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# From Adaptation to Flourishing: The Importance of Designing STEM-Based University Program in the Context of Artificial Intelligence Revolution from an Educators' Perspective

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**Abstract**
This study aimed to explore the attitudes of Jordanian teachers towards the importance of establishing university programs that adopt the STEM approach, integrated with artificial intelligence applications, to enhance the role of universities, making them future-oriented and meeting the needs of society and the labor market with the appropriate competencies for building a prosperous future. The study adopted a descriptive-analytical approach. It reviewed relevant literature and developed a questionnaire consisting of 29 items, after validation and reliability testing, using a six-point Likert scale. A link to the questionnaire was generated using Google's questionnaire distribution tool. The questionnaire was then distributed to all teachers in Jordan using a snowballing technique via various social media platforms. The study sample comprised 160 teachers distributed across several variables (specialization, experience, academic degree, teaching grade, school location, and participation in specialized STEM training programs). The results indicated an overall mean score of 5.081 and a high level of agreement (H), demonstrating a strong and positive reception to the design of STEM programs in schools and universities. When the five dimension are ranked in descending order according to their arithmetic means, it becomes clear that "Dimension Two: Academic Environment and Curricula" came in first (5.1125), followed closely by "Dimension One: Enhancing Students' Skills" (5.1112), then "Dimension Four: Meeting the Needs of Society and the Labor Market" (5.0837), and "Dimension Three: Professional Development of Teachers" came in fourth (5.0651), while "Dimension Five: Expected Challenges" came in last with an average of (5.0343). Furthermore, the results of the one-way ANOVA showed statistically significant differences at the significance level of (0.05) for the variables of teachers' specialization, favoring humanities specializations over science specializations, and for the variable of attending specialized workshops according to the STEM approach. The results confirm that the experience gained from attending these workshops made a real difference in teachers' responses. In contrast, the statistical data revealed no significant differences for the remaining study variables such as years of experience, academic qualification, grades taught, and finally, the school location variable, which means that these factors were not influential in creating a real difference between the responses of the teachers in the study sample.
The study concluded by recommending serious consideration of developing university programs that integrate STEM and artificial intelligence, considering this a roadmap for universities to flourish and remain abreast of modern developments and the rapidly changing demands of the future. The STEM approach is not merely an enrichment option, but rather the fundamental pillar upon which university programs should be built to bridge the gap in academic preparation, which will equip teachers and set them directly on the path to professional success.

**Keywords:** STEM, AI, University Programs, Educators' Perspective, from Adaptation to Flourishing Education

## Introduction
The university, as an institution that has existed for nearly a thousand years, has weathered many revolutions: The printing press, the Industrial Revolution, the internet, distance learning, and the pandemic. It has endured them all because its core function - the monopoly on specialized knowledge and its associated degrees - has remained intact. Today, for the first time

since its founding, this monopoly is being shaken to its very foundations (Bataineh, 2026) [5]. As the world's most prestigious universities begin to redesign their educational processes based on artificial intelligence, we are witnessing a historic transformation. The question now is no longer "Will the university be affected by artificial intelligence?" but rather "How will it be affected?" Global statistics indicate that many higher education institutions have closed completely in recent years, and an even greater number are threatened with closure in the coming years. Many statistical reports and educational studies indicate that the reason is not artificial intelligence alone, but rather a confluence of factors: Rising fees, declining public confidence in the value of degrees, the rise of micro credentials from companies like Google and Meta that are awarded in months and accepted in certain sectors of the job market, and declining birth rates, which researchers call the "demographic cliff." Artificial intelligence then appears to accelerate all these factors simultaneously (Bataineh, 2026; Bawaneh, *et al*, 2026b) [5, 8]. Therefore, universities must recognize the magnitude of this transformation and adapt to avoid collapse, even if it means losing a significant portion of their traditional structure. This could involve a decrease in student enrollment in traditional programs, leading to a smaller but more in-depth university experience. Consequently, lectures that simply transmit information (as artificial intelligence can handle this) will decline, while laboratories, projects, and face-to-face discussions will increase. Assessments will shift from basic levels (recall) to oral evaluations and advanced projects. Universities must invest in and collaborate with AI platforms rather than compete with or fight against them, transforming AI into a partner in education, not a competitor. The role of the university professor will shift from instructor to mentor. As a result, the value of a degree will increase in practical disciplines that require physical and human interaction and decrease in theoretical disciplines that can be learned digitally. This approach requires universities to demonstrate wise and flexible leadership by implementing a range of practices such as adopting the flipped classroom strategy, redesigning curricula, partnering with technology companies, and using alternative assessment methods. This paves the way for a more precise and profound phase that will lead the university to excellence and prosperity (Bataineh, 2026; Al-Hattami, & Bawaneh, 2024) [5, 1].

When universities embrace artificial intelligence (AI) not as a threat but as a historic opportunity to rediscover their core mission as places for shaping minds and personalities -not mere repositories of information - universities that understand and invest in this transformation will flourish (Bawaneh, *et al*, 2025) [10]. This involves training faculty members to be mentors, not lecturers, and integrating AI deeply and meaningfully into curricula, rather than superficially. It also entails redesigning the university environment to be a space for experimentation, creativity, and dialogue, not for rigid lectures. In doing so, their laboratories and innovation centers will thrive. They will succeed in attracting the best minds from around the world, because their newfound energy is compelling. They will have the capacity to train a generation that uses AI wisely and profoundly, making them more productive than any generation before them. And when their graduates enter the workforce, they will make a tangible difference, increasing the value of their degrees, not diminishing it (Bataineh, 2026; Bawaneh, *et al*, 2025) [5, 10].

In this context, and given the numerous attempts and repeated appeals from educators to implement educational approaches that integrate artificial intelligence - as a tool for brainstorming creative ideas, saving effort, time, and money - with a teaching approach based on the integration of science, technology, engineering, and mathematics (STEM), approach, it is believed by those interested in this approach that it will help improve the outcomes of the four disciplines it encompasses (Al-Qadi, 2019; Bawaneh, *et al*, 2026 A &B) [3, 9, 8]. STEM/STEAM has garnered the attention of international organizations seeking to develop their human resources in specialized fields that support innovation and competitiveness. Therefore, the National Governors Association (NGA) calls for increasing the competence of teachers in STEM and increasing the number of students pursuing advanced studies related to this field. Interest in STEM has increased over time, especially after the TIMSS international standardized student tests, in which many countries, including the United States, lagged behind their international competitors (Hong, & Song, 2016; Hussein, 2021) [16, 17]. The National Governors Association (NGA) report showed that the most important reasons for failure were the lack of strict application of science and mathematics standards in general education, the lack of preparation to believe in and care about the STEM approach, the shortcomings in stimulating students' motivation and interest in mathematics and science, and the lack of integration between the subjects that students learn and the real world. It also clarified that students often fail to see the connections between what they study and the career options for science, engineering, and mathematics education (Berland, 2013; Bawaneh, *et al*, 2026 A &B) [12, 9, 8].

Based on the preceding discussion of the future paths of universities in light of the artificial intelligence revolution, we believe that the STEM (Science, Technology, Engineering, and Mathematics) approach represents the most suitable educational framework in the age of artificial intelligence, as it integrates technical logic with human creativity. With machines capable of analyzing data, the learner's role shifts from passive recipient of information to active innovator and facilitator, utilizing AI tools as an intelligent partner. This led to the idea for this research, which sought to survey the opinions of teachers regarding the importance of establishing academic programs at the undergraduate and graduate levels that integrate STEM with artificial intelligence within the curriculum. This would contribute to building generations from primary to secondary school, graduating generations equipped with the knowledge and skills required by the job market. Accordingly, the research questions are as follows:

**Question 1:** To what extent are integrated academic programs combining STEM and artificial intelligence important from the perspective of Jordanian teachers?

