International Journal of Innovative Research and Scientific Studies, 7(2) 2024, pages: 521-534

IJIRSS
International Journal of Innovative Research & Scientific Studies

ISSN: 2617-6548

URL: www.ijirss.com

Science teachers' perceptions towards the challenges of employing educational technology skills in teaching science and their relationship to their motivation

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Abstract

The current study aimed to reveal the science teachers' perceptions of the challenges they face in employing educational technology skills in teaching science and their relationship to their motivation towards teaching. The descriptive survey method was adopted to achieve this study's objectives. Two questionnaires were developed: the first tool measures science teachers' perceptions of the challenges they face in employing educational technology skills in science instruction. It consists of 35 items distributed over four fields using the Likert scale. The second questionnaire measures the science teachers' motivation towards education, consisting of 31 items. The measures were applied to 100 science teachers in the Directorate of Education of the Koura District. The findings showed that science teachers' perceived challenges in employing technology skills in science education were medium. Statistically significant gender differences at the significance level (α=0.05) were found between the means of participants' responses on the measure of the challenge in favor of females. However, no statistically significant differences were attributable to specialization and years of experience. There were statistically considerable gender differences at the significance level (α=0.05) between the participant's responses on the motivation scale in favor of females. There were no statistically significant differences due to specialization or years of experience. However, there was no statistically significant correlation between science teachers' perceptions of the challenges they face in employing educational technology skills and their motivation to teach science.

Keywords: Awareness, Educational technology skills, Institutions, Motivation towards education, Schools, Science teachers, Training programs.

DOI: 10.53894/ijirss.v7i2.2681
Funding: This study received no specific financial support.
History: Received: 28 August 2023/**Revised:** 16 October 2023/**Accepted:** 26 January 2024/**Published:** 5 February 2024

Authors' Contributions: All authors contributed equally to the conception and design of the study. All authors have read and agreed to the published version of the manuscript.
Competing Interests: The authors declare that they have no competing interests.
Transparency: The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.
Institutional Review Board Statement: The Ethical Committee of the Yarmouk University, Jordan has granted approval for this study on 1 September 2022 (Ref. No. DF/103/894).
Publisher: Innovative Research Publishing

1. Introduction

Technology is one of the most significant and rapid achievements in human history, becoming indispensable to people in many spheres of life. It has considerably impacted educational institutions' development by making available the many techniques and means that help access knowledge in its correct form. It provides students with easy-to-access information, accelerated learning, and fun opportunities to practice what they learn. Educational institutions have invested in this technology to develop teacher and student skills. It also sought to provide good infrastructure to keep pace with developments and to provide the best education.

Cruzeiro, et al. [1] consider integrating technology into education as a dynamic process that imposes challenges because the transformation from conventional instruction to modern and advanced instruction depends on teachers' and students' ability to utilise computer-based learning tools. However, to get beyond these challenges, training must be provided, as well as online learning opportunities through educational platforms. The relationship between the education profession and technology has grown significantly. Education-based technology plays a significant role in enhancing instruction, advancing nations, and reducing the complexity of life [1].

Any nation's successful educational system must work to improve education, spread knowledge, and offer the proper methods and resources to accomplish its objectives. The educational system's success mainly depends on the teacher, knowledge-transfer skills, and commitment to teaching. Nobody contests the teacher's significant role as a guiding axis for creating educational plans, developing future human cadres, attempting to improve educational opportunities for learners, and enhancing their knowledge and abilities. Therefore, to tackle the increasing challenges in sophisticated educational settings, teachers must be fully prepared to improve their teaching abilities, especially their educational technology skills [2]. One of the most crucial factors contributing to the advancement of societies in line with the demands of the twenty-first century is the preparation of teachers and the enhancement of their motivation. This helps to prepare people who are aware of the issues facing their country and capable of creativity and innovation.

Fundamental learning skills, including reading, writing, critical and creative thinking, and problem-solving, are emphasised in modern education. However, due to the rapid advancement of technology, it was necessary to shift the emphasis of instruction from the conventional "chalk and talk" method, which relied on reciting and memorising a vast amount of information that has no place in the labour market, to the relevant educational technology.

Conversely, education nowadays has shifted from teacher-centred to learner-centred approaches and technology-based instruction. Modern education has fundamentally transformed the function of the teacher, who now serves as a facilitator and guide who inspires and supports learning by using a variety of technical approaches and tools to handle and create educational content to foster the spirit of inquiry, research, and collaborative learning. In addition, he effectively develops strategies for using technology to digitalise instructional materials and make them easily accessible, whether in a classroom setting or at home. Therefore, ICT and digital skills have become essential, as they are needed when using most applications, social media, and managing digital projects.

Numerous educationalists believe education should focus on developing students' basic abilities to reach the desired outcomes. They also think that teachers and students should focus on developing practical digital skills, meaning that the teacher should be comfortable utilising these tools to access a wealth of knowledge and information to benefit his students and the community. All fields now highly value digital skills.

Education-related technology skills depend on using new technology in the educational process, whether from the technical side or by working with hardware and software, from the personal side by dealing with perception, analysis, and interpretation, or by using educational technology skills by using the right tools and creative solutions for academic problems. Therefore, to help the teacher and student deal with the skills of the twenty-first century to achieve creativity and innovation in education, which depends on technologies and the skill of using them, this is done by identifying the problem and using the design, production, management, and evaluation skills [3].

Digital skill is a set of competencies and capabilities necessary to use digital devices via the Internet to access ideal information and to communicate with students to solve various problems. It is divided into three levels, each of which has skills that students must learn. The first is fundamental digital skills (devices), which include using touch-screen technology, word processing, spreadsheets, email, searching, and interacting with others. These abilities are among the prerequisites for the majority of current jobs. The second is intermediate digital skills, which are ready-to-work abilities requiring an understanding of technology and its tools, computer programs, and programming languages. Students must develop new learning strategies for these skills to keep up with technological advancements. And the last is the level of advanced digital skills possessed by technology specialists, such as computer networks and design programs [4].

