where the research was conducted may have had a more decisive effect on children's interests and perceptions. When the relevant literature is examined, similar to the results of this study, Karakaya, Avgın, and Yılmaz (2018) found that students' interest in STEM professions differed significantly according to their mothers' education level. In a study examining the effect of socio-demographic characteristics of 6th, 7th, and 8th-grade middle school students on their attitudes towards STEM, Karakaya and Avgın (2016) found that parents' education level significantly affected students' attitudes towards STEM. Aydın, Saka, and Guzey (2017), on the other hand, observed in their study that students' STEM attitude levels were at the "agree" level and did not differ according to parents' education level.

6. Conclusion

The result obtained from this research is that the interest levels of the participating 12th-grade students in STEM fields vary according to their gender, their mother's education, purpose and location of internet use, awareness of scientific developments, the type of school they attend, and the presence of a role model working in STEM fields in their environment. Based on these findings, it is thought that the lower interest of female students in these fields compared to male students is a very important finding. In most developed countries, this situation is no longer a problem. It is thought that studies should be conducted in Turkey to keep up with the age and increase the orientation of women towards these fields. It has also been observed that parents are determinants in the level of interest in STEM fields. For this reason, it is thought that necessary studies to raise

awareness of parents would be beneficial in increasing the level of interest in STEM fields. Furthermore, it was determined that the conscious internet use of students in the participant group and their follow-up of scientific developments were determinants in their level of interest in STEM fields. Considering all these results, STEM fields are very important for a society composed of individuals who keep up with the age and are productive. In a globalizing world, as the number of individuals working in this field increases, the level of welfare will rise, and the number of self-sufficient societies in many dimensions, primarily economically, will increase (Sanders, 2009).

7. Recommendations

Based on the results obtained from the findings of the research, the following recommendations are made:

1. To make the roles imposed on girls due to the patriarchal social structure more suitable for the conditions of the age, it is thought that it would be beneficial for the Ministry of National Education to organize various seminars and meetings to raise awareness among families.
2. Considering the effect of conscious internet use on interest levels in STEM fields, it is thought that it would be beneficial for the Ministry of National Education to conduct various informational and seminar meetings on conscious internet use for students in educational institutions.
3. It is thought that establishing STEM workshops in learning environments would be beneficial to increase interest in STEM fields in secondary education institutions.
4. Considering the findings within the framework of the school type variable obtained in the study, it was observed that students attending vocational high schools had low interest levels in science and technology fields. Research can be conducted on the reasons for this finding.
5. It is recommended to conduct studies to investigate the reasons for the low interest of female students in STEM fields.
6. Given the positive impact of role models on students' interest in STEM careers, it is recommended that professionals working in STEM fields be brought together with students in schools, mentorship programs be developed, and STEM role model platforms be expanded.

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Authors contributions

Conceptualization: Tuğba DİLEK

Methodology: Tuğba Dilek, Medine BARAN

Formal analysis: Tuğba DİLEK, Medine BARAN

Investigation: Tuğba DİLEK

Writing - original draft: Tuğba DİLEK

Writing - review & editing: Tuğba DİLEK, Medine BARAN

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