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Do STEM Career Interest Levels Change Over The Years?

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Abstract

Educating a new generation of engineers, mathematicians, and scientists is essential for developing a competent workforce that meets the demands of the 21st century. Given that a qualified workforce trained in STEM disciplines will shape the contemporary corporate landscape, students ought to be steered toward careers associated with these domains. The study seeks to ascertain the interests of high school pupils in STEM careers. This study employs a survey, a quantitative research design. The study sample comprised 326 ninth-grade students enrolled in a high school in Kayseri province during the 2018-2019 and 2019-2020 academic years. The STEM Career Interest Survey (STEM-CIS) scale gathers research data. To ascertain the overall inclinations of the participants towards STEM careers, total STEM scores associated with the scale were computed for each individual. The investigation revealed that total scores for the 2018-2019 academic year varied from 111 to 200 points, with an average of 156.09. For the 2019-2020 academic year, total scores ranged from 113 to 200, with an average of 157.77. The maximum score achievable on this scale is 5*40=200, while the minimum value is 1*40=40. The critical value of 2.60, as recognized in the literature, indicates that findings over this threshold are deemed to exhibit significant interest in STEM careers. Consequently, we ascertained that high school pupils exhibit a favorable and progressively increasing inclination towards STEM vocations, attributable to the existing education system; their interest in mathematics is the most pronounced during both academic periods. We determined that it exhibited the lowest average for the engineering factor. The findings can be augmented by researching diverse socioeconomic and geographical regions, focusing on gender, academic performance, and familial influences, and comparing the outcomes.

Keywords: STEM, professional career interest, science education

Stem Kariyer İlgi Düzeyleri Yıllar Geçtikçe Değişir Mi?

Öz

21. yüzyılın gerekleri arasında yer alan nitelikli iş gücü oluşturmak için, yeni nesil mühendis, matematikçi ve bilim insanlarının yetiştirilmesi önerilmektedir. STEM alanlarında yetişmiş nitelikli iş gücü günümüz iş dünyasına yön vereceğinden öğrencilerin bu alanlarla ilgili mesleklere yönlendirilmesi gerekmektedir. Araştırmanın amacı, lise öğrencilerinin STEM mesleklerine yönelik ilgilerinin belirlenmesidir. Çalışmada nicel araştırmanın tarama deseni kullanılmıştır. Araştırmanın örneklemini 2018-2019/2019-2020 eğitim-öğretim dönemlerinde Kayseri ilinde bir lisede öğrenim gören toplam 326 9. sınıf öğrencisi oluşturmaktadır. STEM Career Interest Survey (STEM-CIS) ölçeği kullanılarak iki ayrı eğitim-öğretim döneminde aynı sınıf seviyesindeki farklı öğrencilerden elde edilen veriler, SPSS.25 paket programı kullanılarak analiz edilmiştir. Katılımcıların STEM mesleklerine yönelik genel eğilimlerini tespit edebilmek için her bir katılımcı için ölçek ile ilgili STEM toplam puanları hesaplanmıştır. Analizler sonucunda, toplam puanların 2018-2019 öğretim yılı için 111 ile 200 puan arasında değiştiği, puan ortalamasının 156,09 olduğu; 2019-2020 öğretim yılı için 113 ile 200 arasında değiştiği ve puan ortalamasının 157,77 olduğu tespit edilmiştir. Bu ölçekten alınabilecek en yüksek puanın 5*40=200, en düşük puanın ise 1*40=40`dür. Alan yazında kritik değer olarak kabul gören 2,60 değerine göre bulgular ve bu değerin üstünde kalanlar STEM mesleklerine yönelik yüksek ilgiye sahip kabul edilmiştir. Sonuç olarak, lise öğrencilerinin STEM mesleklerine yönelik genel eğilimlerinin olumlu yönde ve yıl geçtikçe arttığı belirlenmiştir. Mevcut eğitim sisteminin bir sonucu olarak, öğrencilerin her iki eğitim öğretim döneminde ilgi düzeylerinin matematik faktörü için en yüksek; mühendislik faktörü için ise en düşük ortalamaya sahip olduğu sonucuna ulaşılmıştır. Cinsiyet, akademik başarı, aile gibi faktörler açısından farklı sosyoekonomik ve coğrafi bölgelerde de çalışmalar yapılarak araştırmadan elde edilen sonuçlar genişletilebilir.