**Question 2:** Does the degree of importance of having integrated academic programs between the STEM approach and artificial intelligence differ from the point of view of Jordanian teachers according to some variables (specialization, experience, educational level, stage that the teacher teaches, the location of the school, attendance of specialized training programs in STEM)?

**The significance of the Study**

The importance of this study lies in revealing the perspectives of Jordanian teachers on the importance of establishing academic programs in universities based on the Science, Technology, Engineering, and Mathematics (STEM) curriculum. These programs aim to prepare a generation equipped with the hard and soft skills necessary to keep pace with the rapid advancements in the context of the artificial intelligence revolution. It is hoped that the results will contribute to providing suggestions and recommendations to university leaders, educational policymakers, and the Ministry of Education and Higher Education regarding the importance of such academic programs in transforming universities from mere adaptation to academic flourishing, ensuring their continued vitality and dynamism, and enabling them to produce qualified graduates capable of working effectively.

**Study limitations**

The study sample was limited to teachers working in public schools in Jordan in the academic year 2025/2026, and the results of the study depend on the validity and reliability of the tools used.

**Literature Review**

STEM education requires providing and creating a learning environment that helps learners enjoy and engage in workshops integrating STEM fields. This enables them to develop their knowledge and skills in a way that allows them to understand and grasp science in an accessible, easy, and enjoyable manner, through both classroom and extracurricular learning. Theoretically, STEM education is based on constructivist theory and the findings of three decades of cognitive science. According to Browning and colleagues (2004) and Thomasian (2011) [27] the constructivist pillars that resonate with STEM education are:

- Learning is a constructivist and open process.
- Motivation and beliefs are integral to cognition.
- Social interaction is essential for cognitive development.
- Learning stems from contextual knowledge, strategies, and experiences.

Curricula, activities, and teaching strategies based on STEM education should be designed in an innovative, scientific way that helps students understand and grasp the fundamentals of various sciences in an accessible, easy, interactive, and integrated manner, open to the environment and within the context of the learner's existing knowledge and skills. This fosters the development of high-quality skills that have a lasting impact on daily life. Those interested in STEM education believe it will help improve the outcomes of the four disciplines: Science, technology, engineering, and mathematics (STEM) by using a multidisciplinary approach (Slattery, *et al*, 2013) [26]. Because modern innovations and inventions intersect these disciplines, STEM education has garnered the attention of international organizations seeking to develop their human resources in specialized fields that support innovation and competitiveness. Among these organizations is the National Governors Association (NGA), which advocates for increasing the competence of teachers in STEM and increasing the number of students pursuing advanced studies related to this field (Slattery, *et al*, 2013; Thomasian, 2011) [26, 27].

Thus, STEM schools have recently emerged as a new trend, characterized by distinctive features of their system and targeted practices. Several studies have sought to develop a theoretical model of the comprehensive STEM school, identifying and describing its key components, defining their commonalities, and synthesizing them into core conceptual elements. Comparative studies have also been conducted on comprehensive STEM schools and their counterparts in other fields. Some of these studies have shown that the main components of STEM schools are structural and interactive. The structural components include elements of organization, design, and support, while the interactive components encompass expected behaviors (innovation).

**Comprehensive STEM School**

Comprehensive high schools, traditionally known as STEM (Science, Technology, Engineering, and Mathematics), are widespread throughout the United States and some other countries as a mechanism to improve STEM education and increase the number of students with diverse specializations in STEM fields (Lynch, *et al*, 2013; Knowles, 2016; National Research Council, 2012) [20, 18, 22]. These schools are characterized by their focus on STEM and include both gifted and mainstream schools in the United States. They take a holistic approach, aiming to prepare all students in selective STEM fields for college (Lynch, *et al*, 2013; Knowles, 2016) [20, 18]. They target all students, including underrepresented minority students, and provide them with the necessary tools to succeed in their STEM majors, progressing to college and careers in the field.

By examining the theoretical frameworks of the STEM approach, it becomes clear that there is no single, explicit theory of operation for the comprehensive STEM school, as it is relatively new to the educational landscape, and schools vary in their designs. However, we can deduct from literature a set of common factors among these schools. Some offer enrichment courses in all STEM areas, featuring hypothesis-driven curricula. Others emphasize reformed teaching strategies and project-based learning and encourage the use of innovative technology to connect students with information. Some schools propose integrating specialized STEM programs into formal and non-formal education, after the typical school day, week, or year. Most emphasize the importance of engaging real-world companies in the fields of science, technology, engineering, and mathematics, connecting students with business, industry, and the world of work through mentorships, internships, or projects that take place both within and outside the regular school setting. Many schools also offer college-level courses early in the academic calendar and are flexible, designed to provide students with the opportunity to take courses at higher education institutions or online. Although there are variations in how the STEM approach is implemented, all schools and orientations emphasize the importance of providing a teaching staff comprised of qualified and well-equipped teachers for the STEM program. scholarly, the stated goals of the school are to prepare students for university-level science, technology, engineering, mathematics, and engineering in their chosen fields (Education and Training Evaluation Commission, 2019;

Lynch, *et al*, 2013; Knowles, 2016; National Research Council, 2012) [15, 20, 18, 22].

**The Eight Essential Elements of STEM Schools**

Several scholars and researchers have identified eight essential elements for a school operating according to the STEM approach. These eight elements include six core components (four educational and two non-educational) plus two support components. The educational components focus on teaching strategies and achieving students' academic goals. The non-educational components consist of strategies that do not directly focus on students' academic progress. These support components represent the school's intentions (outside the school itself) and encompass the social and emotional well-being of students. All eight elements contribute to enhancing the STEM education system. A description of each of the eight components follows (Education and Training Evaluation Commission, 2019; Al-Hattami, & Bawaneh, 2024; Physics Education Network, 2021) [15, 1, 24]:

**First: Educational Elements**

1. **Personalized Learning:** This represents the idea that learning should be tailored to each student's unique abilities and interests, as well as the use of methods that deepen learning. A key advantage of personalized learning is that it moves the classroom away from a "one-size-fits-all" approach, allowing for truly individualized instruction. Components of personalized learning include teachers tailoring instruction to individual learning needs, a flexible schedule, and student autonomy.
2. **Rigorous Learning:** STEM education is characterized by rigorous instruction and discipline across all subjects. The specific content of science, technology, engineering, and mathematics is not compartmentalized but rather approached and processed as a single, dynamic, and flexible subject. Components of rigorous learning include teachers facilitating student participation in authentic content.
3. **Career, Technology and Life Skills:** This element involves learning orientations and experiences that focus on the competencies students will use in college, their future careers, and life. Components may specifically emphasize skills that develop the knowledge and skills necessary to join the workforce and will be useful in any future workplace, as well as other skills such as communication and time management. The components included in this element are students' use of technology, student participation in career readiness activities (such as internships), and student-led learning experiences.
4. **Problem-Based Learning:** The problem-solving approach helps develop students' cognitive, behavioral, and social processes, such as observation, understanding relationships and connections between information, using statistical methods, numerical skills, and the ability to classify, communicate, infer, analyze, and interpret data. The problem-solving approach is considered a means of preparing students for real-life challenges (Bawaneh, & Alnamshan, 2023; Mahmoud, & Bawaneh, 2025; Lynch, *et al*, 2013; Knowles, 2016; National Research Council, 2012) [6, 21, 20, 18, 22].