Technological educational skills are the ability to produce educational materials with sound specifications and use innovative ideas in the educational process. These skills are not only technical and are not limited to devices and techniques; they are intellectual and related to creative ideas. Teachers with these skills can solve many problems and advance the educational system. According to Mallah [3], there are numerous categories for classifying educational technology capabilities, each of which is based on a particular foundation:

1. Classification of educational technology skills based on domain processes and components.

a) Analysis skills are based on how to divide the content into small parts and work accurately so that the theoretical aspect prevails in these skills.
b) Production skills are practical skills that use educational production as an educational material or medium.
c) Design skills: These are the most commonly used skills in experimental research, such as designing educational websites, presentations, and learning entities.

d) Implementation skills: These are the most important educational technology skills and are intended to employ all available technologies and electronics to serve the educational process and facilitate its implementation for the teacher.
e) Management skills: This skill is not limited to the administrator but also includes the teacher, who is considered the classroom administrator and the educational process.
f) Evaluation, follow-up and development skills: a skill that shows the extent to which the desired goals are achieved creatively, and then follow-up, and development to identify the shortcomings and address them.

2. Classification of educational technology skills based on the human factor

a) Teacher skills: These are skills that belong to the teacher alone in the educational process, especially the twenty-first-century teacher, who must possess more electronic digital skills than the teacher had in the past.
b) Learner skills: The learner learns many skills that enable him to self-learn.
c) Principal skills: A skilled principal must recognize and master management skills.
d) Parents' skills: parents must possess the skills of technological follow-up, control, and time management.

3. Classification of educational technology skills based on the type of skill:

a) Productive skills are practical manual skills that seek to reach standards and are employed in the educational process.
b) Performance skills: concerned with the ability to use and employ only.

4. Classification of educational technology skills based on the nature of the skill:

a) Electronic skills: These are skills that depend on employing electronic devices such as computers or mobile phones.
b) Networking skills: These are skills that depend on the Internet and local and global networks.
c) Traditional skills: These are skills that depend on the individual's ability to strive to reach the best results in light of the available possibilities, as they do not rely on electronic devices and tools.
d) Intellectual skills: These skills seek to change reality through ideas, not devices and tools, and development to reach the best education.

5.Classification of educational technology skills based on the method of performance:

a) Technical skills: They include the use of software and hardware skills.
b) Communication skills: These include communication skills, dialogue, presentation, interaction, and the ability to exchange knowledge, science, and technology.

Teachers can resort to modern technological methods to enhance instruction. For example, Al-Duwaikat [5] claimed that schooling could be improved by using games to effectively communicate knowledge to students, such as developing a set of questions for students and assigning them to search for the correct answer and organising virtual trips that help students explore forests and landmarks via the Internet. In addition to employing social media, where the student spends most of his time, integrate the educational process and school curriculum with the students' reality. The teacher can also encourage students to create groups through social networking sites to publish lessons, conduct discussions, and share inquiries and ideas. Undoubtedly, multimedia is an innovative way to enhance enjoyable student interaction, in which students can share lesson presentations with images and videos.

Utilising technological skills in education can be advantageous. For example, it can motivate students to learn and engage in online activities and communicate with their peers creatively and distinctively. Furthermore, it can improve their memory and ability to retain information, develop the fundamental skills of teachers and students, and increase their ability to differentiate between reputable and unreliable sources online. Additionally, it contributes to the provision of numerous apps and educational materials over the Internet, the saving of teachers' time and effort, the improvement of current educational practises, and the training of students and teachers in the use of technology [5].

However, teachers in this modern period must consult with Arab and foreign studies and experiences to use contemporary teaching practices to foster students' intellectual skills and increase their educational outcomes. Moreover, teachers, without a doubt, play a significant role in instilling moral values in the hearts of their students, preserving their cultural and civilisational identity, building a love of self-learning, and searching for what is new [6].

Hence, it is necessary to provide educational teaching aids that aim to prepare and qualify the teacher to employ his skills to meet the student's scientific and practical needs and to increase his motivation towards education. Furthermore, it is also necessary to maintain educational attitudes inside and outside the classroom to enable the teacher to deal with scientific challenges and e-learning instruction, as e-learning instruction has emerged in recent times due to the circumstances explicitly imposed by the Corona pandemic, which have changed the course of face-to-face instruction to e-learning instruction. Hence, the teacher must have a distinct motivation in education to deal with these challenges successfully.

Motivation is of great importance for progress and achievement. It is the main engine that stimulates the teachers' performance and practice of educational attitudes and activities effectively, away from tension, and maintains balance. It is a successful paper that directs the teacher to exert more effort in the educational process, exploding all his energies to achieve professional goals, and showing its significant impact on students in helping them acquire knowledge, analyse it, and interpret it [7].

Teacher motivation is of great importance for progress and achievement. It is the main engine that stimulates the teacher's performance and makes him practice educational attitudes and activities effectively, away from tension and poise. It is a successful method that directs the teacher to exert more effort in the educational process, to exploit all his energies to achieve professional goals, and to show its incredible impact on students by helping them acquire knowledge, analyze it, and interpret it [7].

The primary driver of a teacher's success is his internal drive to pursue and persevere in new forms of creativity to keep up with contemporary developments, remain a practical component of the educational process, and assist in involving students in decision-making. These factors all contribute to the teacher's ability to achieve continuous success. In addition, because employee productivity is intimately tied to material and moral incentives, it is possible to motivate people to advance and develop by assessing their skills and efficiency in achieving them and rewarding them with incentives.

Motivation towards work is divided into two main parts, each complementing the other. These parts are internal motives and external motives. Internal influences and sentiments are those that an individual feels and that aid in the development of his abilities and experiences and seek novel and efficient approaches to complete the duties assigned to him with a high level of efficiency to reach the desired success [8]. External motives are motives that the individual acquires when dealing with others at practical and personal levels.

This type helps to enhance mutual respect between the individual and his society and develop the values of love and cooperation. Furthermore, it triggers the individual to search for and strengthen links with others, to achieve the highest levels of human development, and to achieve solidarity among members of society to confront difficulties that may hinder the development of society [9].

The educational system seeks to motivate teachers by developing their expertise, competence, and skills because this reflects positively on students' scientific achievements. Keeping in mind that motivation is the primary driving force for getting a teacher to assess his success in the educational process and his capacity to use technology to help students achieve their goals and allay their fears and anxieties about not gaining scientific knowledge [10].

