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Impact Of Activating Science Laboratories In Schools On Students' Practical Outcomes

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The study aimed to explore the impact of activating science laboratories in schools on students' practical outcomes and the differences in these outcomes based on gender, academic qualification, and years of experience. The descriptive-analytical method was applied due to its suitability for the study's objectives. The study was conducted on a stratified random sample consisting of 100 male and female science teachers for the basic education stage in public schools in Qalqilya Governorate. To collect data for this study, a questionnaire which was consisting of 27 items used.

The researcher recommends that schools should improve and update science laboratories to provide a suitable learning environment, equipping them with the necessary tools and materials to activate experimental activities. It is also advised that workshops and training courses for teachers on how to effectively use science laboratories be offered, enhancing their ability to manage experiments and motivate students.

Keywords: Science laboratories, Students' practical outcomes, Basic education stage.

Introduction:

Currently, the educational landscape, both locally and globally, is witnessing significant developments to keep pace with scientific and technological advancements. This progress is attributed to the effective use of educational technologies. The teaching of science can only achieve its objectives through the correct application of these technologies in schools. Modern educational trends place significant importance on these technologies due to their substantial role in transforming scientific facts and concepts into practical experiments that students can engage with themselves. Consequently, traditional theories that relied on rote memorization and direct instruction, which positioned the teacher at the center of the educational process, have diminished. Instead, modern theories have emerged that rely on scientific experimentation and place the student at the center of the educational process. These theories provide all the tools and curricula that enable students to research and explore independently. Hence, science laboratories are considered an essential part of these modern technologies, as they offer students a rich learning environment filled with diverse sensory experiments, helping them to understand better scientific phenomena and concepts (Bejli, 2019).

School laboratories are the heart of the educational process in the field of science. They go beyond merely conveying theoretical information. They provide students with the opportunity to learn through hands-on experiments. This rich experiment helps them develop a diverse set of skills, including practical skills, critical thinking, and problem-solving. Additionally, laboratories foster scientific curiosity in students and encourage them to explore and discover. This highlights the central role of school laboratories in science education. Transitioning from abstract theories to practical application in the lab environment significantly enhances a deep understanding of scientific concepts. The practical application of science, through conducting experiments and critically analyzing results, strengthens the development of students' scientific knowledge and enhances their critical thinking, creativity, and problem-solving skills (Darwish, 2023).

Therefore, those involved in science education place great emphasis on teaching science in the laboratory due to its advantages over traditional classroom teaching. Many experts in this field agree that the laboratory helps develop students' practical skills, nurtures their scientific interests and trends, involves them in the learning process, and enhances their scientific thinking skills. Thus, the science lab brings a sense of realism to some of the theoretical information and ideas that students hear while simultaneously meeting their need to learn science in a natural environment. As a result, teaching science in the lab is one of the most effective methods for reinforcing information (Robinson, 2014).

The researcher indicates that the importance of school laboratories goes beyond the cognitive aspect to include educational and social dimensions. Through group work in the laboratory, students learn collaboration and communication skills, and they develop positive attitudes toward science. Laboratories also provide an environment that encourages inquiry and discovery, which motivates students to develop scientific research skills. Thus, the school laboratory is an effective pedagogical tool for implementing modern science curricula that focus on building knowledge through inquiry and discovery. It provides students with the opportunity to apply theoretical knowledge in real-world contexts, which deepens their understanding of scientific concepts.

In light of the above, there is a need to study the impact of activating science laboratories in schools on students' practical outcomes in science for the basic stage in public schools in the Qalqilya Governorate.

Study Problem and Questions:

Science is one of the subjects that includes numerous lessons and educational units requiring practical, hands-on activities such as experimentation and discovery. This is because such activities help solidify the material in the student's mind more clearly and quickly, moving away from rote memorization and passive content. This highlights the need for science laboratories, where students can experiment, discover, inquire, and solve problems under the teacher's supervision. This process significantly contributes to increasing students' motivation and enhancing their scientific outcomes.

Through the researcher's experience in teaching science at the primary level, it became clear that many units and lessons in science cannot be explained and clarified properly for students without reinforcing them with practical applications that illustrate the dimensions and objectives of those lessons. Thus, conveying the concept accurately to students ensures it stays in their minds for as long as possible, moving away from mere memorization and rote learning. From this, the study problem emerges, summarized by answering the **following questions**:

1. What is the importance of science laboratories in schools?

2. What is the role of schools in activating science laboratories?

3. To what extent do science laboratories improve students' practical outcomes?

4. Is there a statistically significant impact at the significance level ($\alpha = 0.05$) of activating science laboratories in schools on students' practical outcomes in science for the basic level in public schools in the Qalqilya Governorate?

5. Are there statistically significant differences in activating science laboratories in schools on students' practical outcomes in science for the primary level in public schools in the Qalqilya Governorate based on variables (gender, academic qualification, and years of experience)?

Study Hypotheses:

The following null hypotheses emerged from the fourth and fifth questions:

1- There is no statistically significant effect at the level ($\alpha = 0.05$) of activating science laboratories in schools on students' practical outcomes in science for the basic level in public schools in the Qalqilya Governorate.