Anahtar Sözcükler: STEM, mesleki kariyer ilgi, fen eğitimi

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INTRODUCTION

The STEM workforce is described as employees trained in Science, Technology, Engineering, and Mathematics (STEM) sectors who possess 21st-century abilities (Sarıgül & Çınar, 2021). The STEM workforce is strongly linked to a nation's economic growth, influencing its competitiveness and living standards (Noonan, 2017). Consequently, to participate in the economic competition from technological advancement, nations must enhance their current labor force capacity by using several strategies to cultivate a STEM workforce (Sanders, 2009). The initial stage should be enhancing the quality of science education (NGSS, 2013).

STEM demonstrates a holistic approach by bringing together/integrating existing science achievements with achievements of different disciplines and aims to increase the quality of science education by associating existing subjects/achievements with real life (Wang, 2012). Numerous studies in the literature on the positive effects of STEM education on students provide evidence that STEM increases the quality of science education (Yerdelen-Damar et al., 2021). It is stated that STEM creates an effective learning environment (Lantz, 2009) and helps students transfer scientific knowledge to their daily lives (Mohr-Schroeder et al., 2014). Therefore, STEM education will increase the quality of science education and allow the training of individuals who provide countries with competitiveness (Smith & Karr-Kidwell, 2000). This means training individuals working in professions related to STEM fields, increasing the potential of the STEM workforce (Salzman, 2013; Sasson, 2021).

STEM-related jobs are typically regarded as future careers (TUSIAD, 2017). The range of jobs, about employer expectations and work status, is aptly represented by this terminology. The World Economic Forum forecasts that by 2025, numerous new professions, such as data scientists, will arise, whereas certain current occupations will become obsolete (World Economic Forum/WEF, 2020). Upon examining the emergence of numerous vocations, it is significant to highlight that these professions are directly or indirectly associated with STEM subjects (Vilorio, 2014).

US labor statistics indicate that from 2008 to 2018, non-STEM occupations experienced a growth rate of 1.7%, whereas STEM professionals saw a growth rate of 14% (Langdon et al., 2011). Moreover, the unemployment rate in STEM occupations was, on average, lower than in other sectors.

The rapid evolution of technology and the rise of professions integrating humans, machines, and diverse algorithms have altered employers' expectations of employees. STEM professions equip human resources with technical competencies, including innovation, creativity, and 21st-century abilities. It necessitates the utilization of advanced technologies (digital literacy) and the integration of many professional domains. Consequently, students are educated as next-generation engineers, mathematicians, and scientists (Caglak, 2017; UKCES, 2013).

What accounts for the low preference for STEM occupations despite their critical role in nations' sustained prosperity and stability? STEM careers offer more benefits than non-STEM careers regarding employment opportunities and compensation and are regarded as professions of the future. It is essential to accurately interpret and comprehend the available statistics to address this inquiry. The diminished inclination of students towards STEM careers is corroborated by several national and international statistics data (Özkurt & Yakin, 2020). It is anticipated that almost three million new employments will arise in STEM and associated sectors by 2020, although existing statistics suggest that few of these positions may be occupied. Data from the US indicates that the percentage of STEM graduates declined from 24.8% in 1999 to 22.7% in 2005, with a noted fall in students' willingness to pursue STEM fields in college (Business Europe, 2011). Tas and Bozkurt (2019) emphasized that the proportion of individuals favoring STEM disciplines is minimal. The TUSIAD analysis indicates that merely 10% of overall employment in Turkey in 2023 will be in STEM disciplines. Consequently, most employment requirements will remain unmet (69%). Notwithstanding the rising demand for employment, reports indicate that interest in STEM disciplines, both nationally and globally, remains below the intended threshold (Medeiros, 2011; MoNE, 2018; Yıldırım & Selvi, 2015). Data from the Higher Education Institution (CoHE) indicates a 44.6% decline in students choosing STEM areas (CoHE, 2015).