Given the importance of teachers' digital skills in the educational process, researching the challenges they may face in employing technology inside and outside the classroom, keeping pace with technological developments, and accessing modern education are essential and influential matters in the teacher's motivation towards education. Therefore, these problems are considered very important, whether related to the teacher or the student and their ability to employ them, the availability of infrastructure within the educational building, or the teacher's attitudes towards using educational technology skills. Therefore, this study aims to reveal the science teachers' perceptions towards the challenges they face in employing educational technology skills (digital skills) and their relationship to their motivation towards education.

After reviewing the previous literature, several studies were found related to the current research. Al-Khalidi, et al. [11] aimed to identify the obstacles to using educational technology in middle school schools from the point of view of teachers in Kuwait. The study used a descriptive-analytical approach. To collect data, a three-domain questionnaire consisting of 25items was applied to a sample of 350teachers who were chosen randomly. The findings showed that teachers' obstacles in employing technology in education were moderate, as, for the school administration, they came to a high degree, and the barriers related to the school curriculum were high.

It was also found that there were statistically significant differences between the responses of individuals due to the gender variable. It favoured females, and there were statistically significant differences for the variables of majors and experience for the humanitarian majors and those with experience from 5-10years.

In a recent study, Al-Sbou [12] aimed to identify the reality of science teachers' use of e-learning platforms and the obstacles they face. The study adopted a descriptive-analytical approach using a questionnaire that was applied to a sample of 81teachers who were randomly selected from public schools in Karak. Science teachers' use of e-learning platforms was moderate. However, the obstacles facing science teachers when using e-learning platforms were high. Moreover, there were no statistically significant differences in reality attributable to the variables (gender, educational qualification, and experience).

Shaheen [13] conducted a study to identify the degree to which classroom teachers possess technological competencies and the challenges to employing them in teaching. The descriptive approach was used by developing a questionnaire of 30items over three domains. Each part had 4 items and 10 obstacles, according to the five-year Likert scale. The tool was applied to a sample of 130 class teachers with bachelor's degrees. The results showed that the essential competencies for dealing with Internet services were medium, and using and operating a computer were high. In contrast, the degree of computer software design competency in teaching was low. In addition, the obstacles to employing technological competencies were high, most notably the lack of training programs on modern technology and the overcrowding of classrooms.

2. Review of Related Literature

Al-Shamrani and Al-Jalal [14] conducted a study to identify science teachers' perceptions in the Education Department in Al-Kharj about the importance of using educational technologies and their obstacles in teaching science in Saudi Arabia. The researchers developed a questionnaire divided into two axes: the importance of using educational technologies in teaching science and the challenges of using educational technologies. The questionnaire was applied to a sample of 188 teachers. Teachers' perceptions of using educational technology in teaching science were high. However, teachers reported the importance of using technology in the classroom and underestimated its role in communication. The results also showed no statistically significant differences in teachers' perceptions of the importance of using educational technologies due to gender, qualification, experience, specialisation, and academic stage.

The findings also showed that teachers' perceptions of obstacles to the use of technology in science teaching were moderate. It was clear from the sample that the highest barriers included what was outside their responsibilities and tasks and that the challenges centred around the teacher and his capabilities to a lesser degree. It also showed that there were no statistically significant differences in the sample depicting the obstacles due to the variables (qualification, experience,

training, educational stage, and specialisation). In contrast, a statistically significant difference was found between males and females, with males favouring females.

Odeh and Odeh [15] conducted a study to reveal the extent to which teachers in the Education Directorate of the Shubak Brigade know the basic applications and software of information and communication technology, the degree of their use, and the obstacles to their employment in teaching. A questionnaire consisting of 40items was designed and applied to 101 randomly chosen teachers. It was found that most of the sample members were practising different software and applications of ICT, but not for teaching purposes because there are obstacles to using ICT in teaching. Among the most significant obstacles are the necessary equipment and infrastructure and the lack of training to employ them in education. Therefore, the study recommended providing all educational requirements to utilise educational technology and make it an essential tool in the educational process.

Al-Ruwaili [16] sought to explore the obstacles to using educational platforms from the point of view of kindergarten teachers. The researcher used the descriptive survey method, and to achieve the objectives of the study, a questionnaire was developed and distributed electronically to the sample consisting of 163 teachers. The results showed the presence of obstacles when using educational platforms to a high degree, and the study shows that there are statistically significant differences attributed to the academic qualification variable and in favor of postgraduate studies, and there are differences attributed to the training courses variable and in favor of those who have taken the courses.

Al-Mujlad [17] did a study to reveal the degree of use of ICT by intermediate school teachers in Arar, their attitudes towards it, and the obstacles to using ICT in teaching. Teachers' use of ICT competencies was medium. The findings also revealed that e-learning topped the fields with a medium degree and that female teachers hold positive attitudes towards using technological competencies in teaching. The results showed that the obstacles to using technological competencies came to a moderate degree.

Several studies have addressed the motivation of science teachers towards education. Mansour [18] sought to identify the most prominent factors of the school environment affecting teachers' motivation towards achievement from the point of view of public education teachers in Saudi Arabia. The study followed a descriptive approach. A questionnaire was applied to a sample of 702 teachers who were randomly selected from five regions in Saudi Arabia. The findings reported that male teachers had a better school environment than female teachers, and there were statistically significant differences in the reality of the school environment due to the variable of the educational region (eastern region).

Abu Aisha [19] tried to reveal the teachers' degree of motivation in the Ministry of Education in Jordan. However, no statistically significant differences in the degree of motivation towards education were found due to the variables (gender, experience, and educational qualification). Therefore, the study recommended the need to design systematic and accurate plans to reduce the teaching burden on the teacher by increasing the number of teachers and administrators.

BaniKhalaf [20] investigated the level of motivation towards school work among science teachers in Jerash Governorate and its differences according to variables (gender, experience, and specialisation). A questionnaire consisted of 37 educational and non-educational behaviors that highlight the most important aspects of motivation among science teachers, and a questionnaire consisted of 32 material and moral factors showing the factors that affect the level of motivation. It was applied to a sample of 225teachers. It is clearly obvious that the level of motivation among science teachers was moderate, and there were statistically significant differences due to the gender (females) variable. It was also found that there are statistically significant differences due to the educational experience variable for those with long working experience. In contrast, the academic cycle variable has no statistically significant differences. The results also showed that the strength of the factors measuring the level of motivation for science teachers was moderate, and there were statistically significant differences in the strength of the influence of motivation factors due to the variable of gender (females).

