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The Interests and Perceptions of Jordanian University Students of Science, Technology, Engineering, and Mathematics (STEM) Education and Their Effects on Their Future Careers

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Abstract

Objectives: This study aimed to investigate Jordanian university students' perceptions of the importance of STEM knowledge for their future careers and to explore the relationship between their awareness of STEM-related careers and these perceptions. **Methodology:** A descriptive survey design was employed to collect data from 1,176 engineering, science, mathematics, and information technology (IT) students at Al-Balqa Applied University. The survey instrument, adapted from Serhan and Almeqdadi (2021), assessed participants' demographic information, awareness of STEM-related careers, and perceptions of STEM's importance for future career prospects. Data analysis involved descriptive statistics and correlation analysis. **Results:** The findings revealed a significant positive correlation between students' awareness of STEM-related careers and their perceived importance of STEM knowledge. Regression analysis further indicated that awareness of STEM careers was a significant predictor of perceived importance. **Conclusion:** The study suggests that Jordanian university students in STEM fields are aware of STEM-related careers, which positively influences their perception of STEM's importance for their future. To further enhance students' career aspirations and preparedness, it is recommended to continue implementing initiatives that promote STEM education and career guidance.

Keywords: STEM, Awareness, Perceptions, Future Careers, University Students.

اهتمامات وتصورات طلبة جامعة ال البيت في تعليم العلوم والتكنولوجيا والهندسة والرياضيات (*STEM*) وتأثيرها على حياتهم المهنية المستقبلية

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الملخص

الأهداف: هدفت هذه الدراسة إلى الكشف عن تصورات طلبة جامعة آل البيت لأهمية المعرفة في مجالات العلوم والتكنولوجيا والهندسة والرياضيات لمستقبلهم المهني واستكشاف العلاقة بين وعيهم بالمهن المرتبطة بالعلوم والتكنولوجيا والهندسة والرياضيات وهذه التصورات. **المنهجية:** استخدم المنهج الوصفي لجمع البيانات من (1176) طالبًا وطالبة في الهندسة والعلوم والرياضيات وتكنولوجيا المعلومات في جامعة آل البيت استخدمت أداة المسح، المقتبسة من سرحان والمقدادي (2021). وتضمن تحليل البيانات

إحصاءات وصفية وتحليل الارتباط. **النتائج:** كشفت النتائج عن وجود ارتباط إيجابي كبير بين وعي الطلبة بالمهن المرتبطة بالعلوم والتكنولوجيا والهندسة والرياضيات وأهميتها المدركة لمعارف العلوم والتكنولوجيا والهندسة والرياضيات. وأشار تحليل الانحدار أيضًا إلى أن الوعي بالمهن المرتبطة بالعلوم والتكنولوجيا والهندسة والرياضيات كان مؤشرًا مهمًا للأهمية المدركة. **الخلاصة:** تشير الدراسة إلى أن طلبة جامعة آل البيت في مجالات العلوم والتكنولوجيا والهندسة والرياضيات على دراية بالمهن المرتبطة بالعلوم والتكنولوجيا والهندسة والرياضيات، مما يؤثر بشكل إيجابي على تصورهم لأهمية العلوم والتكنولوجيا والهندسة والرياضيات لمستقبلهم. ولتعزيز تطلعات الطلاب المهنية واستعدادهم لها، يوصى بمواصلة تنفيذ المبادرات التي تعزز تعليم العلوم والتكنولوجيا والهندسة والرياضيات والتوجيه المهني.

الكلمات المفتاحية: العلوم والتكنولوجيا والهندسة والرياضيات، الوعي، التصورات، المهن المستقبلية، جامعة آل البيت.

Introduction

STEM, which stands for science, technology, engineering, and mathematics, is an educational approach that focuses on integrating these four disciplines into a cohesive learning paradigm. STEM education aims to provide students with a practical and problem-solving approach to learning, which, in turn, helps them develop skills and knowledge in critical thinking, problem-solving, collaboration, communication, and creativity. STEM education encourages students to use their knowledge of science, technology, engineering, and mathematics to develop practical solutions to real-world problems and challenges. Therefore, it aims to prepare students for the challenges of the modern world and for the jobs of the future, as well as to foster innovation and creativity (National Academy of Engineering and National Research Council, NAENRC, 2014). The interest of university students in STEM fields is a critical factor in predicting their future career paths. For instance, Ma et al. (2021) found that students who were more interested in STEM subjects were more likely to pursue STEM majors and careers. Therefore, fostering an interest in STEM education is essential to nurture the next generation of STEM professionals. There are many forms of STEM education, from classroom-based instruction to hands-on workshops and summer camps. There are also many STEM-related careers, such as computer programming, engineering, medicine, and environmental science, among others (Bybee, 2013). STEM education has grown in importance as technology and innovation continue to play vital roles in shaping our world. STEM and research closely correlate, as STEM fields are essential for conducting scientific research and developing new technologies, while research is an essential part of STEM education that provides students with the hands-on experience required to develop critical thinking and problem-solving skills (NAENRC, 2014). Furthermore, some STEM fields, such as science and engineering, are heavily involved in research, with scientists and engineers working to develop new technologies, processes, and products. Meanwhile, STEM research helps solve real-world problems, improves existing technologies, and develops new ones that can transform industries, create new jobs, and improve lives (National Research Council, 2011).