**Second: Non-Academic Elements**

Non-academic elements include the school community and belonging, and the external community.

1. **School Community and Belonging:** This element focuses on the non-academic aspects of student development and includes fostering a strong school culture and providing students with support to meet their emotional needs. Many STEM high schools describe culture as an important part of student success. Some schools describe it as a family culture, while others focus on a school-wide culture of professionalism, for example: Staff support for the student's overall needs, students treating each other with trust and respect, and student participation in school decision-making. Staff also emphasize the school's symbolism in terms of behavior and values.
2. **External Community:** The external community represents the school's efforts and commitment to building and maintaining relationships with community members and various institutions. In some cases, schools may have a strong commitment to supporting their local community, while others may focus on their presence in the STEM education community and feel that a significant part of their success involves sharing best practices and strategies with other schools. Components that include this element include: The school establishing and maintaining a community presence, disseminating staff practices, and student participation in community service.

**Third: Supporting Elements**

1. **Staff characteristics:** This element focuses on the deliberate activities within the school model that aim to empower teachers' teaching and non-teaching behaviors, as well as the foundations of relationships among staff. Schools belonging to this model report the necessity of essential components such as staff collaboration and the school leader's support for staff growth and development. These two components facilitate communication among teachers across multiple disciplines, provide opportunities for staff participation in decision-making, and offer a shared planning element.
2. **Key Factors:** This element focuses on a set of factors (contexts and conditions) identified by stakeholders. These factors may include the characteristics of the organization where innovation takes place, the external (political and societal) climate surrounding innovation, and some schools have described family involvement as a crucial support for the school's mission. Other schools have described key staff attitudes, while others have highlighted the efforts of all students as essential for achieving school goals, and still others have pointed to staff flexibility and adaptability.

A critical reading of all that has been presented reveals that these factors are of great importance to schools, justifying their inclusion as one of the eight elements. The eight elements have shown that high-quality constructivist practices are essential to STEM school models. These practices encompass a variety of educational approaches and skills that students may use in future academic and professional endeavors, as well as strategies for engaging staff, students, and communities, which represent one of the key aspects of creating a framework for comprehensive STEM high schools in general.

**Steps for explaining a lesson according to the STEM approach:**

The STEM approach is based on the integration of Science, Technology, Engineering, and Mathematics (STEM), which are the four fundamental pillars of the STEM curriculum. These pillars must be integrated and utilized effectively. This can be implemented practically and easily through the following steps (Al-Hattami, & Bawaneh, 2024; Bawaneh, & Malkawi, 2023; Bawaneh, *et al*, 2026a and b; Berland, 2013; Physics Education Network, 2021) [1, 7, 9, 8, 12, 24]:

- **Brainstorming:** In this step, the teacher brainstorms numerous ideas, topics, and areas that can be focused on within the subject to be taught comprehensively. They then create a list of ideas they wish to implement, specifying where each idea falls within STEM, technology, engineering, arts, and mathematics. Finally, they select the idea that integrates all four subjects. At certain points in the lesson, students may participate in brainstorming and topic selection.
- **Validation:** In this step, the teacher verifies the ideas and their relevance to the main topic. They may consult with teachers from different disciplines to refine the idea and its implementation.
- **Application:** The teacher applies the five pillars of the STEM approach: Science, technology, engineering, arts, and mathematics. This step determines which pillars can be incorporated into the lesson in a meaningful and relevant way. Not all lessons will include all four pillars, but it's possible to achieve the goals of the STEM approach by relying on just two.
- **Implementation:** The teacher implements the lessons and may discover some errors. They should also be prepared to discover new things. The teacher's role is to support and facilitate the learning process.
- **Feedback:** In this step, the teacher reflects on what worked and what didn't happen after each lesson. They identify the best methods for their students, anticipate what can be achieved in each time, and understand what captured their students' interest and motivated them to learn.

**In conclusion:**

One of the noble goals of the STEM approach is to focus on practical application and connect learning to real life. Through this, all students can benefit from the STEM program by developing their inquiry, dialogue, critical thinking, and creative skills. It fosters genuine innovation that results from combining the mind of the scientist and technician with the mind of the artist and designer. It contributes to improving students' achievement in science and mathematics, increasing their interest in these subjects, and acquiring life skills and concepts of the ecosystem. Furthermore, the educational curricula, activities, and teaching strategies based on the STEM approach relieve modern, innovative scientific methods, helping students grasp and understand the educational material in an interactive and integrated manner, thus developing modern, high-quality skills relevant to their daily lives.

**Artificial Intelligence in STEM Education**

Today, educational institutions rely on artificial intelligence to develop the STEM curriculum, which helps us in the following ways (Bawaneh, *et al*, 2025 [10]; Curriculum Development Council, 2025; Mahmoud, & Bawaneh, 2025 [21]; Mahmoud, & Bawaneh, 2025 [21]; Lynch, *et al*, 2013 [20]; Knowles, 2016 [18]; National Research Council, 2012 [22]):

- **Designing Adaptive Learning Environments:** AI helps design personalized learning paths for each student based on their learning pace in mathematics and science.
- **Fostering Artistic Creativity:** Using AI-powered design tools helps students translate complex engineering and mathematical concepts into visual art projects.
- **Practical Competitions:** Schools and universities compete in AI competitions, where students integrate robotics programming with AI algorithms to solve complex problems.
- **Future Jobs and Career Paths:** The future job market depends on the intersection of these fields: AI Engineers: They combine programming (technology), statistics (mathematics), and the ability to create unconventional software solutions. User Experience (UX) and Data Designers: They rely on the arts (A) and mathematics (Math) to transform complex AI-generated data into engaging and user-friendly interfaces.

**The Role of Artificial Intelligence in Enriching STEM Applications:**

Artificial intelligence can play a pivotal role in enhancing STEM applications through (Bawaneh, *et al*, 2025 [10]; Al-Hattami, & Bawaneh, 2024 [1]; Curriculum Development Council, 2025; Mahmoud, & Bawaneh, 2025 [21]):

1. **Generating multimedia educational content:** AI can create 3D models and interactive simulations for project work and conduct virtual experiments that support understanding complex concepts in STEM fields.
2. **Personalizing activities and projects:** AI can analyze individual learners' needs and suggest STEM projects that match their interests and levels, increasing their motivation and engagement.
3. **Supporting creativity and innovation:** Generative AI tools can help learners generate new ideas, design innovative solutions to engineering and scientific problems, and create digital artwork.
4. **Facilitating collaboration and communication:** AI can provide platforms and tools that support teamwork and effective communication among learners during STEM projects.
5. **Providing assessment and feedback:** AI can analyze learners' work and provide detailed, personalized feedback that helps them develop their skills and understanding.

**Challenges and Obstacles to Integrating AI into STEM:**

Despite the immense potential of integrating generative AI into STEM, several challenges may hinder this process, including (Weis, Eisenhart, & Allen, 2016; Siyam, & Asqoul, 2021) [29, 25]; (Bawaneh, & Alnamshan, 2023; Mahmoud, & Bawaneh, 2025; National Research Council, 2012) [6, 21, 22]:

- **The need for advanced technological infrastructure and teacher training:** Using AI tools requires advanced hardware and software, as well as specialized training for teachers on how to effectively integrate them into the curriculum.
- **Ethical and legal considerations:** Privacy, data protection, and intellectual property rights issues must be considered when using generative AI tools in education.
- **Ensuring the quality of AI-generated content:** The accuracy and reliability of AI-generated content must be verified before its use in the educational process.
- **Avoiding over-reliance on technology:** It must be emphasized that AI is a tool to assist, not replace, human interaction and the teacher's essential role in guiding and facilitating learning.