2.1. A Comparative View with the Previous Studies

Reviewing previous studies shows that most of the studies are consistent with the current research in the methodology used. The current study and most studies targeted male and female teachers regarding the sample. Some limited their choice to male teachers [14, 20].These studies differed from the current study regarding the variable and its objective. Some of them focused on the obstacles to using technology, such as Al-Khalidi, et al. [11], or the competencies of using technology and its barriers [17]. Several studies have focused on teachers' motivation towards schoolwork [20], and others have focused on the factors affecting teachers' motivation and challenges [18].

Some studies included female subjects only [17]. Regarding the topic of this study—the use of technology in education and teachers' motivation—all studies concurred with the current research. But this study differs from the earlier one because it looked at both variables simultaneously.

The current study shows that the perceptions of science teachers about the problems they face in employing electronic skills were moderate, and that there were statistically significant differences attributed to the gender variable in favor of females and the absence of statistically significant differences attributed to the variables of specialization and teaching experience. It agreed with some previous studies, such as the study of Al-Khalidi, et al. [11], which all showed that the obstacles to using educational technology were to a moderate degree and in favor of females. As for Al-Sbou [12] and Shaheen [13], the results showed that the obstacles facing teachers were high, and there were no statistically significant differences attributed to gender, academic qualification, or teaching experience, so the current study did not agree with those studies.

The current study stresses that the problems encountered by teachers in terms of technology use did not affect their motivation. However, there were statistically significant differences attributed to gender and in favor of females, and there

were no statistically significant differences attributed to specialization or teaching experience. All the previous studies have shown their differences with the current study, includingAbu Aisha [19] and the study of BaniKhalaf [20], which showed that teachers' motivation for teaching was moderate. It agreed with the study of BaniKhalaf [20] in the presence of statistically significant differences attributed to gender and in favor of female teachers. It differed from the study of Abu Aisha [19] in that there were no statistically significant differences for all variables (gender, academic qualification, teaching experience). Therefore, what really distinguishes this study is the way it dealt with those problems and connected them with their sense of motivation.

The importance of this study lies in the subject it addresses and in linking the challenges faced by science teachers in using computer skills and their relationship to their motivation for education, which explains the importance of the current study. In addition, the researchers benefited from the theoretical framework and methodology of the previous studies, developing the study tools and benefiting from them in discussing the results.

2.2. Study Questions

The study sought to investigate the perceptions of science teachers about the problems they face in employing electronic skills in teaching science so to *know whether they differ according to gender, specialization, and years of experience?* Also, another important question seeks to know whether *there is a correlation between science teachers' perceptions of the problems they face in employing electronic skills and their motivation towards education?*

2.3. Problem Statement

The Ministry of Education has tried to incorporate contemporary educational technologies into the teaching and learning process, practise e-learning in all forms, and create curricula and teaching strategies based on modern trends while also considering the current pandemic conditions experienced by the world. The educational process was carried out utilising technology methods and resources that focused on the teacher's practical and technological skills and on developing his ability to engage with the demands of the moment. Due to its speed and wide adoption, using educational technology skills in the classroom has emerged as one of the most effective ways to impart knowledge to students today.

Given the importance of technological skills in science education and their role in increasing student achievement, the Ministry of Education sought to train science teachers and introduce e-learning skills to change the educational style and increase the teacher's motivation. However, by looking at many studies, it was noted that they indicated a shortcoming in teachers' employment of modern technologies, including e-learning skills [21], which showed that technology in education was used at a low level. Furthermore, the study by Abdul Razzaq [22] also showed that educational technology is employed to a low degree in teaching physics and that challenges have largely been evident.

Harris [23] study proved that a few teachers use technology in the educational process, but these studies did not reveal the problems teachers face in using educational technology skills.

In addition, through the experience of researchers in the educational field and the supervision of teachers, it has been seen that some science teachers do not employ educational technology skills in education as required. This study sought to reveal the science teachers' perceptions of the challenges they face in operating e-learning skills inside and outside the classroom and their relationship to their motivation towards science education. The study's central question is: What are the science teachers' perceptions of the challenges they face in employing e-learning skills and their relationship to their motivation towards education? The following sub-questions emerge from it:

1. What are the science teachers' perceptions towards the challenges they face in using technological skills in science education?
2. Do science teachers' perceptions of the challenges of using technological skills differ due to gender, specialization, and years of experience?
3. To what extent is the science teachers' motivation towards education?
4. Does the science teachers' motivation towards education differ due to gender, specialization and years of experience?
5. Is there a correlation between science teachers' perceptions of the challenges they face in employing e-learning skills and their motivation towards education?

2.4. The Significance of the Study

The study's modernity and the gravity of its subject matter, which focuses on utilizing the teacher's technological skills, give it theoretical significance given the use of contemporary technology in education both inside and outside the classroom. However, its importance also lies in enhancing the body of knowledge in the field of education and in maintaining research on the subject at hand, as it enables educators to understand the challenges teachers face when using their ICT skills and how those challenges relate to their desire to learn.

The study's practical value may be seen in the conclusions made to the advantage of numerous parties, including the Ministry of Education and institutes of higher education that train scientific teachers. It gives all Ministry of Education staff accurate information about the challenges faced by science teachers in using technology, and it explores solutions and encourages positive attitudes towards using technology. It also aims to establish effective teaching strategies and methodologies to enable teachers of all levels to use technological skills. To improve scientific teachers' motivation for teaching and their competence and efficiency in using technological skills, it also helps design training programmes for them.

2.5. Study Terminology and Definitions

Skill is a set of knowledge, experiences, and personal capabilities that an individual must acquire to accomplish a specific job [24].

2.5.1. Technological Skills

A set of skills that allow the individual to use networks, digital devices, and various online applications to work inside and outside the school environment [3]. Operationally, they are the skills related to the employment of different technological techniques by the science teacher in the Directorate of Education in the Koura Education Department inside and outside the classroom. And their perceptions of the challenges they faced. By responding to the questions designed for this tool, teachers can determine the degree they are measuring.

2.5.2. Motivation towards Education

It is the tendency and the continuous desire to teach everything new, excel and achieve the desired goals, raise the levels of knowledge, overcome the difficulties facing students, control them, and treat them [25].