STEM research also plays a crucial role in enhancing the knowledge of a wide range of industries, such as health, energy, environment, and aerospace, among others, as it is a collaborative process that requires scientists, engineers, mathematicians, and other experts to work together to solve complex problems (Alkhawaldeh & Alghazo, 2021). STEM research is not only a critical component for industry and society but also for higher education. As such, many universitys and universities offer students research opportunities in STEM fields and the chance to work alongside faculty members on cutting-edge research projects. Apart from that, STEM research is also essential for the development of new technologies and innovations, as it sets the foundation for future advancements. For instance, STEM research enables scientists and engineers to identify new challenges and opportunities, develop innovative solutions, and improve the world we live in. Meanwhile, STEM education is crucial for students who aspire to pursue careers in science, technology, engineering, and mathematics. Therefore, a solid foundation in these fields can open doors to a plethora of opportunities, especially in this fast-paced digital era. The literature review of this present study examines the interests and perceptions that Jordanian university students have regarding the effect of

STEM education on their future careers (Alkhawaldeh & Alghazo, 2021).

Statement of the Problem: The Status of STEM Education in Jordan

Jordan prioritizes STEM education, recognizing the need for a highly skilled workforce in science, technology, engineering, and mathematics (STEM) fields. To achieve this goal, the country has implemented various initiatives:

- Education reforms: This includes increasing funding for STEM programs in schools and providing professional development opportunities for STEM teachers. This aims to improve the quality of STEM education delivered to students.
- STEM programs and initiatives: Examples include the Jordanian National Robotics Competition, which specifically targets developing skills in robotics and engineering among young Jordanians. These programs aim to cultivate interest and practical knowledge in STEM fields.
- Strong STEM institutions: Jordan boasts universities like the University of Jordan and the Jordan University of Science and Technology, along with research centers like the Royal Scientific Society. These institutions play a crucial role in driving STEM research and education in the country.
- International collaboration: Partnerships with other countries and organizations, like the European Union, contribute additional resources and expertise to support STEM education and research in Jordan. While these initiatives demonstrate Jordan's commitment to STEM education, challenges remain.

Strategies to Strengthen STEM Education:

- Boost Student Engagement: Encourage teachers to adopt project-based learning. This involves hands-on activities like designing buildings, solving engineering problems, and conducting experiments. This approach fosters a deeper understanding and excitement for STEM subjects.
- Prioritize Computer Science: Integrate computer science education throughout the curriculum by offering dedicated courses, coding classes, and robotics workshops. This equips students with the skills needed for success in the technology industry.
- Invest in Teacher Training: Provide ongoing professional development opportunities for teachers. This could include training in new technologies, innovative teaching methodologies, and best practices to increase student engagement in STEM subjects. Effective teachers are key to a strong foundation in STEM education.
- Forge Collaboration Networks: Encourage partnerships between schools, universities, and the private sector. This could involve collaborative projects, internships, or guest speaker programs with technology companies and research institutions. These partnerships provide students with valuable hands-on experiences in real-world STEM fields.
- Empower Female Participation: Implement mentorship programs, after-school programs, and targeted resources specifically designed to support female students in STEM. This helps address the gender gap and ensures equal access to careers in these fields.
- Fuel Innovation and Entrepreneurship: Provide resources and training for students to develop entrepreneurial skills and launch their own STEM-related businesses. This fosters innovation in the technology sector and creates new job opportunities.

The Perceived Benefits of STEM Education

University students perceive STEM education as the gateway to diverse and promising career opportunities. For instance, Wang and Degol (2017) found that students believe STEM majors are more likely to lead to higher-paying jobs and job security than non-STEM majors. This perception has contributed to the growing popularity of STEM fields among university students.

The Barriers to Promoting STEM Education in Jordan

Nevertheless, despite recent developments in the country, Jordan still faces multiple challenges in promoting STEM education and pursuing STEM-based careers, such as a lack of capacity and funding for STEM education in universities, inadequate teacher training, and outdated teaching materials, to name a few. Furthermore, a lack of awareness of the benefits of STEM education, as well as social and cultural taboos and gender discrimination, also hinder teaching students STEM subjects. University students also face barriers when pursuing STEM careers, with recent studies revealing that a lack of diversity and STEM-related mentorship opportunities, as well as the prevalence of imposter syndrome, prevent students from viewing STEM-based careers in a positive light (Lee et al., 2019; Byars-Winston et al., 2020).

Why STEM Education Matters

STEM education plays a crucial role in shaping students' futures and preparing them for a rapidly changing world. Here's how:

- Career Advantages: STEM fields offer diverse and promising career opportunities with high job growth compared to non-STEM fields (National Science Foundation, 2020). A strong STEM education provides students with the foundation to succeed in these in-demand careers.
- Enhanced Skills: STEM education equips students with valuable skills like critical thinking, problem-solving, and innovation. These skills are essential for success in any career path, especially in a world driven by

technology.