According to statistical data, one cause for the decline in choice for STEM subjects is students' indifference towards these disciplines (Scott & Martin, 2012). The positive disposition of individuals toward STEM disciplines is characterized by STEM career interests (Şahin et al., 2014). The interest of individuals in a specific domain directly influences their job decisions (Buxton, 2001; Luo et al., 2021). Nevertheless, specific research indicates divergent outcomes that contradict this finding. Research on students' professional orientation indicates that despite their elevated interest in science, mathematics, technology, and engineering, their career interests tend to gravitate toward other domains (Çiftci & Çınar, 2017). In the research by Çiftçi and Çınar (2017) aimed at assessing the perspectives and professional awareness of 7th-grade students regarding STEM professions, they revealed that students exhibited a high level of interest in science and mathematics yet demonstrated a low level of interest in careers within these domains. Consequently, enhancing student interest in STEM requires more than only providing a quality education. Simultaneously, it is essential to enhance their understanding of occupations associated with STEM disciplines to furnish reliable information, assess their interest levels, and subject them to appropriate professional supervision at an early age. TUSIAD (2014) corroborates this forecast with several findings from the STEM-trained workforce research regarding demands and expectations. The pertinent report indicates that 31 senior managers involved in the study asserted that newly graduated employees failed to fully meet expectations in the field, attributing this shortcoming to the inability to accurately assess the talents and characteristics of employees prior to their professional selection. This study advocates for facilitating appropriate professional orientations by identifying students' professional interests, which are predictors for their career choices before making them. This study aims to identify the elements influencing professional interest by examining its variation throughout the years. Consequently, it is believed that the barriers hindering students from pursuing STEM-related disciplines can be recognized and eradicated. Furthermore, the research was conducted to ascertain that the professional orientation of children predominantly occurs at the middle school level. Conversely, the vocational choices of pupils are predominantly defined during their high school years (Mangu et al., 2015). This study is expected to yield more conclusive results than previous research about students' interest in literature within STEM fields.

Theoretical Framework

This study is based on "Social Cognitive Career Theory (SCCT)". This theory was developed based on Bandura's social cognitive theory. SCCT says that people can direct their own career choices. It also emphasizes that people's abilities, interests, attitudes, and beliefs are practical in their career development. It is underlined that career choices are dynamic, as these characteristics, especially interest, may change over time. Accordingly, students' attitudes and interests toward STEM affect their future career choices (Moore & Richards, 2012). Our study aims to determine students' future tendencies towards STEM professions based on their interest levels in STEM fields. For this reason, SCCT is taken as a basis (Lent et al., 1994).

Moreover, one of the four elements Lent et al. (1994) identified for SCCT is personal input, encompassing characteristics such as gender, personal history, geographic location, and the educational attainment of both parents. This investigation examined whether students' interest levels in STEM disciplines varied by gender, utilizing the Social Cognitive Career Theory (SCCT) framework. Gender is a significant variable that influences STEM occupations and can directly or indirectly impact students' preferences (Christensen & Knezek, 2017). Numerous research studies have investigated the correlation between gender and inclination toward STEM professions, yielding varied results (Gülhan & Şahin, 2018; Karakaya et al., 2018). Age, similar to gender, influences individuals' professional selections. SCCT and various developmental career theories analyze individuals' interests and the evolution of their interests over time. The study analyzed the evolution of students' interest in STEM jobs over time, considering the age variable by SCCT. Longitudinal research was not performed with the same cohort of students. We believed that data collected from students at the same educational level across different years could yield insights into their age-related professional preferences. This research seeks to ascertain the career interest levels of 9th-grade students in STEM subjects and their professional orientation and elucidate the variations over time. Given the research findings, we anticipated they would enhance students' self-awareness and guide them toward areas aligned with their personality traits. Consequently, advisors assisting students with their career decisions require support.

METHOD

Research Design

This study is organized based on an examination of quantitative research methodologies. The survey is administered to a sample of the public to formulate a broad assessment of the specified population and ascertain the participants' opinions, attitudes, interests, and abilities regarding a subject or event (Gable, 1994). This study was also performed on the chosen sample. The study surveyed the STEM career interest scale and students' professional interests in science, engineering, mathematics, and technology. In contrast to other studies, surveys are frequently applicable to significantly higher sample sizes (Fraenkel & Wallen, 2006). Given the sample size in this study, the survey is appropriate for the research.

The Sample

This research focuses on 9th-grade students in Kayseri. The sample types in this study were determined using convenience sampling, with participants selected from the accessible population (Fraenkel & Wallen, 2000). The study sample comprises 326 students, with 146 from the 2018-2019 academic year and 180 from the 2019-2020 academic year, all enrolled in a high school accessible to the researcher in the Melikgazi district of Kayseri province, which was deemed appropriate for the study. The measurement tool comprised 40 items, and efforts were made to reach five times the number of students relative to these items, thereby enhancing the representativeness of the population (Büyüköztürk et al., 2008). The rationale for engaging with 9th-grade students lies in the observation that, following this grade, students' professional preferences become more defined, influencing their field choices in subsequent high school years.