Operationally, the internal state of the science teacher in education is effectively based on the challenges they face in employing e-learning skills in science education. The average of the teachers' responses to the tool items created for this purpose serves as a measure.

2.6. Study Limitations

The generalisation of the results of the study is limited inlight of the following limitations:

- The study was limited to science teachers' perceptions of the challenges they face in employing technological skills, as mentioned in the study tools.
- The study was limited to science teachers in the Koura District Directorate.
- The study was conducted in some public schools for girls and boys in the Koura District.
- The subjects' degree of seriousness and objectivity in answering the items of the tools.

3. Methodology

3.1. Study Approach

The descriptive survey method was adopted due to its relevance to the nature of the study, which aims to reveal the science teachers' perceptions about the challenges they face in employing technological skills and their relationship to their motivation towards education.

3.2. Population and Sample

The study population consisted of science teachers who teach all grades of the primary stage and who hold a certificate in (chemistry, physics, biology, earth sciences, and general sciences) in the Koura District Education Directorate in Jordan, and their number is 94 male and 113female teachers.

The study sample (n=100) of teachers was selected from the study population by a stratified random method from science teachers who teach the basic stage classes in public schools. Table 1 shows a clear description.

Table 1.
Data of the study subjects.

	Categories	N	Ratio
Gender	Male	50	50.0
	Female	50	50.0
Major	General science	25	25.0
	Chemistry	23	23.0
	Physics	25	25.0
	Biology	17	17.0
	Geology	10	10.0
	< 10yrs.	33	33.0
	> 10 yrs.	67	67.0
Experience	Total	100	100.0

3.3. Instruments

To achieve the objectives of the study, two measures were used:

3.3.1. Challenges of Technological Skills Employment Measure (CTSEM)

After reviewing the previous studies by Odeh and Odeh [15], the researchers developed a questionnaire of 35 items to measure the respondents' perceptions of the challenges they face when using technological skills. The questionnaire measures four areas: availability of appropriate equipment, students-related problems, the ability to use technological skills, and the science teacher's perceptions of using technological skills. A five-point Likert scale was adopted to assess the subjects' responses using the following ratings (5) very high, (4) high, (3) medium, (2) low, and (1) very low. In addition,

the following statistical standard ratings were used to determine teachers' perceptions: (low: 1.00-2.33, medium: 2.34-3.67, high: 3.68-5.00).

The measure was presented to a committee of specialists in science curricula and instructional methods to evaluate its face validity and establish whether the instrument is pertinent to and representative of the targeted construct it is supposed to measure. It was also shown to experts in scientific curriculum, instructional methods, and educational technologies to gauge the instrument's content validity. All committee recommendations to remove and add certain statements were considered. Finally, the measure was applied to a pilot sample (n=30). The correlation coefficients were calculated between each item and the overall score, between the items and the field they belong to, and between each area.

The correlation coefficients of the items with the overall tool ranged between (0.38-0.84), and between the domains (0.39-0.93). All these values are acceptable and statistically significant. Therefore, there was no need to delete any statements. The correlation coefficients of the fields were extracted and ranged between (0.41-0.79). All these values are statistically significant, indicating reasonable construct validity.

The tool's reliability was assessed by calculating the reliability coefficient and conducting the test-retest method. First, the test was applied to a pilot sample of 30 male and female teachers. Then, after two weeks, it was re-applied to check its reliability using the Pearson correlation coefficients, which ranged from (0.81-0.86). Finally, the internal consistency reliability coefficient was computed using Cronbach's alpha equation (0.77-0.84).

3.3.2. Motivation towards Teaching Measure

The BaniKhalaf [20] measure served as the foundation for developing the questionnaire. It consisted of 31items.A five-point Likert scale rating of (5) very high, (4) high, (3) medium, (2) low, and (1) very low was used to determine the degree of teachers' motivation to teach.

The measure was presented to a committee of specialists in science curricula and instructional methods to evaluate its face validity and establish whether the instrument is pertinent to and representative of the targeted construct it is supposed to measure. It was also presented to experts in scientific curriculum, instructional methods, and educational technologies to gauge the instrument's content validity.

The item correlation coefficients with the scale's total score were computed after applying the questionnaire to a pilot sample from outside the study sample (n=30) of male and female teachers to determine the significance of the construct validity of the tool. The correlation coefficients of the items with the overall scale score ranged from (0.38-0.82). It should be noted that all correlation coefficients were statistically acceptable to significant degrees. As a result, none of the items were removed, indicating that degree of construct validity is appropriate.

The reliability coefficient was calculated using the test-retest method to check the tool's reliability. The test was applied twice, with two weeks between each application, to a pilot sample of 30 male and female teachers. The Pearson correlation coefficient between their estimates was calculated, showing a reliability value of (0.85). The internal consistency reliability coefficient was also calculated utilizing Cronbach's alpha equation, reaching (0.81). These values were considered acceptable for this study.

3.4. Study Variables

1. Independent Variables:
- Gender: It has two categories (male and female).
- Specialisation: It has five levels (General sciences, physics, geology, biology, and chemistry).
- Years of Experience: It has two levels (less than ten years and more than ten years).
2. Dependent variables:
- Science teachers' perceptions of the challenges they face in employing technology skills in science education.
- The motivation towards education.

3.5. Procedures

To achieve the study objectives, the following procedures were followed:

1. Defining the study problem and its questions.
2. Reviewing the theoretical literature and previous studies to develop tools and reach a deeper understanding of the study.
3. Preparing the two final versions of the measures after verifying their validity.
4. Applying the study instruments to a pilot sample to obtain their reliability.
5. Applying the measure to the study sample, which are male and female science teachers in the schools of the Koura District.
6. The generated data was coded and entered on the computer to be analysed and interpreted using the Statistical Package for Social Sciences (SPSS) program.

4. Findings and Discussion

1. Findings of the first question: "What are the science teachers' perceptions towards the challenges they face in using technological skills in science education"?

The arithmetic means and standard deviations of the respondents' responses on the scale **(CTSEM)** were extracted to determine teachers' perceptions, as shown in Table 2.

Table 2.
Means and standard deviations of subjects' responses on (CTSEM).