• Economic Engine: A skilled STEM workforce is vital for driving innovation and economic growth. By investing in STEM education, countries become more competitive in the global economy (National Science Foundation, 2020).

• Tackling Global Challenges: STEM skills are crucial for addressing global issues like climate change, food security, and healthcare. STEM education equips individuals with the tools and knowledge to find sustainable solutions.

• Hands-on Learning Shapes Careers: Studies by Vekkaila et al. (2020) show that students who participate in hands-on experiences like internships and STEM programs develop clearer career goals and are more likely to pursue STEM careers.

• Closing the Gender Gap: While many women have the potential and interest in STEM fields, research by Smith et al. (2020) suggests they may be discouraged by a perceived lack of inclusivity and opportunities. Addressing these perceptions is crucial for increasing diversity in STEM fields.

In summary, STEM education empowers individuals with the skills and knowledge to succeed in the workplace, drive innovation, and solve global challenges. It's a critical investment for both individual and national prosperity.

The Importance of STEM Education

STEM education significantly influences the career aspirations of university students. According to Vekkaila et al. (2020), students who participate in STEM programs or internships during their university years tend to have clearer career goals and are more likely to pursue STEM-related careers. This emphasizes the importance of hands-on experiences in shaping career perceptions.

STEM education has grown in popularity as it equips students with the knowledge, skills, and abilities required to succeed in their future careers. Furthermore, as STEM-related fields are rapidly growing, individuals with STEM-related skills are, and will remain, in high demand across the globe. According to a recent report by the World Economic Forum (WEF), more than half of all employees will require significant re-skilling and training in STEM fields in the next few years. Therefore, STEM education is essential for individuals and societies to achieve economic prosperity, social progress, and sustainable development. As such, STEM education is important because:

1. STEM fields provide numerous career opportunities, with job growth anticipated to outpace non-STEM fields (National Science Foundation, 2020). Therefore, a strong STEM-based educational foundation would prepare students for these in-demand careers and help them succeed in the job market.
2. STEM education increases innovation and problem-solving skills as STEM students learn to identify problems and develop creative solutions using critical thinking and analytical skills. This is vital in a world that is rapidly evolving due to technological advancements (Gericke & Boehnke, 2018).
3. STEM education is critical for economic growth as it prepares students for emerging STEM industries. A skilled workforce is essential to drive innovation and support the growth of STEM industries, which are critical drivers of economic development (National Science Foundation, 2020).
4. STEM education increases the global competitiveness of a nation. More specifically, countries that invest in STEM education are more likely to be competitive in the global economy. Therefore, a strong STEM workforce is critical for national security and defense (National Science Foundation, 2020).
5. STEM education is essential for addressing global challenges, such as climate change, food security, and healthcare. It also sets the foundation and provides individuals with the tools and knowledge needed to address these challenges and find sustainable solutions.

Lastly, there is an evident gender disparity in STEM fields, as fewer women pursue STEM careers than men. According to Smith et al. (2020), although women may have the potential and are interested in STEM, they often do not pursue STEM-related careers because they perceive these industries to be less inclusive and to have fewer opportunities for them. Therefore, it is critical to understand and address these gender-related perceptions to increase diversity in STEM fields.

The Perceptions of Jordanian University Students on STEM Education

STEM education's critical role has garnered global attention, including in Jordan. However, the low number of Jordanian students pursuing STEM careers has raised concerns. This has led to several studies investigating Jordanian university students' perceptions of STEM education. These studies reveal a complex picture. While research by Al-Sharideh et al. (2019) found positive attitudes towards STEM education and its career benefits, many students lacked knowledge of specific STEM fields and career opportunities.

Similarly, Alkhawaldeh & Alghazo (2021) identified student interest in STEM subjects as the key factor influencing career choices. However, the study also highlighted challenges like limited resources, a lack of career guidance, and the perceived difficulty of STEM subjects, deterring students from pursuing STEM careers. Focusing on female students, Al-Alawneh & Al-Qudah (2019) found positive attitudes towards STEM education despite facing cultural norms, limited family and teacher support, and gender bias. In contrast, Qablan (2021) presented a more optimistic view. They reported that over 80% of students considered STEM education crucial

for their careers and relevant to their future plans. Additionally, STEM courses were a top priority when choosing their fields of study.

Overall, Jordanian university students generally have positive views of STEM education. However, addressing challenges like limited resources, career counseling, and student awareness, particularly among females, is crucial. Increased efforts are needed to raise student interest in STEM fields and equip them with the knowledge and skills for success.