**In conclusion**, artificial intelligence (AI) offers promising opportunities in STEM education, enhancing its goals of fostering innovation and cognitive integration among learners. This is achieved through generating diverse and interactive educational content, personalizing activities and projects, supporting creativity and collaboration, and providing effective assessment. AI can enrich the learning experience in STEM fields (science, technology, engineering, and mathematics). However, realizing this potential requires addressing challenges related to infrastructure, training, and ethical considerations to ensure the optimal use of these technologies in the educational process. AI's ability to generate diverse and interactive content can significantly contribute to making STEM concepts more engaging and accessible. Nevertheless, this approach must be accompanied by careful planning and consideration of the technical, ethical, and pedagogical challenges identified earlier. Ultimately, future research could focus on developing generative AI-based educational models that are adaptable to different educational and cultural contexts.

## Method

The descriptive analytical method was used by the researchers (Skafi, 2022). They employed advanced statistics utilizing a one-way analysis of variance test (One-way ANOVA) as the test's conditions were met after applying descriptive statistics like means, standard deviations, and the rank of each study tool item.

## The study population and its sample

All Jordanian educators employed in Jordanian schools during the 2025–2026 school year were included in the study sample. After reviewing the literature about the study—the STEM approach and its significance as an academic program that keeps up with global developments—the researcher used Google Forms to create the questionnaire. It was sent to as many instructors as possible via their social media groups, especially WhatsApp, using a sequential sampling technique after its validity and reliability had been confirmed. Table 1 displays the distribution of the study sample based on its variables.

**Table 1:** Description of the study sample of teachers according to the study variables

| Variables | | N | % |
|---|---|---|---|
| **Specialization** | Science | 88 | 0.55 |
| | Humanity | 45 | 0.28 |
| | Languages | 27 | 0.17 |
| | Total | 160 | 100% |
| **Education** | Bachelor | 91 | 0.57 |
| | Bachelor + PGDE | 31 | 0.19 |
| | MA or PhD | 38 | 0.24 |
| | Total | 160 | 100% |
| **Experience (Years)** | More than 15 | 54 | 0.34 |
| | (11-15) | 58 | 0.36 |
| | (6-10) | 20 | 0.125 |
| | (1 – 5) | 28 | 0.175 |
| | Total | | 100% |
| **Grades you teach** | Grades (1 – 6) | 54 | 0.34 |
| | Grades (7 – 10) | 48 | 0.30 |
| | Grades (11 – 12) | 58 | 0.36 |
| | Total | 160 | 100% |
| **School location** | Desert | 17 | 0.11 |
| | Village | 73 | 0.45 |
| | City | 70 | 0.44 |
| | Total | 160 | 100% |
| **Attended STEM workshops** | YES | 39 | 0.24 |
| | NO | 121 | 0.76 |
| | Total | 160 | 100% |

The results of the statistical description of the study sample of 160 teachers in Jordan showed a variation in their demographic and professional distribution. In terms of academic specialization, science teachers formed the largest group with 88 teachers (55%), followed by humanities teachers with 45 teachers (28%), while language teachers came in last place with 27 teachers (17%). As for academic qualifications, the majority of the sample held a bachelor's degree, with 91 teachers (57%), followed by those with higher degrees (master's or doctorate), with 38 teachers (24%), and then those with a bachelor's degree and a higher diploma, with 31 teachers (19%). Regarding professional experience, the data revealed that the most representative category was those with 11 to 15 years of experience, with 58 teachers (36%), closely followed by those with more than 15 years of experience, with 54 teachers (34%). The rest of the sample was distributed between those with 1 to 5 years of experience, with 28 teachers (17.5%), and those with medium experience, with 6 to 10 years, with 20 teachers (12.5%). This distribution mirrored the grade levels they teach, with teachers of grades 11-12 topping the list at 58 (36%), followed by teachers of grades 1-6 at 54 (34%), and then teachers of grades 7-10 at 48 (30%). Regarding the geographical location of the schools, the largest proportion of teachers were concentrated in rural schools (73, or 45%), followed by urban schools (70, or 44%), while desert and rural schools had only 17 teachers (11%). As for professional development and training, the results revealed a clear gap in qualifications; most teachers (121, or 76%) had never attended STEM workshops, compared to only 39 (24%) who had.

**Study instrumentation**

The researcher examined academic literature and previous research concerning the significance of the STEM approach and its impact on the future of commerce and the sustainability of higher education institutions (Berland, 2013; Kusmariono, Gopriyanto, and Kusumaningsih, 2021; Bawaneh, & Malkawi, 2023; Bawaneh, *et al*, 2026a and b; Wahono, Lin, & Chang, 2020; Weis, Eisenhart, & Allen, 2016) [12, 19, 7, 9, 8, 28, 29]. Subsequently, he devised a tool using a Likert scale with six points (strongly agree: 6; agree: 5; somewhat agree: 4; somewhat disagree: 3; disagree: 2; strongly disagree: 1) for positively phrased statements, and the reverse for negatively phrased ones. This decision was made to enhance the accuracy and dependability of the findings by preventing respondents from opting for the neutral option. The examination of the outcomes was carried out using SPSS statistical software, utilizing a six-point Likert scale instead of a five-point one. The tool consisted of 29 items across five categories (enhancing students' skills and competitiveness, academic environment and curriculum, professional growth and teaching effectiveness of educators, meeting societal and labor market needs, and lastly; focusing on the anticipated challenges in implementing the STEM approach). Its purpose was to gauge the satisfaction level of teachers in Jordan regarding the necessity of incorporating STEM-based educational programs in universities to align with global advancements amidst the era of artificial intelligence.

**Validity and Reliability of the instrument:**

To test the instrument's validity, the initial version, consisting of 35 items, was presented to a committee of six experts. Four of them were faculty members in educational technology and science and mathematics education at Yarmouk University and the Hashemite University in Jordan; and two were educational supervisors from the Jordanian Ministry of Education, one supervising science courses and the other humanities courses. The experts were invited to provide feedback on the clarity and suitability of each item individually, and its effectiveness in measuring the intended objectives. Based on their feedback, the reviewers removed six items according to specific criteria, and made the necessary modifications to five items, resulting in a final version of the instrument comprising 29 items: Five items to measure the development of students' skills and competitive abilities; six items to measure the motivating factors of the educational environment and curricula; seven items to measure the professional development and teaching performance of teachers when using the STEM approach; five items to determine the role of STEM in meeting the demands of the current and future labor market; and finally, six items to identify the most significant challenges expected in implementing the STEM approach. The researcher calculated the reliability coefficient using Cronbach's alpha, yielding a value of 0.965. This result is considered excellent and acceptable for scientific research purposes (Obiedat, Kayed, and Adass, 2016 [23]; Al-Kellani, and Al-Shraifeen, 2011).