Rank	N	Field	Mean	Std.	Level
1	1	Availability of appropriate equipment	3.77	0.690	High
2	4	Students-related problems	3.48	0.788	Medium
3	2	The ability to use technological skills	2.93	0.694	Medium
4	3	Science teacher's perceptions of using technological skills	2.67	0.797	Medium
Total			3.24	0.515	Medium

Table 2 shows that the means of the responses ranged between (2.67-3.77). The availability of appropriate equipment topped the fields with the highest mean of (3.77) and a high degree. On the other hand, science teachers' perceptions of using technological skills ranked last with a mean of (2.67) and a medium degree. The overall mean of the measure was (3.24) with a medium level.

The means and standard deviations of the participants' responses were calculated for the items in each field separately, as illustrated in Table 3.

Table 3.
Means and standard deviations of participants' responses on the (CTSEM).

N	Items	Mean	Std.
1	Unavailability of e-learning devices in the classrooms	4.10	1.314
2	Lack of specialized software that serves science learning	4.15	1.048
3	Lack of supporting infrastructure for employing e-learning skills in the school	3.93	1.027
4	The scarcity of educational websites that serve science on the Internet within the school	3.17	1.181
5	Lack of appropriate classroom environment for employing electronic skills	4.10	0.990
6	The high cost of electronic devices used in the classroom	4.36	0.882
7	There is a mismatch between the number of electronic devices and the number of students in the class.	4.28	1.083
8	Weak internet services (Packages and speed).	3.87	1.228
9	The difficulty of obtaining educational software in science from external sources.	3.69	1.203
10	Curriculum overcrowding in science content, which does not allow the use of electronic skills during the implementation of the class lesson	3.98	1.063
11	Power outage at school or computer lab while employing electronic skills	2.29	1.131
12	Lack of regular maintenance services for computers inside the school	3.32	1.238
13	Lack of specialized training courses on how to employ electronic skills in science education in the classroom.	3.39	1.127
14	Weakness in the English language among the science teacher.	2.60	1.082
15	Weakness in dealing with and using electronic devices.	2.33	0.922
16	Lack of knowledge of educational sites that serve the science curriculum	2.77	1.053
17	Non-cooperation of the computer supervisor/Supervisor with the science teacher in employing electronic skills in teaching science	2.50	1.142
18	The difficulty of renewal and changing teachers from the traditional teaching style to the modern Internet-based	2.75	1.123
19	Momentum and intensity of the teaching quorum of the science teacher within the school.	4.16	1.032
20	Fear of conflicting scientific materials and information on the Internet (Outside the educational content) with the religious belief and the prevailing customs and traditions surrounding the school community.	2.95	1.077
21	The lack of conviction of the science teacher that electronic skills serve the science subject	2.55	1.266
22	Teachers feel that employing electronic skills in science education loses its character to the educational process	2.37	1.152
23	The low desire of the science teacher to employ electronic skills in education	2.52	1.141
24	The prevailing mental state of science teachers in resisting change	2.89	1.348
25	Employing electronic skills prevents social interactions between students as required	2.95	1.266
26	Employing electronic skills is a waste of time in science education for teachers	2.37	1.079
27	The feeling that employing electronic skills strips the science teacher of human interaction	2.45	1.158
28	Teachers' fear of dealing with modern technology	2.17	1.025
29	The teacher's feeling of frustration due to the lack of capabilities and technical support within the school	3.51	1.267
30	The lack of appropriate competencies among students in modern education based on the Internet	3.77	1.053
31	The presence of a barrier of fear and dread for some students in entering modern learning	3.23	1.162
32	Some students do not have the appropriate electronic devices for learning at home	3.76	1.311
33	Fear of some students being preoccupied with websites that have nothing to do with education	4.14	1.128
34	Weakness of students in possessing electronic skills	3.59	1.311
35	Students' lack of direct support and motivation from the science teacher in the classroom	2.36	0.894

The findings demonstrate that the difficulties science teachers have using technology are closely related to the accessibility of technological tools. The responses from the teachers clearly showed how scarcely available these devices

are. As a result, they could not use them effectively in the educational setting, indicating a weakness in the accessibility of electronic devices and science-related educational software. This can be due to the high price of technological devices and their inappropriateness for students' preparation inside and outside the classroom. However, infrastructure serves as the foundation for the science teacher's use of technological means, the Internet, and the classroom setting. Therefore, it should be accessible to the teacher so that he can employ his skills efficiently in teaching science.

This result is consistent with Odeh and Odeh [15], which revealed several obstacles to using educational and communication technology in teaching, the most important of which is the infrastructure and appropriate equipment. In addition, student-related problems were also evident. These problems, infact, hinder teachers from employing technological skills appropriately, as teachers indicated that most students do not have the appropriate competencies in modern education based on the Internet and technical devices, in addition to being afraid of using these devices. Perhaps this is due to the failure to give the computer subject its due in teaching, like other subjects, or the students do not have these devices to deal with them efficiently.

The findings also demonstrated that the science teacher's reasonable ability to use technology was not one of the issues preventing the effective use of technology. This may be because the teacher received the proper training, was well equipped to handle them, was fully convinced of their value, and had a strong desire to use them when teaching science.They are, however, limited by the infrastructure. This finding was consistent with Al-Mujlad [17], which found that teachers' attitudes towards applying competencies and the severity of their challenges were positive and moderate. The result also agreed with the study Shaheen [13], which exhibited a high degree of employing technological competencies, most notably in training programs and classes.

2. Findings of the second question: "Do science teachers' perceptions of the challenges of using technological skills differ due to gender, specialisation, and years of experience?"

Table 4.
Means and standard deviations of participants' responses on the (CTSEM) by gender, specialisation, and years of experience.

Variable	Category	Mean	Std.	N
Gender	Male	3.14	0.514	50
	Female	3.34	0.500	50
Major	General science	3.37	0.526	25
	Chemistry	3.25	0.532	23
	Physics	3.30	0.362	25
	Biology	2.98	0.541	17
	Geology	3.15	0.648	10
Experience	< 10 yrs.	3.19	0.415	33
	> 10 yrs.	3.26	0.559	67

To answer this question, means and standard deviations of science teachers' perceptions about the challenges they face in employing technological skills in science education were extracted by the variables (gender, specialisation, and years of experience); see Table 4.

Table 4 shows significant differences in the means and standard deviations of science teachers' perceptions about the challenges they face in employing technological skills in science education attributable to gender, specialisation, and years of experience. A three-way ANOVA was used to determine if the differences were statistically significant, as shown in Table 5.