Research Questions

According to the above problem statement and STEM issues, the researchers decided to investigate the following four research questions:

1. What is the extent of the knowledge that Jordanian university students have of STEM-related careers?
2. What is the extent of the interest that Jordanian university students have in STEM-related courses? (Table 2)
3. What perceptions do Jordanian university students have of the effects of STEM education on their future careers? (Table 3)
4. What is the extent of the interest that Jordanian university students have in STEM-related courses, in terms of gender? (Table 4)

Literature Review

The literature review revealed that only a handful of studies have specifically examined the perceptions that Jordanian students have of the effects of STEM education on their future careers. As is the case in many countries, STEM fields are playing an increasingly larger role in driving innovation and economic growth in Jordan, as well as increasing its global competitiveness. The literature review explores the interests and perceptions that Jordanian university students have regarding the impact of STEM education on their future careers. It also provides insights into how these students view STEM disciplines, the challenges they face, and the factors influencing their career choices.

Here are some previous studies: Wang et al. (2020) conducted a meta-analysis study about university students' perceptions of STEM education and barriers to pursuing STEM careers. This meta-analysis examined students' perceptions of STEM education across various countries. It identified factors like positive attitudes toward STEM, perceived career opportunities, and self-efficacy as crucial for pursuing STEM careers. Barriers included a lack of role models, inadequate teaching methods, and limited practical experiences.

Another study conducted by Terenzini et al. (2019) investigated the gender gap in persistence in STEM fields from high school to university. This study highlighted how early positive experiences, self-confidence, and mentorship opportunities can encourage female students to pursue STEM careers.

Al-Saadi and Al-Zboon (2020) conducted an additional study to analyze the factors affecting high school students' interest in choosing STEM subjects in Jordan. A quantitative approach was used to collect data from 567 high school students using a questionnaire. The findings revealed that various factors influence students' interest in STEM courses, including instructor competence, curriculum relevance to future vocations, parental encouragement, and students' evaluations of their own talents. Furthermore, the survey found gender variations in interest levels, with male students expressing a larger interest in STEM courses than female students. The implications of these findings for educational policy and practice are examined, emphasizing the significance of addressing these issues to promote more interest and participation in STEM.

Abu-Eideh (2021) investigated Jordanian university students' attitudes toward STEM (science, technology, engineering, and mathematics) topics. Using a quantitative research approach, data was collected from a sample of university students through a questionnaire survey. The findings reflect a variety of student attitudes about STEM, such as their perceptions of the importance of STEM subjects to their future jobs, their confidence in their ability to succeed in STEM fields, and their overall enthusiasm for STEM disciplines. The study also investigates gender variations in university students' views about STEM. The consequences of these findings are examined in terms of strategies for increasing Jordanian university students' interest and involvement in STEM education.

In a recent study, Aldalalah and Momani (2023) employed mixed methods to explore the impact of STEM (science, technology, engineering, and mathematics) education on the job goals of Jordanian high school students. Data obtained from a sample of high school students (170 participants) were collected using both quantitative and qualitative methodologies to investigate their perceptions and experiences with STEM education and its impact on their career goals. The quantitative research found statistically significant relationships between participation in STEM education and students' aspirations to pursue STEM-related occupations. Furthermore, the qualitative findings shed light on the different elements that influence students' career goals within the framework of STEM education, such as personal interests, parental influence, and views of social expectations.

The Significance of STEM Education in Jordan

STEM education has gained prominence in Jordan as it could potentially help achieve the country's national development goals. As such, the Jordanian government has recently prioritized STEM fields as drivers of innovation and economic growth. This has led to the development and implementation of multiple initiatives, such as the Jordan Vision 2025 and the National Strategy for Human Resource Development, both of which

prioritize STEM education and acknowledge its role in developing a skilled workforce (Jordan Vision, 2025).

The Perceptions of STEM Education

The perceptions that students have of STEM education play a crucial role in shaping their career choices. Alkandari and Alduaij (2019) explored the perceptions that Kuwaiti and Jordanian students have of STEM careers and found that they often held stereotypical beliefs about STEM fields, such as viewing them as challenging and demanding—perceptions that would inevitably deter them from pursuing STEM-related careers.

The Gender Disparities in STEM Education

Gender disparities exist in STEM education and affect career choices, both globally and in Jordan. Alshumaimeri et al. (2021) found that gender stereotypes and societal expectations are responsible for the gender-based differences in attitudes toward STEM, as well as influencing the career aspirations and decisions of students, with female students expressing less interest in STEM fields.

The Challenges in STEM Education

Some of the challenges that STEM education faces in Jordan include the need for better teacher training and curricula, as well as the integration of hands-on learning. Furthermore, the lack of access to advanced STEM resources and extracurricular activities also hinders student engagement (Khlaif et al., 2020).

The Factors Influencing the Selection of STEM-related Careers

Various factors influence the decisions of Jordanian university students to pursue STEM-related careers. Alkandari and Alduaij (2019) found that parental support, teacher encouragement, and access to role models are influential factors that motivate students to pursue STEM careers. Career counseling and exposure to STEM industries were also found to positively impact their career decisions.

Therefore, the interests and perceptions that Jordanian university students have of STEM education and its impact on their future careers are shaped by a complex interplay of individual motivations, societal expectations, and educational experiences. Although Jordan's development agenda acknowledges the importance of STEM, gender disparities and stereotypical perceptions of STEM fields continue to pose challenges. As such, it is essential to address these issues and provide students with the necessary resources, mentorship, and support to develop a thriving STEM workforce in Jordan. In addition, previous studies also suggest that Jordanian students have positive attitudes toward STEM education and believe that it is important for their future careers. However, more studies that specifically examine the perceptions that university students have of STEM education and its effect on their future careers are needed in Jordan (Jordan Vision, 2025).