**Statistical standard**

The questionnaire items are divided into three categories indicating weak (W), medium (M), and strong (S) based on the average numerical value of each item. To classify the items, a specific equation is utilized to determine the width of each category. This equation, as referenced in studies by Al-Rashidi (2018) [4] and Bawaneh *et al*. (2020) [11], is as follows:

$$P = (U – L) / N$$

Here, U and L represent the upper and lower boundaries of the scale, while N indicates the number of categories needed. By substituting the values of U, L, and N into the equation, we calculate the value of P:

$$P = (6-1) / 3 = 1.67$$

With P equaling 1.67, we establish the ranges for the three categories within the scale of 1.00 to 6.00. These intervals are defined as follows: W Є (1:00; 2:67), M Є (2:68; 4:35), and S Є (4:36; 6:00), representing weak, medium, and strong correspondingly. For instance, an item with an average (m) falling between 4.36 and 6.00, meeting the condition (4:36 < m < 6:00), is classified as S, indicating strong.

**Results**

Assumptions linked to the normal distribution and linear regression were examined. According to the guidelines provided by George and Mallery (2000), it was observed that the skewness and kurtosis values were nearing zero, indicating that the distribution of the scores closely resembled a normal curve. Additionally, the study's results confirmed that there was no breach in the assumption of a linear association between the variables.

To answer the first study question, which states: "To what extent is the existence of integrated academic programs between the STEM approach and artificial intelligence important from the point of view of Jordanian teachers?", the researcher calculated the arithmetic means and standard deviations for all items of the instrument and for each of its domains, and for each item of the five dimensions of the study, noting that the number of participants was 160 teachers. The results were presented in Table (2).

**Table 2:** Means and standard deviations for all items of the instrument

| No | Item | Mean | SD | Category |
|---|---|---|---|---|
| **Dimension 1: Enhancing students' skills and competitiveness** | | | | |
| I_1 | Implementing the STEM program contributes to enhancing students' critical thinking and problem-solving skills. | 5.1563 | .75691 | H |
| I_2 | The STEM approach helps develop teamwork and cooperation skills among students. | 5.1438 | .77579 | H |
| I_3 | The STEM program links theoretical concepts with practical applications in students' daily lives. | 5.0875 | .78818 | H |
| I_4 | The STEM approach develops innovation and creativity skills to meet the challenges of the digital future. | 5.0375 | .86065 | H |
| I_5 | This approach strengthens teamwork skills and effective communication among learners during practical application. | 5.1313 | .74498 | H |
| **Overall_Dimension 1** | | **5.11128** | **H** | |
| **Dimension 2: Academic Environment and Curriculum** | | | | |
| I_6 | The STEM program integrates science, technology, engineering, and mathematics in an interconnected and complementary way. | 5.1625 | .77612 | H |
| I_7 | The STEM program transforms the classroom from a rote learning environment to an active, student-centered learning environment. | 5.1063 | .87305 | H |
| I_8 | The STEM approach provides engaging learning contexts that increase students' motivation to learn. | 5.0688 | .84765 | H |
| I_9 | The program provides broader opportunities to use technology and modern technical means in education. | 5.1250 | .79107 | H |
| I_10 | Project-based learning in STEM increases students' motivation towards self-directed learning. | 5.1188 | .75546 | H |
| I_11 | The program establishes a culture of innovation and early scientific research among all student groups. | 5.0937 | .68952 | H |
| **Overall_Dimension 2** | | **5.112517** | **H** | |
| **Dimension 3: Teachers' professional growth and teaching effectiveness** | | | | |
| I_12 | Having a STEM program motivates teachers to diversify their teaching and assessment strategies. | 5.1062 | .74053 | H |
| I_13 | Integrated planning in STEM promotes coordination and collaboration among teachers of different disciplines. | 5.0875 | .73019 | H |
| I_14 | Implementing this program enhances the professional competencies and technical skills of the teacher. | 5.1188 | .65753 | H |
| I_15 | The STEM program provides teachers with a clear framework for assessing students' performance and practical skills. | 4.9625 | .70833 | H |
| I_21 | I believe that having a degree (Bachelor's, Higher Diploma, Master's) specializing in the STEM field is of great importance. | 5.0000 | .80094 | H |
| I_22 | If I had the opportunity to study for a higher diploma or a specialized master's degree in a STEM field, I wouldn't hesitate. | 5.0625 | .87371 | H |
| I_23 | I believe that studying and working with the STEM approach in the field of education will be enjoyable and attractive. | 5.1188 | .76374 | H |
| **Overall_Dimension 3** | | **5.065186** | **H** | |
| **Dimension 4: Meeting the needs of society and the labor market** | | | | |
| I_16 | This program effectively keeps pace with the demands of the future job market and digital transformation. | 5.0563 | .79501 | H |
| I_17 | The application of the STEM approach enhances students' ability to solve real-life problems in creative ways. | 5.0375 | .67187 | H |
| I_18 | Integrating the STEM approach contributes to preparing a generation capable of meeting the demands of the current industrial revolution. | 5.1063 | .72335 | H |
| I_19 | The STEM program directs students' interests towards the scientific and engineering disciplines that society needs. | 5.1063 | .76559 | H |
| I_20 | The program reduces the gap between what students learn in school and what the actual job market needs. | 5.1125 | .67281 | H |
| **Overall_Dimension 4** | | **5.08378** | **H** | |
| **Dimension 5: Expected challenges in implementing the Science, Technology, Engineering and Mathematics (STEM) curriculum.** | | | | |
| I_24 | Teachers face a severe shortage of specialized training courses to implement STEM activities. | 5.1125 | .95158 | H |
| I_25 | The current school environment lacks the laboratories and technological tools necessary to implement projects. | 5.1375 | .87945 | H |
| I_26 | The limited class time prevents the teacher from implementing inquiry-based strategies. | 4.9375 | 1.00744 | H |
| I_27 | The lack of clear and readily available methodological evidence places an additional burden on teachers in preparation. | 5.1000 | .85561 | H |
| I_28 | The large number of students in a single class makes it difficult to monitor and evaluate the groups accurately. | 5.1313 | .94584 | H |
| I_29 | Current traditional assessment and testing methods conflict with the nature of STEM skills assessment. | 4.7875 | 1.04843 | H |
| **Overall_Dimension 5** | | **5.034383** | **H** | |
| **Overall** | | **5.081429** | **H** | |

**An analytical reading of the study results within each of its dimensions and in general.**

**The first dimension: Enhancing students' skills and competitiveness**

The statistical results showed that this dimension received a very high level of agreement (H) with an overall arithmetic mean of (5.111). The first item (I_1), related to enhancing critical thinking and problem-solving skills, ranked first with a mean of (5.156) and a standard deviation of (0.756), indicating the study sample's agreement on the added cognitive value of the STEM approach. This was followed by a noticeable convergence between the second (I_2) and fifth (I_5) items, related to teamwork and effective communication skills, with means of (5.143) and (5.131) respectively and low standard deviations, confirming the respondents' awareness of the social and skill-based impact of the approach. In contrast, the fourth item (I_4) related to innovation skills to meet digital challenges recorded the relatively lowest average in this dimension (5.037) accompanied by the highest rate of dispersion (0.860), which shows a slight difference among the sample members regarding the readiness of current programs for the digital future.

**The second dimension: Academic Environment and Curricula**

The second dimension ranked first in terms of importance, with an overall mean score of 5.112 and a high level of agreement (H). Item 6 (I_6), which stipulates the integrated integration of science, technology, engineering, and mathematics (STEM), topped the list with a mean score of 5.162 and a standard deviation of 0.776. This reflects the deep and accurate understanding of the structural philosophy underlying the STEM approach among the sample group. Item 10 (I_10), concerning increasing student motivation towards self-directed learning through projects, also received high agreement and interest, with a mean score of 5.118 and the lowest standard deviation in this dimension (0.755), demonstrating the effectiveness of active learning strategies. Item 8 (I_8), related to providing engaging learning contexts, ranked relatively last with a mean score of 5.068 and a standard deviation of 0.847. This necessitates considering how to develop these contexts to make them more attractive to all student groups.