There are statistically significant differences ($\alpha = 0.05$) attributed to the effect of gender, where the F-value is 4.454 with a statistical significance of 0.038 in favour of females. And there were no statistically significant differences ($\alpha = 0.05$) due to the effect of specialisation, where the value of F is 1.710, with a statistical significance of 0.154. Furthermore, there were no statistically significant differences ($\alpha = 0.05$) due to the effect of years of experience, where the value of F is 0.108 with a statistical significance of 0.743.

Table 5.
The results of the three-way ANOVA by the study variables.

Source of variance	SS	DF	MS	F value	P value
Gender	1.117	1	1.117	4.454	0.038
Specialisation	1.716	4	0.429	1.710	0.154
Experience	0.027	1	0.027	0.1080	0.743
Error	23.333	93	0.251		
Total	26.212	99			

The findings indicate significant differences in gender, where females outperformed males. And there are no differences due to specialisation and years of experience. This finding suggests that, regardless of their specialisations or years of experience, female science teachers seek to develop the teaching process more than male science teachers and have a greater sense of the challenges that face science teachers when using digital skills. Due to their more remarkable dedication to the educational process, greater interest in their work and more significant commitment to attending seminars,

conferences, and training sessions than male teachers, female teachers are better able to apply their knowledge both inside and outside of the classroom. They also respond favourably to exceptional work in educational competencies, regardless of their specialisations and years of experience. It was also found that there were no statistically significant differences due to specialisation and years of experience.

This shows that all science teachers, regardless of their experience level, have taken training programmes for using digital skills. And that the infrastructure and accessibility of electronic devices within and outside the classroom and the student's proficiency with technology were the issues affecting the utilisation of electronic skills in teaching science, not the teacher's technical abilities. This result agreed with the result of Al-Khalidi, et al. [11], which showed that there were statistically significant differences in the obstacles to using technology, which were in favour of females, and the study of Al-Shamrani and Al-Jalal [14], which showed that the level of obstacles facing the teacher in using educational technologies was moderate and in favour of females. However, there were no statistically significant differences due to specialisation and experience.

3. Findings of the third question: "To what extent is the science teachers' motivation towards education?

Means and standard deviations of science teachers' motivation towards education were obtained, as shown in Table 6.

Table 6.
Means and standard deviations of subjects' responses on the motivation scale.

Rank	N	Items	Means	Std.	Level
1	18	I associate my work with accountability before God Almighty and obtaining his approval	4.57	0.700	High
2	3	I attend science class early.	4.54	0.576	High
3	5	I like conversing with my students on the topics they prefer.	4.48	0.703	High
4	12	I separate my private life from the work environment so that it does not affect it	4.35	0.744	High
5	31	I strive to provide the appropriate educational climate for students	4.34	0.699	High
6	7	I feel like my time with my students goes quickly during science classes	4.28	0.866	High
7	2	I search all educational resources for what enriches the science lesson	4.16	0.849	High
7	17	I feel that education is life and not a job	4.16	0.861	High
9	30	I seek to apply creative ideas that support learning constantly	4.15	0.869	High
10	16	I always strive to achieve everything new in education	4.11	0.764	High
11	11	I do not link my work to the incentive system, and the salary I receive	4.10	1.115	High
12	13	I seek to change the routine and stereotypes in school	4.10	0.937	High
13	29	I pursue my career goals with a strong desire	4.08	0.884	High
14	22	I assist students in acquiring the abilities needed for learning inside and outside the classroom.	4.07	0.820	High
15	25	I stay up-to-date with all educational developments	4.03	0.969	High
16	6	I proudly talk to others about my accomplishments with my students	4.02	1.092	High
17	21	I work to overcome the challenges that I face daily inside and outside school	3.99	0.823	High
18	10	I do my school work perfectly on time during my school day	3.98	0.910	High
19	26	I constantly develop myself by keeping abreast of all technological developments	3.94	0.941	High
20	1	The teaching profession is better than any other profession	3.90	1.235	High
21	24	I feel that my work as a teacher fits my abilities	3.89	1.109	High
22	27	I am good at using modern technologies in science education with enjoyment	3.86	1.005	High
23	28	I find myself ambitious and do not stop at a certain level of achievement	3.79	1.008	High
24	20	I find myself ambitious and do not stop at a certain level of achievement	3.76	0.911	High
25	14	I mention the most prominent shortcomings in the reality of the school	3.74	1.097	High
26	4	I do all the activities and experiments in science books	3.63	1.212	Medium
27	15	I don't feel bored and lazy at school	3.62	1.187	Medium
28	19	I expand my activities inside and outside the school by participating in exhibitions.	3.57	1.174	Medium
29	9	I don't bother with schoolwork and repeat lessons for students	3.54	1.114	Medium
30	8	I use my spare time inside the school to design science activities for students	3.26	1.011	Medium
30	23	I participate in conducting research related to my work	3.26	1.177	Medium
Total			3.98	0.503	High

Table 6 shows that the means ranged between (3.26-4.57). Item (18), which reads, "I associate my work with accountability before God Almighty and obtaining His approval,"topped the items with a mean of (4.57). In contrast, Items (8 and 23), which read, "I use my spare time inside the school to design science activities for students," and "I participate in conducting research related to my work," came in the last rank, with a mean of 3.26. The overall mean score for the scale was (3.98) with a high degree. 24 items had a high degree, and six items had a medium degree.

The findings suggested that science teachers were highly motivated. This shows that the science teacher at the Koura district schools engages in effective and enthusiastic teaching, constantly works to improve education, and looks for innovative and encouraging ways to provide the right environment for their students. Motivation is the primary factor driving a teacher's actions to direct his behavior toward the educational process and carry out tasks related to science. It drives the teacher to invest time and effort in inspiring students to pursue the highest level of education.

It was discovered that the teacher's primary motivation was religious, which suggests that he strives to please God Almighty in his work. The fact that religion encourages people to perfect their jobs may be the source of their strong motivation. As a result, people are more inclined to seek cutting-edge scientific advancements with pleasure and overcome obstacles to advance their education. This finding differed from the studies by Abu Aisha [19], which claimed that teachers' motivation is medium, and BaniKhalaf [20], which demonstrated that the motivation of the science teacher is moderate.

4. The findings of the fourth question:"Does the science teachers' motivation towards education differ due to gender, specialisation and years of experience?"