ResearchMethodologyParticipants

The population of this study consisted of all the students from the following universities of Al al-Bayt University who were registered in the academic year 2022/2023: University of Engineering, University of Science, and University of Information Technology (IT). The sample comprised 1,176 randomly selected students from Years 1 to 4 studying science (n = 294), IT (n = 294), engineering (n = 294), and mathematics (n = 294) in the Academic Year 2022/2023. The researchers selected all participants randomly from each of the above universities. In addition, the sampling technique, such as random selection of students from Years 1 to 4, minimizes selection bias and increases the likelihood of obtaining a representative sample from each academic level. In terms of gender, 576 were male while 600 were female. All 1,176 students responded to the survey, which consisted of 32 items across three sections.

Instruments

The survey instrument of this study was adapted from Serhan and Almeqdadi (2021). It consisted of 32 items in three sections and was originally written in English before it was translated into Arabic and reviewed by professional translators to determine its accuracy. The participants responded to the survey on paper.

The four items in the first section collected their demographic information, as shown in Table 1. The 16 items in the second section examined the students' knowledge about STEM-related careers (Factor 1), and the 12 items in the third section examined their perceptions of the importance of STEM on their future careers (Factor 2), as well as their interest in STEM subjects. The participants answered questions such as "How interested are you in the following school subjects?" by choosing from a 1-to-5 scale of responses: (1) "I have never studied this subject," (2) "I am not interested in this subject," (3) "I am moderately interested in this subject," (4) "I am interested in this subject," and (5) "I am highly interested in this subject."

Table 1: Sample distribution according to demographic information.

Gender	N	%
Male	576	49.0%
Female	600	51.0%
Major	**N**	**%**
Science	294	25.0%
Mathematics	294	25.0%
Engineering	294	25.0%
IT	294	25.0%
Year	**N**	**%**
First	51	4.30%
Second	281	23.90%
Third	424	36.10%
≥ Fourth	420	35.70%

Validity

The degree of validity of a test is determined by its characteristics and the criteria employed. A highly valid test implies that its conclusions are pertinent and significant to the study. The validity of the survey and its content was confirmed via peer review by the researcher's supervisors, who granted their approval. The questions were scrutinized to ensure that they were consistent with the content. A pilot study was then conducted to test the definitions and eliminate any ambiguity.

Reliability Analysis

Table 2 presents the reliability test results of each factor. The reliability coefficient (Cronbach's α) of Factor 1, which comprised four items, was 0.801, indicating good internal consistency among the items, while that of Factor 2, which comprised three items, was 0.715, indicating an acceptable level of internal consistency among the items. The Cronbach's α is deemed acceptable if it exceeds 0.60 (Sekaran & Bougie, 2016).

Table 2: The reliability test results of each factor.

	Factor	Cronbach's α	N of Items
1	Students' knowledge of STEM-related careers	0.801	4
2	Students' perceptions of the importance of STEM on their future careers	0.715	3

Results of the Study

In order to apply statistical analysis, the Statistical Package for the Social Sciences (SPSS) version 28 was used to analyze the collected data and gain valuable insights into the correlation between Factors 1 and 2. The analysis involved descriptive statistics, reliability analysis, and regression analysis. Table 1 provides the sample distribution in terms of gender, major, and academic year of study.

As seen in Table 1, 49.0% (n = 576) of the participants were male, while the remaining 51.0% (n = 600) were female. Therefore, men and women were almost equally represented. Each of the majors was also equally represented, with 294 participants (25%) from each of the science, mathematics, engineering, and IT majors.

The sample included students from four different educational stages; namely, 4.30% (n = 51) were first-year students, 23.90% (n = 281) were second-year students, 36.10% (n = 424) were third-year students, while 35.70% (n = 420) were fourth-year students or above.

Table 3 provides valuable insights into the extent of the students' knowledge of STEM-related careers, with key statistical measures that help understand the distribution and variability of the scores for each of the examined majors. For the science students, the means ranged from 2.412 to 2.833, while the standard deviations (SDs) ranged from 0.777 to 0.861, reflecting the dispersion of scores around the mean. For the mathematics students, the means ranged from 2.517 to 2.759, while the SDs ranged from 0.873 to 0.893. For the engineering students, the means ranged from 2.745 to 3.167, while the SDs ranged from 0.868 to 0.944. For the IT students, the means ranged from 2.588 to 2.905, while the SDs ranged from 0.867 to 1.007. The total means of the items in Factor 1 for all the majors ranged from 2.643 to 2.976, with SDs ranging from 0.537 to 0.804. Therefore, the distribution was normal, as none of the items exhibited skewness and kurtosis beyond the recommended range of ±2 (George & Mallery, 2010)..