**The third dimension: Teachers' Professional Development and Teaching Effectiveness**

The overall arithmetic mean for this dimension was 5.065, with a high level of agreement (H). Item 14, concerning the enhancement of professional competencies and technical skills, and Item 23, based on the idea of the attractiveness and enjoyment of working in the STEM field, each had an average of 5.118. Item 14 demonstrated the highest degree of statistical homogeneity within the dimension, with a small standard deviation of 0.657, indicating strong confidence in the professional benefits of this approach. Furthermore, respondents expressed a clear desire to advance their academic careers by pursuing a postgraduate diploma or a specialized master's degree in Items 21 and 22. However, Item 22 exhibited a relative dispersion of 0.873, reflecting the presence of individual or institutional obstacles preventing them from making an immediate decision to study. The fifteenth item (I_15), which relates to the clarity of the performance skills assessment framework, came in last place with an average of (4.962), an indicator that draws attention to the weakness of the current assessment tools.

**The fourth dimension: Meeting the Needs of Society and the Labor Market**

The results showed that the fourth dimension received very high approval, with an overall average of (5.083). Item 20 (I_20), which focuses on bridging the gap between what students learn in school and the actual needs of the labor market, ranked first with an average of (5.112) and a very low standard deviation (0.672), confirming the strong belief in the utilitarian function of the approach. Items 18 (I_18) and 19 (I_19) were tied with an average of (5.106) for promoting developmental aspects, keeping pace with the industrial revolution, and guiding students towards engineering and scientific fields. Although item 17 (I_17), which deals with solving real-life problems creatively, received the highest degree of agreement (0.671), it recorded the lowest average within the dimension (5.037), indicating that the sample group perceives the program's connection to the immediate labor market as stronger than its connection to solving general, everyday problems.

**The fifth dimension: Expected Challenges in Implementing the STEM Approach**

This dimension was the most statistically significant, recording an overall mean of (5.034) with a high degree of agreement (H). However, it was associated with the highest rates of dispersion and standard deviations in the entire study. Item 25 (I_25), concerning the lack of laboratories and technological equipment in the school environment, emerged as the greatest challenge with a mean of (5.137) and a standard deviation of (0.879). This was closely followed by the high student density in item (I_28), with a mean of (5.131) and a high standard deviation of (0.945). Item 29 (I_29), regarding the conflict between traditional assessment methods and the nature of STEM skills, had the highest standard deviation in the study (1.048) with a mean of (4.787). This was followed by item 26 (I_26), concerning the limited class time, with a standard deviation of (1.007) and a mean of (4.937). This marked increase in standard deviations (which exceeded the fractional value of 1.00) confirms the heterogeneity of the sample responses, which proves that the extent of suffering from these challenges varies sharply and substantially from one school to another based on the reality of the available infrastructure.

**Comparative Analysis of the Study's dimensions**

A close reading of the overall study average (5.081) and the high level of agreement (H) indicates a solid and very positive foundation for the implementation of the STEM program. When ranking the five dimensions in descending order according to their arithmetic means, it becomes clear that "The second dimension: Academic Environment and Curriculum" came in first (5.1125), followed closely by "The first dimension: Enhancing Students' Skills" (5.1112), then "The fourth dimension: Meeting the Needs of Society and the Labor Market" (5.0837), and "The third dimension: Professional Development of Teachers" came in fourth (5.0651), while "The fifth dimension: Expected Challenges" came in last with an average of (5.0343).

**Interpretation and Interrelation of Results (The Gap Between Theory and Practice)**

This descending order reveals a significant semantic gap between the theoretical and practical aspects of the approach. The study sample placed the cognitive framework of curricula and students' future skills at the top of their priority list, demonstrating a strong conviction in the idea's feasibility and educational merit. However, this optimistic outlook gradually declines, reaching its lowest point when discussing the implementation environment and the real-world challenges facing teachers. This reflects a legitimate concern within the educational field regarding the lack of essential elements for practical success.

This statistical correlation is clearly evident at the intersection of the results for the third and fifth dimensions. The significant decrease in the mean score for item (I_29), concerning the conflict between traditional assessment and STEM skills, correlated with a corresponding decrease in item (I_15), related to the absence of a clear framework for evaluating teachers' performance and practical skills (4.962). This statistical crossover academically proves that the "assessment and testing" system is the most opaque and profound obstacle in the field, and that teachers' belief in the STEM program is mainly threatened by the existence of traditional assessment systems that do not suit its integrative and project-based nature.

**To answer the second question,** which states: "Does the degree of importance of having integrated academic programs between the STEM approach and artificial intelligence differ from the point of view of Jordanian teachers according to some variables (specialization, experience, educational level, stage taught by the teacher, location of the school, attendance of specialized training programs in STEM)?" the researchers calculated the arithmetic means and standard deviations associated with the study variables, and the results were as shown in Table (3).

**Table 3:** Means and standard deviations associated with the study variables

| Variables | | N | Mean | SD | Std. Error |
|---|---|---|---|---|---|
| **Specialization** | Science | 88 | 5.1489 | .44534 | .04747 |
| | Humanity | 45 | 4.9004 | .77135 | .11499 |
| | Languages | 27 | 5.1533 | .52499 | .10104 |
| | Total | 160 | 5.0797 | .57524 | .04548 |
| **Education** | Bachelor | 91 | 5.0925 | .46074 | .04830 |
| | Bachelor + PGDE | 31 | 5.1179 | .44843 | .08054 |
| | MA or PhD | 38 | 5.0181 | .85853 | .13927 |
| | Total | 160 | 5.0797 | .57524 | .04548 |
| **Experience (Years)** | More than 15 | 28 | 5.0542 | .47396 | .08957 |
| | (11-15) | 20 | 5.0845 | .46418 | .10379 |
| | (6-10) | 58 | 5.1463 | .49164 | .06455 |
| | (1 – 5) | 54 | 5.0198 | .72954 | .09928 |
| | Total | 160 | 5.0797 | .57524 | .04548 |
| **Grades you teach** | Grades (1 – 6) | 54 | 5.0594 | .52729 | .07176 |
| | Grades (7 – 10) | 48 | 5.2098 | .36039 | .05202 |
| | Grades (11 – 12) | 58 | 4.9911 | .73131 | .09603 |
| | Total | 160 | 5.0797 | .57524 | .04548 |
| **School location** | Desert | 17 | 5.1582 | .45699 | .11084 |
| | Village | 73 | 5.0685 | .57458 | .06725 |
| | City | 70 | 5.0724 | .60654 | .07250 |
| | Total | 160 | 5.0797 | .57524 | .04548 |
| **Attended STEM workshops** | YES | 121 | 5.0208 | .61839 | .05622 |
| | NO | 39 | 5.2626 | .36275 | .05809 |
| | Total | 160 | 5.0797 | .57524 | .04548 |

The descriptive data for the specialization variable reveals an apparent disparity in the response levels of the sample members. Language teachers showed the highest level of agreement, with a mean score of 5.1533, followed closely by science teachers with a mean score of 5.1489. Conversely, the overall response rate for humanities teachers dropped to 4.9004, the lowest level compared to the other specializations. Regarding the dispersion of opinions, the standard deviation values revealed that the science specialization exhibited the most homogeneous and consistent viewpoints, with a standard deviation of 0.44534. In contrast, the humanities specialization showed the greatest dispersion among its members, with a standard deviation of 0.77135, indicating a lack of consistency in the response pattern within this latter group. Statistical extrapolation for the educational qualification variable indicates a significant convergence in the means of the three groups, with a relative advantage for those holding a bachelor's degree plus a higher diploma, who recorded the highest mean score of 5.1179, followed closely by those holding a bachelor's degree with a mean score of 5.0925. In contrast, the mean score for those holding advanced degrees (MA or PhD) settled at the lowest value of (5.0181). Considering the dispersion indicators, the higher diploma category was the most consistent and homogeneous with a low standard deviation of (0.44843), while the postgraduate category recorded a high standard deviation of (0.85853), reflecting a wide variation and gap in the views of highly qualified teachers regarding the studied variable.