Means and standard deviations of science teachers' motivation towards education were extracted according to gender, specialisation, and years of experience. See Table 7.

Table 7.
Means and standard deviations of science teachers' motivation towards education by gender, specialization, and experience.

Variable	Category	Mean	Std.	N
Gender	Male	3.84	0.5660	50
	Female	4.11	0.3930	50
Specialisation	General science	3.78	0.593	25
	Chemistry	4.10	0.403	23
	Physics	4.01	0.544	25
	Biology	4.11	0.452	17
	Geology	3.87	0.316	10
Experience	<10 yrs.	4.07	0.438	33
	>10 yrs.	3.93	0.529	67

Data in Table 7 shows significant differences in means and standard deviation scores of teachers' motivation towards education due to gender, specialization, and years of experience.

Table 8.
Three-way ANOVA of the effect of gender, specialization, and experience on science teachers' motivation towards education.

Source of variance	SS	DF	MS	F-value	P-value
Gender	1.614	1	1.614	7.038	0.009
Specialisation	1.542	4	0.386	1.681	0.161
Experience	0.257	1	0.257	1.119	0.293
Error	21.334	93	0.229		
Total	25.057	99			

Table 8 shows that there are statistically significant differences ($\alpha = 0.05$) due to the effect of gender, where the f-value is 7.038, with a statistical significance of 0.009, and the differences are in favour of females. And there were no statistically significant differences ($\alpha = 0.05$) due to the effect of specialisation, where the value of F is 1.681, with a statistical significance of 0.161. And there were no statistically significant differences ($\alpha = 0.05$) due to the effect of the number of years of experience, where the value of F is 1.119, with a statistical significance of 0.293.

The findings showed that the motivation of science teachers was influenced by gender and that this effect favoured female teachers. This could mean that female teachers are more inclined to pursue careers in education than male teachers are. Furthermore, female teachers pursue this career in an innately pleasant way, maybe because it is the most suitable for them and is compatible with society's culture. In contrast, the teacher prefers occupations other than teaching. Therefore, she continually strives for perfection to demonstrate her existence, making her more motivated than the teacher.

Years of experience and specialization had no impact on these results, demonstrating that teachers continue to strive for educational excellence and success regardless of their specialization or experience levels. They also continue to overcome challenges and develop novel ideas that advance science and knowledge and foster creative thinking. Furthermore, they pursue education and stay up with current technological developments, participating in developing skills and changing traditional teaching methods, regardless of the teacher's experience and specialization. This result agreed with Mansour [18], which showed that the teachers' environment is better than the teachers' environment, which affects their

motivation, and BaniKhalaf [20], which showed that there are differences due to gender variables and in favour of female teachers.

Findings of the fourth question: "Is there a correlation between science teachers' perceptions of the challenges they face in employing e-learning skills and their motivation towards education?"

Table 9.
Pearson's correlation coefficient of the correlation between science teachers' perceptions of the challenges of employing technological skills and their motivation (n = 100).

Teachers' perceptions		Motivation
Availability of appropriate equipment Students-related problems	R	0.039
	P-value	0.703
The ability to use technological skills	R	-0.052
	p-value	0.605
Availability of appropriate equipment Students-related problems	R	-0.156
	p-value	0.122
The ability to use technological skills	R	0.151
	p-value	0.134
Total	R	-0.026
	p-value	0.800

To answer this question, Pearson's correlation coefficient was calculated between science teachers' perceptions of the challenges they face in employing technological skills and their motivation towards education. Table 9 illustrates this.

Table 9 shows no statistically significant correlation between science teachers' perceptions of the challenges they face in employing technological skills and their motivation towards education as an overall tool and in each field.

It also notes that the correlation coefficients between the challenge areas faced by teachers and motivation were low and negative in two fields and on the overall tool, despite the lack of statistical significance. This is logical and shows that the science teacher's problems using digital skills were insignificant, did not affect his or her motivation, did not weaken their abilities, and did not reduce their use of multiple methods of instruction. It also means that when there are few problems, there is a high level of motivation. As it became evident from the results that the issues were primarily caused by the lack of electronic devices, applying technological skills is a crucial approach to supporting the teacher in the educational process rather than being a primary goal to undermine his motivation.

To achieve their aim of receiving the best education possible, science teachers are searching for innovative educational techniques. To obtain the best education, he or she also searches for solutions to the issues he or she encounters. The study revealed that the teacher has a high level of technological proficiency, which suggests that he or she is driven by a desire to see students succeed. The findings also demonstrated the science teacher's aptitude for using technology to research educational trends and his or her familiarity with websites that support the science curriculum. Despite this, he or she remained motivated despite the development of issues in other aspects. Therefore, he or she is looking for new education methods because his or her goal is to reach the best education in various ways and looks for ways to solve problems to achieve the best education.

It was found that the teacher's ability to possess technological skills is very high, which indicates that he or she has a motivation towards education, which is what the study showed. The results also revealed that the science teacher could employ technological skills, search for what is new in modern education, and use his knowledge of educational sites that serve the science curriculum. Despite this, the emergence of problems from other aspects did not affect his motivation.

This result conforms with the study of Odeh and Odeh [15], which showed that teachers' attitudes towards using technological competencies were positive. However, the degree of their obstacles was moderate and differed from the study [26], which indicated that the work environment, training, and development significantly impact stimulating teachers' motivation. Generally, the following points are the major findings of the study:

- Science teachers' perceptions of the problems they face in employing electronic skills in science education came in at a moderate degree.
- Science teachers' motivation towards education was high.
- The absence of a statistically significant correlation between the problems that science teachers face in employing electronic skills and the motivation towards education.
- The problems facing science teachers in employing electronic skills were not large, so they did not affect their motivation towards teaching.
- An effective teacher who possesses electronic skills and has a desire to teach is not affected by the challenges and difficulties he or she faces.

5. Recommendations

Considering the findings of the current study, it is recommended to:

1. Holding training courses for science teachers to increase their proficiency and ability to employ technological skills and raise their awareness of its importance.
2. Providing financial support from competent authorities to schools to provide electronic devices that help employ electronic skills.

3. Training students and increasing their ability to use and deal with technological devices.
4. Conducting more studies dealing with the problems of employing technological skills and introducing new variables related to the success of education.

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