Data Collection

The STEM Career Interest Scale (STEM-CIS) utilized in the study was created by Kier et al. (2013) and is founded on the Social Cognitive Career Theory (SCCT) established by Lent et al. (1994) and grounded in Bandura's General Social Cognitive Theory, the Social Cognitive Career Theory (SCCT) has a four-factor framework: self-efficacy, outcome expectancies, interest, and personal goals (Lent, 2005). Articles pertinent to the STEM-CIS scale were developed by considering these frameworks.

The research data were collected using the STEM-CIS developed by Kier et al. in 2013 and adapted to Turkish by Koyunlu Unlu et al. (2016). The measurement tool consists of 40 items and a 4-factor structure (science-technology-engineering-mathematics). The study data were collected separately in September in two different academic years. One of the researchers provided the necessary information to apply the measurement tool, and the application was carried out online.

Data Analysis

The acquired data were analyzed using SPSS 25 software. A descriptive-analytic was employed to examine the data. Frequency values, arithmetic mean, and standard deviation were computed for the data. No validity research has been done since the scale utilized in the study has undergone numerous validity assessments. An examination of Cronbach's alpha was conducted to demonstrate reliability. Frequency values and parametric analysis techniques were employed to analyze data about the student's personal information.

FINDINGS

Findings on Reliability

Reliability is the first condition to be met in scientific studies and is used to explain how many times the findings can be repeated. At the same time, it can be defined as the degree to which the measurement results are free from accidental errors (Çepni, 2009). To determine the reliability of the scale, which consisted of 40 items developed to determine the professional interests and orientations of students related to STEM, reliability analysis was performed using the SPSS.25 program, and the Cronbach alpha reliability (α) coefficient was interpreted. α coefficient is a widely used statistical technique to determine the internal consistency of a test. If the calculated alpha value approaches +1.00, it is interpreted that the consistency of the test increases within itself (Tekin, 1996).

The reliability coefficients of α were computed for the overall scale and each sub-dimension. The alpha coefficient for the entire scale was found to be .92. Reliability refers to the consistency with which respondents answer items on a scale (Pallant, 2016). Reliability analysis was conducted using the SPSS 25 program to assess the scale comprising 44 items designed to evaluate students' professional interests and orientations about STEM. The α coefficient was calculated and interpreted. The α coefficient is a widely utilized statistical method for assessing the internal consistency of a test. An alpha value nearing +1.00 indicates an increase in the test's consistency. The scale's reliability was assessed by calculating the reliability coefficients of α for the overall scale and each sub-dimension, as well as the test-retest reliability, based on a sample of 87 randomly selected students from the total population. The reliability and homogeneity of the scale scores were assessed by calculating the α coefficient and test-retest reliability. The overall scale's α was determined; the test-retest reliability was .92, while the test reliability was .89.

The α coefficient of the scores obtained from this scale in 2019 is .92, as indicated in Table 11. A reliability coefficient approaching 1 indicates the test's more excellent stability, consistency, and repeatability. The scores derived from the scale in this study demonstrate consistency and reproducibility.

Table 1. The Cronbach alpha reliability coefficient for the overall scale

Years	Cronbach's alpha	N of Items
2019	.92	40
2020	.93	40

Table 2. Cronbach alpha reliability coefficient for sub-dimensions

Years	Dimension	Number of Items	Cronbach alpha
2019	Science	10	.87
	Mathematics	10	.85
	Technology	10	.86
	Engineering	10	.93
2020	Science	10	.85
	Mathematics	10	.87
	Technology	10	.89
	Engineering	10	.94

Tables 1 and 2 indicate that the α coefficients were near 1, with values as follows: Total 2019: α=.92, Science 2019: α=.87, Mathematics 2019: α=.84, Technology 2019: α=.86, Engineering 2019: α=.93; Total 2020: α=.92, Science 2020: α=.84, Mathematics 2020: α=.87, Technology 2020: α=.89, Engineering 2020: α=.93. The reliability of the scores obtained from the scale in this research exceeds 0.70, indicating an acceptable, consistent, and reproducible value (Pallant, 2016).