Table 3: The means and SDs for each item in Factor one of the Four Majors.

Major	Item	Mean	SD
Science	Jobs related to my major are available in the labour market.	2.833	0.777
	I know where to find jobs related to my major.	2.650	0.803
	I am aware of the steps that I need to take if I want to pursue a career in my major.	2.687	0.861
	I am aware of the employers and companies that hire employees to work in jobs related to my major.	2.412	0.829
	Total mean: Students' knowledge of STEM-related careers.	**2.645**	**0.537**
Mathematics	Jobs related to my major are available in the labour market.	2.759	0.886
	I know where to find jobs related to my major.	2.748	0.873
	I am aware of the steps that I need to take if I want to pursue a career in my major.	2.548	0.880
	I am aware of the employers and companies that hire employees to work in jobs related to my major.	2.517	0.893
	Total mean: Students' knowledge of STEM-related careers.	**2.643**	**0.659**
Engineering	Jobs related to my major are available in the labour market.	3.167	0.944
	I know where to find jobs related to my major.	3.061	0.868
	I am aware of the steps that I need to take if I want to pursue a career in my major.	2.932	0.914
	I am aware of the employers and companies that hire employees to work in jobs related to my major.	2.745	0.938
	Total mean: Students' knowledge of STEM-related careers.	**2.976**	**0.762**
IT	Jobs related to my major are available in the labour market.	2.905	0.885
	I know where to find jobs related to my major.	2.782	0.867
	I am aware of the steps that I need to take if I want to pursue a career in my major.	2.690	0.958
	I am aware of the employers and companies that hire employees to work in jobs related to my major.	2.588	1.007
	Total mean: Students' knowledge of STEM-related careers.	**2.741**	**0.804**

Table 4 provides valuable insights into students' perceptions of the importance of STEM in their future careers, with key statistical measures that help to understand the distribution and variability of the scores for each of the examined majors. For the science students, the means ranged from 2.884 to 3.092, while the standard deviations (SDs) ranged from 0.678 to 0.759; therefore, the score dispersion was around the mean. For the mathematics students, the means ranged from 2.840 to 3.024, while the SDs ranged from 0.840 to 0.919.

For the engineering students, the means ranged from 3.136 to 3.282, while the SDs ranged from 0.834 to 0.982. For the IT majors, the means ranged from 2.956 to 3.058, while the SDs ranged from 0.898 to 0.901. The total means of the items in Factor 2 for all the majors ranged from 2.920 to 3.194, with SDs ranging from 0.429 to 0.759. Therefore, the distribution was normal, as none of the items exhibited skewness and kurtosis beyond the recommended range of ±2 (George & Mallery, 2010).

Table 4:The means and SDs for each item in Factor 2.

Major	Item	Mean	SD
Science	I am aware that possessing good knowledge and skills related to my major is useful in the labour market.	3.092	0.678
	I am aware that it is important to have good knowledge and skills related to my major to secure a good job in this world.	2.884	0.757
	I am aware that employers generally value employees that have strong knowledge and skills related to their majors.	2.915	0.759
	Total mean domains: Students' perceptions of the importance of STEM on their future careers.	**2.964**	**0.429**
Mathematics	I am aware that possessing good knowledge and skills related to my major is useful in the labour market.	3.024	0.840

Major	Item	Mean	SD
	I am aware that it is important to have good knowledge and skills related to my major to secure a good job in this world.	2.840	0.919
	I am aware that employers generally value employees that have strong knowledge and skills related to their majors.	2.895	0.908
	Total mean domains: Students' perceptions of the importance of STEM on their future careers.	**2.920**	**0.737**
Engineering	I am aware that possessing good knowledge and skills related to my major is useful in the labour market.	3.282	0.834
	I am aware that it is important to have good knowledge and skills related to my major to secure a good job in this world.	3.163	0.905
	I am aware that employers generally value employees that have strong knowledge and skills related to their majors.	3.136	0.982
	Total mean domains: Students' perceptions of the importance of STEM on their future careers.	**3.194**	**0.759**
IT	I am aware that possessing good knowledge and skills related to my major is useful in the labour market.	3.058	0.901
	I am aware that it is important to have good knowledge and skills related to my major to secure a good job in this world.	2.956	0.898
	I am aware that employers generally value employees that have strong knowledge and skills related to their majors.	3.017	0.899
	Total mean domains: Students' perceptions of the importance of STEM on their future careers.	**3.010**	**0.755**

Regression Analysis

Regression analysis was used to examine the hypotheses of this present study as it facilitates analyzing the correlation between a single dependent variable (DV) and an independent variable (IV) (Hair Jr et al., 1998). Table 5 presents the results of a regression analysis of the correlation between the IV, namely, "Students' knowledge of STEM-related careers" (Factor 1), and the DV, namely, "Students' perceptions of the importance of STEM on their future careers" (Factor 2).

Table 5: The results of the regression analysis of the correlation between Factors 1 and 2 among science students.