On the other hand, an analytical reading of the years of experience variable reveals that teachers with intermediate experience (6 to 10 years) achieved the highest response rate, with a mean score of 5.1463. This was followed by the 11–15-year experience group (5.0845), and then teachers with more than 15 years of experience (5.0542). Conversely, newly appointed teachers with 1 to 5 years of experience showed the lowest agreement, with a mean score of 5.0198. Standard deviations indicate that the 11–15-year experience group exhibited the most cohesive and homogeneous opinions (0.46418), while the newly appointed teachers (1-5 years' experience) exhibited the most disparate and divergent views (0.72954). An examination of the data related to the grade levels taught by the respondent teachers reveals a clear difference favoring teachers of grades 7-10, who recorded the highest mean score of 5.2098, followed by teachers of elementary grades 1-6 with a mean of 5.05594. Teachers of secondary grades 11-12, however, showed the lowest response rate, with a mean of 4.9911. When measuring descriptive agreement, teachers of grades 7-10 demonstrated exceptional agreement and a very high degree of homogeneity, with a low standard deviation of 0.36039, while the responses of teachers of grades 11-12 were significantly dispersed, achieving the highest standard deviation of 0.73131.

Furthermore, a descriptive comparison of the school environment and location variables reveals a clear convergence and near-perfect match between the responses of teachers in urban schools (mean 5.0724) and rural schools (mean 5.0685). Despite this similarity between urban and rural environments, schools in desert regions stood out, achieving the highest mean score among all groups (5.1582). This distinction is further reinforced by the fact that desert schools had the lowest standard deviation (0.45699), confirming the convergence of a unified and stable opinion among their members, in contrast to urban schools, which exhibited the greatest dispersion in responses (standard deviation 0.60654). Given the study's focus on the STEM approach and its role in enhancing the future role of universities, the statistical comparison of the variable of participation in STEM workshops revealed a clear research paradox. It showed that teachers who had never attended these workshops demonstrated a higher level of agreement, with a mean score of 5.2626, surpassing their colleagues who had attended, whose mean score was 5.0208. The difference was not limited to the mean scores; it extended to levels of homogeneity as well. The group that did not attend the workshops showed a low and stable standard deviation of 0.36275, reflecting strong agreement in their views, while the responses of the group that attended the workshops were characterized by greater dispersion and a high standard deviation of 0.61839.

Based on the results, we find clear and varying differences in the mean scores of Jordanian teachers regarding the importance of the STEM approach in enhancing the role of universities and their contributions to serving human societies and providing the labor market with suitable competencies. These differences in mean scores varied according to the study variables (specialization, experience, academic degree, the stage the teacher teaches, school location, and attendance at specialized STEM training programs). To confirm the significance of these differences, the researcher conducted a one-way analysis of variance (ANOVA), and the results are shown in Table 4.

**Table 4:** One-way analysis of variance (ANOVA) for the study variables

| Variables | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| **Specialization** | Between Groups | 2.014 | 2 | 1.007 | 3.125 | .047 |
| | Within Groups | 50.600 | 157 | .322 | | |
| | Total | 52.614 | 159 | | | |
| **Experience** | Between Groups | .469 | 3 | .156 | .468 | .705 |
| | Within Groups | 52.145 | 156 | .334 | | |
| | Total | 52.614 | 159 | | | |
| **Education** | Between Groups | .204 | 2 | .102 | .306 | .737 |
| | Within Groups | 52.410 | 157 | .334 | | |
| | Total | 52.614 | 159 | | | |
| **Grades you teach** | Between Groups | 1.290 | 2 | .645 | 1.973 | .142 |
| | Within Groups | 51.324 | 157 | .327 | | |
| | Total | 52.614 | 159 | | | |
| **School location** | Between Groups | .118 | 2 | .059 | .176 | .839 |
| | Within Groups | 52.496 | 157 | .334 | | |
| | Total | 52.614 | 159 | | | |
| **Attended STEM workshops** | Between Groups | 1.724 | 1 | 1.724 | 5.354 | .022 |
| | Within Groups | 50.890 | 158 | .322 | | |
| | Total | 52.614 | 159 | | | |

The results of the one-way ANOVA showed statistically significant differences at ($\alpha$= 0.05) level between the mean responses of the sample members attributable to the variable of academic specialization. The calculated F-value was 3.125, with a significance level of 0.047, which is a statistically significant indicator demonstrating the impact of participants' specialization on their responses. Similarly, statistically significant differences were also found attributable to the variable of attending STEM workshops. The calculated F-value was 5.354, with a significance level of 0.022, which is less than 0.05 and confirms that the experience gained from attending these workshops made a real difference in the teachers' responses.

In contrast, the statistical data revealed no statistically significant differences at ($\alpha$= 0.05) level attributable to the variable of years of experience. The calculated F-value was 0.468, with a high significance level of 0.705. The results also indicated the absence of significant differences for the educational qualification variable, with a calculated F-value of 0.306 and a non-significant significance level of 0.737.

The results also showed no statistically significant difference attributable to the grade level taught variable, with a calculated F-value of 1.973 and a significance level of 0.142. Finally, the school location variable was consistent with the previous variables in terms of having no effect, with a calculated F-value of 0.176 and a significance level of 0.839. This means that the last four factors (experience, qualification, grade level, and location) did not significantly influence the responses of the teachers in the study sample.

**Interpreting the Results and Linking Them to the Study Title**

**Interpreting the Results of Question 1:** The significant increase in the overall study average (5.081), and specifically the leading scores in the "Academic Environment and Curriculum" (5.1125) and "Enhancing Students' Skills" (5.1112) areas, is attributed to teachers' growing awareness of the nature of the digital age. Educators recognize that traditional teaching practices based on knowledge recycling and memorization are no longer sufficient to counter the artificial intelligence revolution, which has rendered rote learning obsolete. This high level of support reflects the field's conviction that moving students from a stage of passive "adaptation" to technology to one of "flourishing" and innovation necessarily requires moving beyond linear, disconnected curricula and modernizing educational thought. Therefore, teachers believe that the only radical approach to achieving this transformation is the integrated "STEM" philosophy, which, in its structure, mirrors the workings of artificial intelligence based on data processing, logical analysis, and solving complex problems.

Conversely, the decline in the "Professional Growth of Teachers" (5.0651) and "Expected Challenges" (5.0343) dimensions is explained by the "stressful duality" dilemma faced by teachers in the field. Educators find themselves required to keep pace with the rapid advancement of artificial intelligence without receiving sustained prior training, leading them to perceive in-service training as a drain on their effort and time. This highlights the critical importance of "designing university programs according to a STEM approach." This statistical decline reflects teachers' desire for their professional preparation to be built in an integrated manner from their undergraduate studies, enabling them to enter the field ready to thrive and be empowered directly, rather than bearing the burden of subsequent adaptation and training in a school environment that may lack the necessary digital infrastructure and logistical resources for implementation.