Research Questions Findings

The total STEM career interest scores associated with the scale were computed for each participant. The maximum score achievable is 200, while the minimum score is 40. The total scores for each participant should be divided by the total number of items to assess their career interests in STEM professions (Turgut & Baykul, 1992). The scores, ranging from 1.00 to 5.00, indicated that students' vocational interest was considered high when scores were near 5.00 and low when scores were near 1.00. The literature indicates that the average score ranges for response categories are as follows: Completely Disagree (1.00-1.79), Disagree (1.80-2.59), Not Sure (2.60-3.39), Agree (3.40-4.19), and Completely Agree (4.20-5.00) (Öztaban & Satıcı, 2015). The critical value of 2.60, as established in the literature, indicates that scores below this threshold on the STEM-CIS reflect negative interest. Scores of 2.60 and above signify a positive interest (Netemeyer et al., 2003).

Table 3. Statistics of Factors and Total Item Scores

	Mean	$\overline{X}_{item}$	Median	Mode	Std. Dev.	Skewness	Kurtosis	Min.	Max.
Total_2019	156.09	3.90	156.00	156	18.62	-.047	-.45	111	200
Science_2019	40.27	4.03	41	39[a]	6.22	-0.83	0.99	18	50
Math_2019	41.37	4.14	42	42	5.72	-0.69	0.48	24	50
Technology _2019	39.47	3.95	39	39	6.01	-0.44	0.81	16	50
Engineering_2019	34.98	3.50	35	30	8.18	-0.16	-0.23	10	50
Total_2020	157.77	3.94	157.5	141[a]	18.87	0.08	-0.46	113	200
Science_2020	41.08	4.11	41	43	5.52	-0.69	1.13	17	50
Math_2020	41.77	4.18	42	50	5.88	-0.40	-0.54	24	50
Technology _2020	39.81	3.98	40	40	6.55	-0.66	1.16	12	50
Engineering_2020	35.11	3.51	35	31	8.38	-0.18	-0.35	12	50

When the results of the analysis were evaluated according to Table 3, we saw that the total scores for 2019 ranged between 111 and 200 points, the total points for 2020 ranged from 113 to 200 points, and the average of the total scores was $\overline{X}$top_2019=156.09/40=3.90 and $\overline{X}$top_2020=157.77/40=3.94. Based on the average scores, we determined that the average score (STEM career interest level) was higher for 2020.

In addition, total scores were calculated within each factor according to years, and score statistics were evaluated. Accordingly, the highest score that can be obtained from each factor of the scale is 5*10 =50, and the lowest score is 1*10 =10. In addition, the average values for the total scores of the factors were taken and factor averages were obtained by dividing the number of items (the number of items under each factor is 10) by the values falling under each factor ($\bar{X}$science_2019=4.03, $\bar{X}$matematik_2019=4.14, $\bar{X}$technology_2019=3.95, $\bar{X}$engineering_2019=3.50; $\bar{X}$science_2020=4.11, $\bar{X}$matematik_2020=4.18, $\bar{X}$technology_2020=3.98, and $\bar{X}$engineering_2020=3.51). Accordingly, we determined that the averages of 2020 (science, mathematics, technology, and engineering interest level) were higher than 2019 in sub-dimensions, albeit with slight differences. When the factors were examined in detail, we determined that the highest average in both years was the mathematical factor, and the lowest was the engineering factor.

When Table 3 is examined, we see that all items' skewness and kurtosis values are in the range of -2 to +2 and are by the normal distribution (Pallant, 2016). Therefore, we accepted that total and factor scores were generally distributed since the necessary assumptions were met. We used the independent sample tests to answer the question "What is the distribution of 9th-grade students' STEM career interest levels by year according to gender?" and the sub-research problems related to this question.