IV	Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
	B	**SE**	***β***		
Science students' knowledge of STEM-related careers	0.475	0.038	0.595	12.655	0.000
R	**R^2**	**F**	**Sig.**	**DV:** Science students' perceptions of the importance of STEM on their future careers	
0.595	0.354	160.157	0.000		

Table 5 shows the results of the regression analysis of the correlation between Factors 1 and 2 among science students. Regression coefficients provide information about the strength and direction of a correlation. As the unstandardized coefficient (B) of the independent variable (IV) was 0.475, a one-unit increase in "students' knowledge of STEM-related careers" results in a 0.475 increase in "students' perceptions of the importance of STEM on their future careers" among science students.

The standard error (SE), which estimates the variability in a coefficient, was 0.038. The standardized coefficient (β), which is the standardized effect size, was 0.595, indicating the relative importance of the IV in predicting the dependent variable (DV). As the statistical significance (t) was 12.655, the coefficient was statistically significant ($p < 0.001$). Therefore, the correlation between Factors 1 and 2 was unlikely to have occurred by chance among science students.

Several measures were used to assess the overall fit of the regression model. The adjusted coefficient of determination (R^2) was 0.354, indicating that the IV explains approximately 35.4% of the variance in "students' knowledge of STEM-related careers" on "students' perceptions of the importance of STEM on their future careers" in the case of science students. The F statistic, which indicates the overall significance of the model, was 160.157. As $p < 0.001$ is deemed significant, the model was statistically significant in predicting the DV. Furthermore, the regression model demonstrates that the IV is a meaningful predictor of the DV and explains a significant proportion of the variance in the perceptions of science students.

Table 6: The results of the regression analysis of the correlation between Factors 1 and 2 among mathematics students.

	Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
	B	**SE**	***β***		
Mathematics students' knowledge of STEM-related careers	0.731	0.050	0.653	14.740	0.000
R	**R^2**	**F**	**Sig.**	**DV:** Mathematics students' perceptions of the importance of STEM on their future careers	
0.653	0.427	217.281	0.000		

Table 6 shows the results of the regression analysis of the correlation between Factors 1 and 2 among mathematics students. As the B of the IV was 0.731, a 1-unit increase in "students' knowledge of STEM-related careers" results in a 0.731-unit increase in "students' perceptions of the importance of STEM on their future careers" among mathematics students. The SE was 0.050, while the β was 0.653, indicating the relative importance of the IV in predicting the DV. As the t was 14.740, the coefficient was statistically significant ($p < 0.001$). Therefore, the correlation between Factors 1 and 2 was unlikely to have occurred by chance among mathematics students.

The R^2 was 0.427, indicating that the IV explains approximately 42.7% of the variance in "students' knowledge of STEM-related careers" on "students' perceptions of the importance of STEM on their future careers" in the case of mathematics students. As the F was 217.281, the model was statistically significant in predicting the DV ($p < 0.001$). Therefore, there is a statistically significant and positive correlation between "students' knowledge of STEM-related careers" and "students' perceptions of the importance of STEM on their future careers" among mathematics students. Furthermore, the regression model proves that the IV is a meaningful predictor of the DV and explains a significant proportion of the variance in the perceptions of the mathematics students.

Table 7: The results of the regression analysis of the correlation between Factors 1 and 2 among engineering students.

IV	Unstandardised Coefficients		Standardised Coefficients	*t*	Sig.
	B	**SE**	***β***		
Engineering students' knowledge of STEM-related careers	0.731	0.040	0.734	18.459	0.000
R	**R^2**	**F**	**Sig.**	**DV:** Engineering students' perceptions of the importance of STEM on their future careers	
0.734	0.539	340.743	0.000		

Table 7 shows the results of the regression analysis of the correlation between Factors 1 and 2 among engineering students. As the B value of the independent variable (IV) was 0.731, a 1-unit increase in "students' knowledge of STEM-related careers" results in a 0.731-unit increase in "students' perceptions of the importance of STEM on their future careers" among engineering students.

The standard error (SE) was 0.040, while the beta (β) was 0.734, indicating the relative importance of the IV in predicting the dependent variable (DV). As the t value

was 18.459, the coefficient was statistically significant ($p < 0.001$). Therefore, the correlation between Factors 1 and 2 was unlikely to have occurred by chance among engineering students. The R^2 value was 0.539, indicating that the IV explains approximately 53.9% of the variance in "students' knowledge of STEM-related careers" on "students' perceptions of the importance of STEM on their future careers" in the case of engineering students. As the F value was 340.743, the model was statistically significant in predicting the DV ($p > 0.001$).

Therefore, there is a statistically significant and positive correlation between "students' knowledge of STEM-related careers" and "students' perceptions of the importance of STEM on their future careers" among engineering students. Furthermore, the regression model demonstrates that the IV is a meaningful predictor of the DV and explains a significant proportion of the variance in the perceptions of engineering students.

Table 8: The results of the regression analysis of the correlation between Factors 1 and 2 among IT students.