A deeper explanation for this gap emerges when analyzing the assessment crisis through the statistical intersection of items (I_29) and (I_15), with an average of (4.962). This decline is attributed to a "structural schism" within the educational system and its legislative policies. While modern trends encourage teachers to adopt innovative and integrated teaching methods aligned with the STEM approach, official measurement and assessment systems insist on using traditional standardized and achievement tests that measure individual memorization and rely on rigid grades. This contradiction undermines teachers' sense of professional security due to the absence of clear frameworks and performance evaluation rubrics that measure their and their students' practical and performance skills in STEM and artificial intelligence projects. Consequently, their high motivation towards the university philosophy of the STEM approach is threatened by the clash with traditional and inadequate measurement systems. This academically demonstrates that the success of any modern university program design hinges on a comprehensive restructuring of the measurement and assessment system in parallel with curriculum development.

**Interpretation of the Results of Question 2:** The statistically significant differences in the specialization variable (F = 3.125, Sig = .047) are attributed to the varying cognitive and academic backgrounds of the teachers. Specialized university preparation contributes to differentiation in the teacher's vision, training style, and receptiveness to modern concepts. This variation indicates that the nature of the specialization (scientific, humanities, or applied) plays a crucial role in determining the level of teachers' skills or attitudes. This is because some specializations inherently include technical or scientific skills that directly intersect with the study's objectives, leading to significantly different responses from their colleagues in other specializations. Furthermore, the superior responses of those in scientific specializations can be attributed to the nature of these specializations, which rely on cumulative knowledge building, logical thinking, and problem-solving—skills that often align with modern educational approaches. The decline in specialization in the humanities and the significant disparity in responses is attributed by researchers to a traditional gap in the preparation of humanities and social science teachers regarding the integration of modern technologies or scientific models. This leads to fluctuating and inconsistent opinions between teachers with self-taught skills and those who rely on lecture-based methods. The absence of statistically significant differences in years of experience (F = .468, Sig = .705) indicates that the length of service in the field of education no longer significantly influences the responses of the sample. This can be explained by the fact that the current educational system imposes uniform standards and challenges on all teachers, regardless of their seniority, or that available professional development programs are offered equally to everyone. This has resulted in a convergence of views and a homogeneity of opinions between new and long-serving teachers about this study.

The results also show no statistically significant differences based on academic qualifications (F = 0.306, Sig = 0.737). This may indicate clear homogeneity in the responses of teachers with varying degrees (Bachelor's, Master's, and Doctorate). This can be attributed to the fact that daily field practices within schools, regulations, and the prescribed curriculum are the primary drivers of a teacher's behavior and opinions, rather than their academic qualifications. Thus, the knowledge acquired through higher degrees did not manifest as a differentiating factor in this specific aspect of the study, given the prevalence of a uniform professional environment. Furthermore, the results confirmed the absence of statistically significant differences based on the grade level taught by the teacher (F = 1.973, Sig = 0.142), reflecting a convergence of teachers' viewpoints regardless of the age group or grade level of the students they work with. This can be explained by the fact that the skills or competencies targeted in the survey represent commonalities and general requirements for the teaching profession as a whole and are not limited to one educational stage over another. This led to teachers across different grade levels agreeing in their evaluations and responses to the study items. To understand the role of school location within the Jordanian context, the absence of statistically significant differences in the school location variable (F = .176, Sig = .839) can be attributed to the Ministry of Education's policy of standardization and centralization in resource allocation, curriculum implementation, and the provision of educational and training environments for schools. This administrative and organizational similarity has blurred the lines between schools based on their geographical location (whether in urban, rural, or other areas), resulting in teachers facing the same conditions and possessing identical attitudes unaffected by their workplace location.

**Conclusions**

Since this study focuses on the role of the STEM approach in enhancing the role of universities and providing the labor market with competencies suited to future jobs, the statistically significant differences favoring teachers who did not attend STEM workshops (F = 5.354, Sig = 0.022) represent a common paradoxical finding. Educationally, this can be explained by the "awareness of difficulty effect." Individuals who did not attend the workshops possess idealized and theoretical perceptions of these educational models, leading to high and consistent evaluations due to their lack of exposure to practical challenges. Teachers who did attend the workshops, however, encountered the real-world demands of the STEM methodology, such as the need for advanced laboratory equipment, complex planning, and extended lesson time. This made them more realistic and cautious in their responses, and their divergent opinions can be attributed to the availability of resources in their schools to implement what they learned in those workshops. In addition, the number of teachers who answered in the negative (no) was three times less than those who answered in the positive (yes), and this may also be an additional factor.

The statistically significant differences in the specialization variable (Sig = .047) are of paramount importance in the context of this study's title. They underscore that current university programs, with their traditional outcomes, create a gap among teachers in their ability to transition from "adapting" to the AI revolution to "flourishing" and achieving digital empowerment. This disparity suggests that teachers with scientific or applied specializations may be better prepared to integrate AI tools due to the intersection of their disciplines with 21st-century skills. This necessitates a redesign of university programs and the standardization of their objectives according to a STEM approach across all disciplines, ensuring that all future teachers are equally equipped with the tools for professional flourishing before entering the field.

The statistically significant differences in STEM workshop attendance (Sig = .022) provide compelling practical evidence supporting the study's central theme. These workshops served as a true "bridge" for teachers to thrive in the context of the artificial intelligence revolution, equipping them with the problem-solving and design thinking skills demanded by this era. This tangible positive impact of the workshops validates the teachers' view that the STEM approach is not merely an enrichment option, but rather the fundamental pillar upon which university programs should be built. Bridging this gap during the academic preparation phase will eliminate the need for subsequent adaptation workshops and directly propel teachers onto the path of professional success.

The absence of statistically significant differences in the variables of years of experience (Sig = .705), academic qualifications (Sig = .737), grade level (Sig = .142), and school location (Sig = .839) provides a unifying indication that supports the study's philosophy. The artificial intelligence revolution has imposed a rapidly evolving technological reality that has erased traditional distinctions among teachers. Long experience, advanced academic degrees, and school geography are no longer sufficient to enable teachers to confront the challenges of artificial intelligence. This homogeneity in teachers' responses reflects a collective awareness among professionals in the field that the challenge is a shared one, and that the only common solution to move beyond simple "adaptation" to comprehensive "flourishing" lies in a unified, radical strategy that begins with the fundamental starting point: "designing university programs according to the STEM approach."

**Recommendations**

The study recommends the importance of designing integrated university programs that combine STEM and artificial intelligence to enhance the role of universities and provide the labor market with the skills needed for future jobs. Current university programs, with their traditional outcomes, create a gap in graduates' ability to move from "adapting" to the AI revolution to "flourishing" and achieving digital empowerment. This study aligns with numerous international studies that consider integrated programs not merely an enrichment option, but a fundamental pillar upon which university programs should be built, serving as a roadmap to save universities and higher education from extinction. Bridging this gap during the academic preparation phase will eliminate the need for subsequent training workshops and enhance the effectiveness of workers in various sectors, thus achieving professional success that benefits human societies and global progress.

**Point for clarification:** I disclose that I used some artificial intelligence applications for translation and linguistic reformulation.

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