Table 4. T-test results by gender

Scale	Gender	N	$\bar{X}$	Sd	t	p
Total_2019	Female	61	159.51	19.27	1.90	.29
	Male	85	153.64	17.85	1.87	
Totalscience_2019	Female	61	39.26	7.27	-1.67	.01
	Male	85	41.00	5.27	-1.59	
Totalmath_2019	Female	61	41.39	5.51	.04	.35
	Male	85	41.35	5.90	.04	
Totaltechnology_2019	Female	61	41.52	5.55	3.65	.62
	Male	85	37.99	5.93	3.69	
Totalengineering_2019	Female	61	37.33	8.21	3.02	.33
	Male	85	33.29	7.79	2.99	
Total_2020	Female	71	160.75	21.30	1.72	.02
	Male	109	155.83	16.93	1.64	
Totalscience_2020	Female	71	40.56	5.19	-1.02	.52
	Male	109	41.42	5.73	-1.04	
Totalmath_2020	Female	71	42.00	6.40	.42	.06
	Male	109	41.62	5.54	.41	
Totaltechnology_2020	Female	71	41.35	7.56	2.60	.02
	Male	109	38.80	5.62	2.44	
Total engineering _2020	Female	71	36.83	9.15	2.25	.10
	Male	109	33.99	7.67	2.17	

$p<.05$

When Table 4 is examined, the Total_2019 score (t(144)=.29; p>.05) and the Total math_2019 constituting the scale (t(144) =.35; p>.05), Total technology_2019 (t(144)=.62; p>.05), Total engineering _2019 (t(144)=.34; p>.05) while there was no significant difference according to gender in the dimensions; Total science_2019 (t(144)=.010; p<.05) a significant difference was found in favor of men. Also, the Total science_2020 for the sub-dimensions for 2020 (t (178)) =. 52; p>.05), Totalmath_2020 (t (178) =.06; p>.05), Total engineering_2020 (t (178) =.10; p>.05) while there was no significant difference according to gender in the dimensions; Total technology_2020 (t (178) =.02; p<.05) and Total_2020 points (t (178) =.02; p<.05) was found to be a difference in favor of girls.

DISCUSSION AND CONCLUSION

The total scores of each participant were calculated to determine their overall inclination toward STEM careers. The study indicated that both the overall average scores for the years and the sub-dimension scores surpassed the critical threshold of 2.60. Thus, we concluded that the participants exhibited a positive interest in STEM careers across both years. This conclusion aligns with findings from previous research (Christensen & Knezek, 2017; Langdon et al., 2011). Christensen and Knezek (2017) found that middle school boys exhibited significant interest in STEM careers. Contemporary research and publications indicate that students are interested in STEM occupations, highlighting their potential as career paths and the associated employment benefits and compensation.

In 2020, the average score for STEM career interest levels was determined to be greater. This indicates a growing interest in STEM disciplines over time. Since the inception of STEM education in the educational agenda, research in this domain has proliferated (Barry & Kanematsu, 2006), and numerous reports have been generated on the topic (NGSS, 2013). Training programs for educators and teacher candidates have been implemented (Wang et al., 2011) alongside various student projects (Christensen & Knezek, 2017). Consequently, STEM education has proliferated extensively, its recognition has heightened, and individual consciousness regarding these fields has been established. We believed that the heightened interest in STEM disciplines throughout the years was a logical consequence of these findings.

In terms of sub-dimensions (science, mathematics, technology and engineering level of interest), 2020 averages were higher than 2019, with the highest average belonging to the mathematics factor and the lowest average belonging to the engineering factor in both years ($\overline{X}_{science\_2019}$=4.03, $\overline{X}_{math\_2019}$=4.14, $\overline{X}_{technology\_2019}$=3.95, $\overline{X}_{engineering\_2019}$=3.50; $\overline{X}_{science\_2020}$=4.11, $\overline{X}_{math\_2020}$=4.18, $\overline{X}_{technology\_2020}$=3.98 and $\overline{X}_{engineering\_2020}$=3.51). When the factors were examined in detail, we determined that the mathematical factor was the highest average in both years, and the lowest average belonged to the engineering factor.