IV	Unstandardized Coefficients		Standardized Coefficients	*t*	Sig.
	B	**SE**	***β***		
IT students' knowledge of STEM-related careers	0.700	0.037	0.746	19.156	0.000
R	**R^2**	**F**	**Sig.**	**DV:** IT students' perceptions of the importance of STEM on their future careers	
0.746	0.557	366.946	0.000		

Table 8 shows the results of the regression analysis of the correlation between Factors 1 and 2 among IT students. As the B of the independent variable (IV) was 0.700, a 1-unit increase in "students' knowledge of STEM-related careers" results in a 0.700-unit increase in "students' perceptions of the importance of STEM for their future careers" among IT students.

The standard error (SE) was 0.037 while the beta (β) was 0.746, indicating the relative importance of the IV in predicting the dependent variable (DV). As the t-value was 19.156, the coefficient was statistically significant ($p < 0.001$).

Therefore, the correlation between Factors 1 and 2 was unlikely to have occurred by chance among IT students. The (R^2) was 0.557, indicating that the IV explains approximately 55.7% of the variance in "students' knowledge of STEM-related careers" on "students' perceptions of the importance of STEM for their future careers" in the case of IT students.

As the F-value was 366.946, the model was statistically significant in predicting the DV ($p < 0.001$). Therefore, there is a statistically significant and positive correlation between "students' knowledge of STEM-related careers" and "students' perceptions of the importance of STEM for their future careers" among IT students. Furthermore, the regression model proves that the IV is a meaningful predictor of the DV and explains a significant proportion of the variance in the perceptions of IT students.

These results indicate that, among science, mathematics, engineering, and IT majors, "students' knowledge of STEM-related careers" has a significant positive correlation with "students' perceptions of the importance of STEM for their future careers." The regression models indicate moderate-to-strong effect sizes and explain a considerable amount of variance in the students' perceptions.

Discussion

The observed correlations between students' awareness of STEM-related career opportunities and their perceptions of the importance of STEM in their future careers underscore the interconnectedness of educational exposure and career aspirations. These results suggest that interventions aimed at enhancing students' knowledge of STEM-related professions could profoundly impact shaping their career trajectories and fostering a greater appreciation for STEM fields. In general, the results of the current study showed a significant positive correlation between students' knowledge of STEM-related careers and their perceptions of the importance of STEM for their future careers across science, mathematics, engineering, and IT majors.

Additionally, the significant explanatory power of the regression models highlights the importance of considering factors beyond the academic curriculum in influencing students' attitudes and outlook toward STEM disciplines. These findings not only provide valuable insights into the dynamics between educational experiences and career aspirations but also emphasize the need for targeted interventions to promote STEM literacy and engagement among students from diverse academic backgrounds. Overall, the regression models indicate moderate-to-strong effect sizes and explain a considerable amount of variance in the students' perceptions, suggesting that students' understanding of STEM-related careers significantly influences their perceptions of the importance of STEM in their future careers.

The current study's findings align with previous research on students' perceptions and attitudes toward STEM education and careers. Wang et al. (2020) highlighted the importance of positive attitudes toward STEM, perceived career opportunities, and self-efficacy in influencing students' decisions to pursue STEM careers, which resonates with our findings regarding the correlation between students' knowledge of STEM-related careers and their perceptions of STEM's importance in their future careers. Similarly, Al-Saadi and Al-Zboon (2020) identified various factors influencing high school students' interest in STEM subjects, including curriculum relevance, parental encouragement, and students' self-perception of their talents, echoing our observations regarding the relationship between students' awareness of STEM careers and their perceptions of the importance of STEM in their future professions. Moreover, Abu-Eideh (2021) investigated university students' attitudes toward STEM, emphasizing the importance of understanding students' perceptions of STEM subjects and their confidence in succeeding in STEM fields. Our findings complement this by highlighting the significant positive correlation between students' knowledge of STEM-related careers and their perceptions of the importance of STEM in their future careers. Furthermore, Aldalalah and Momani (2023) explored the impact of STEM education on high school students' career goals, emphasizing the role of personal interests, parental influence, and social expectations. This study contributes to this understanding by demonstrating the significant influence of students' awareness of STEM-related careers on their perceptions of the importance of STEM in their future professions, thereby highlighting the broader impact of STEM education on career aspirations.

Collectively, these studies underscore the multifaceted nature of factors influencing students' engagement and persistence in STEM fields, with our findings adding to the growing body of literature by highlighting the importance of promoting awareness and knowledge of STEM-related careers to foster positive perceptions of STEM among students.

Conclusion

STEM education plays a pivotal role in preparing university students for careers in this increasingly technology-driven world. As technology continues to shape industries and job markets, it is of paramount importance to understand the interests and perceptions that university students have regarding the impact of STEM education on their future careers. This study explored extant studies on university students' interests and perceptions of STEM education and its influence on their career choices. It found that Jordanian university students perceive STEM education as crucial to their future careers. They also consider STEM-related courses among their top priorities. However, challenges such as a lack of resources, inadequate teacher training, and social and cultural barriers hamper the promotion of STEM education in Jordan. Therefore, it is essential to increase awareness and support for students, especially female students, to enable them to pursue STEM-related fields and improve their career prospects, which would, in turn, contribute to the development of Jordan's economy.

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