The existing assessment approach indicates that mathematics is more definitive than other fields in terms of the number of questions and scoring results. As a result, it has become more important for students than other areas. Studies in the literature (Karakaya et al., 2018; Sadler et al., 2012) report differing outcomes regarding the sub-dimensional averages (interest levels) in STEM subjects. Karakaya et al. (2018) evaluated the mean scores of four variables in their study, which involved 611 middle school students. The factor with the highest mean score was Technology (3.88), while Mathematics (3.79) ranked third. In contrast, Sadler et al. (2012) examined more than 6000 participants and found that male students exhibited a significant interest in the engineering sub-dimension. Different interpretations can be offered for each study, resulting in varied outcomes. The findings of our study demonstrate that the existing examination system favors mathematics relative to other disciplines, as reflected in the more significant number of questions and scoring weight allocated to it, thus making it more consequential for students compared to other subjects. This condition produces diverse results in research because of the four-factor structure of the SCCT, which supports the STEM-CIS, including self-efficacy, outcome expectancies, interest, and personal goals. This suggests that further research is required to acquire comprehensive and diverse data. Compared to others, the lower average interest in the engineering sub-dimension can be attributed to students' insufficient knowledge of engineering fields, negative perception patterns, lack of motivation, and inadequate guidance. The reduced average interest in the engineering sub-dimension, relative to other sub-dimensions, can be ascribed to inadequate student awareness of engineering fields, negative perception patterns, and insufficient motivation and guidance. Literature studies support this conclusion and its underlying reasons (Gülhan & Şahin, 2018). In a two-week study involving middle school students, Gülhan and Şahin (2018) found that girls and boys had limited interest in pursuing engineering careers. This may be due to students' limited understanding of engineering careers in Turkey, or their views on these professions may arise from socio-cultural influences or economic factors.

In 2019, the total and sub-dimension scores obtained by participants from the scale, excluding the science scores (Totalscience_2019 = .010; $p < .05$), did not exhibit a significant difference based on gender. The notable disparity in science scores favored males (mean female = 39.26; mean male = 41.00). The average values for 2020 indicated no significant gender differences, except for the total score and technology averages. The analysis revealed a notable difference between the aggregate scores and technology averages, favoring the female participants (Total average score: female=160.75; male=155.83; Technology sub-dimension average score: female=41.35; male=38.80). Numerous studies in the existing literature exhibit similarities and differences compared to this result (Karakaya et al., 2018; Knezek et al., 2013). Karakaya et al. (2018) concluded that secondary school students' interest levels in STEM professions exhibited a significant gender difference in both total scores and sub-dimensions, with the difference favoring girls. In contrast to the findings of this study, a disparity favoring males was observed in the average science scores for 2019. This may be attributed to the male-dominated socio-cultural environment of the study or individual differences influencing characteristics like professional career interests.

Upon re-evaluation, it is evident that female students exhibit high levels of success, interest, and positive attitudes toward STEM and its sub-dimensions. Their orientation toward STEM professions varied (Christensen & Knezek, 2017). The outcome favoring the total average of girls in 2020 in this study may not serve as a sufficient indicator of their orientation towards STEM professions alone. The study employs various variables, including student age, sociocultural factors, and socio-economic status, to analyze preferences for information technology usage in STEM fields. This study examines a case related to gender.

The study's results indicate that the average technology scores for 2020 were higher for girls, which is significant. The study by Taş and Bozkurt (2019) on gender representation in STEM fields in Turkey reveals a predominant preference among men for information technologies, supported by statistical evidence. The findings of our study supporting girls diverge from the existing literature on this matter. The disparity can be attributed to the heightened engagement of female students with information resources during the remote schooling mandated by the pandemic in 2020. Studies demonstrate a positive relationship between secondary school students' interest in STEM careers and their frequency of technology use (Karakaya et al., 2018). The findings from our research indicate that the perception of men being more inclined towards STEM disciplines is not widely recognized. Our findings suggest that job preferences in STEM fields are shaped by individual characteristics such as interest, skill, and busyness rather than gender.

Recommendations

The personal output dimension of SCCT can be examined whether STEM career interest levels differ in factors other than gender, such as school type, place of residence, race, and socioeconomic status. To investigate the reasons behind the linear relationship or differences in participants' interests in STEM fields and their professional orientation, a mixed-method approach may be advantageous by incorporating qualitative data collection tools. A more comprehensive longitudinal study can be conducted to reveal the change in students' interests in STEM professions over the years. Based on the findings of studies assessing student interests in STEM fields, it is possible to develop guidance framework programs to enhance student engagement. A more comprehensive longitudinal study can be conducted on the same study group to reveal the change in students' interest in STEM professions over the years. A structural equation model showing the four dimensions of the STEM field and the change of these dimensions according to gender can be created. The model can be enhanced by incorporating analyses of moderator and mediator variables. The influence of gender on interests in STEM careers will be examined in greater detail.

Statements of Publication Ethics

The authors of this article declare that this research has no ethical conflicts or problems that may limit the publication of the article.

Researchers' Contribution Rate

The authors equally contributed to this study.

Conflicts of Interest

As authors of the research, we declare no conflict of interest for this research.

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