2- There are no statistically significant differences at the level ($\alpha = 0.05$) in the respondents' answers regarding the impact of activating science laboratories in schools on students' practical outcomes, attributed to the variables (gender, academic qualification, and years of experience).

Study Objectives:

1. To identify the importance of scientific laboratories in schools.

2. To determine the role of schools in activating scientific laboratories.

3. To measure the extent of improvement in students' practical outcomes through the use of scientific laboratories.

4. To study the impact of activating scientific laboratories on students' practical outcomes in science for the basic level in public schools in the Qalqilya Governorate at the significance level ($\alpha = 0.05$).

5. To analyze the statistically significant differences in the impact of activating scientific laboratories on students' practical outcomes in science for the basic level in public schools in

the Qalqilya Governorate based on the variables (gender, academic qualification, and years of experience).

Study Importance:

Theoretical Importance: The researcher reflects on the study's contribution to deepening the understanding of the relationship between the use of scientific laboratories and students' scientific outcomes and how they interact with each other within the context of academic teaching. Upon reviewing previous research studies, the researcher found no local studies addressing the impact of activating scientific laboratories in schools on students' practical outcomes in science for the basic education stage in public schools in Qalqilya Governorate. Thus, the importance of the current study lies in its potential to improve educational practices and teaching methods for science in all schools through a deeper understanding of this relationship.

Practical Importance: The researcher reflects on developing policies and procedures that assist and promote the use of scientific laboratories in the teaching environment. This is due to the significance, role, and effectiveness of these laboratories on students' achievement and performance, as evidenced by the results of previous studies. From this, the practical importance of the study becomes clear through the investigation of the expected impact of using scientific laboratories on students' practical outcomes in science.

Study limits:

The researcher adhered to the following limits while conducting the study:

Human limit: Science teachers for the basic education stage in public schools in Qalqilya Governorate.

Spatial limit: Public schools in Qalqilya Governorate, West Bank.

Temporal limit: This study was conducted during the year 2024.

Terms and Procedural Definitions of the Study:

• **Scientific Laboratories:** The designated space in schools for conducting experiments and practical activities related to the science curriculum, equipped with the necessary tools and devices to implement those activities. The scientific laboratory aims to stimulate students' interests, desires, curiosity, and love of inquiry, as well as enhance their problem-solving skills, foster creative thinking, develop scientific methods and thinking, and enable the understanding of concepts while working to develop thinking abilities. Also, the development of laboratory skills, such as designing and conducting experiments, making observations, recording information, and analyzing and interpreting results (Montalbano et al., 2014).

• **Procedural Definition of Scientific Laboratories:** A designated space where science teachers conduct demonstrative experiments and explain practical lessons related to theoretical subjects. It is equipped with all the necessary supplies to implement these activities.

• **Students' Practical Outcome:** All of the information, abilities, attitudes, and values that a student gains from participating in certain educational activities and studying a particular curriculum (Al-Thubaiti, 2021).

• **Procedural Definition of Students' Practical Outcome:** It refers to the cognitive development of basic education students through their interaction with the surrounding environment, facilitated by providing an engaging atmosphere characterized by practical application in the subject of science.

• **Basic Education Stage:** This stage consists of both the lower and upper basic levels, covering grades 1 to 10. It is divided into two parts: the lower basic stage (preparatory), which includes grades one through four, and the upper basic stage (empowerment), covering grades five to ten (Afouna, 2014).

The researcher operationally defines basic education students as those studying in the basic education grades, which extend from the first grade to the tenth grade. This is a mandatory stage that begins when a Palestinian student enters the first grade at the age of 5 years and 6 months and lasts for ten years, concluding at the end of the tenth grade. The Ministry of Education and Higher Education in Palestine oversees basic education in public schools.

Previous Studies

The researcher addressed several previous studies related to the research topic, presenting them in two sections: the first section covers Arab studies, while the second section discusses foreign studies.

First: Arab Studies:

Al-Husseini's (2023) study examined the influence of the school laboratory approach on the growth of scientific thinking abilities in Kuwaiti primary school pupils. One hundred elementary school pupils from Kuwait's Hawalli educational area made up the study sample. 50 children who represented the experimental group were examined using the school laboratory approach, and 50 students who represented the control group were studied using the conventional method, which made up the study's sample. The study found that, when comparing the mean scores of the experimental group, which used the school laboratory to study for the scientific thinking skills test, to the control group, which used traditional methods, the study found statistically significant differences in favor of the experimental group at the level of ($\alpha \leq 0.05$).

The Al-Sulh (2023) research examined the influence of the school physics lab on second-grade intermediate students' curiosity development and understanding of scientific ideas in physics. The researcher applied the experimental procedure to a sample of sixty pupils. He discovered that there were statistically significant differences between the experimental and control groups. This is explained by the fact that second-grade intermediate students use science labs to learn scientific topics in physics. The usage of science labs and the emergence of physics interest in second-grade intermediate students were also found to be responsible for the disparities between the experimental and control groups.

In the same context, Darwish (2023) examined the factors that activate the role of school laboratories from the perspective of science teachers in the southern region of Jordan. The study sample consisted of 139 teachers, selected randomly. A tool was developed to measure the factors that activate school laboratories. To analyze the data, the researcher employed the descriptive survey method. The results showed that the overall mean score of the factors activating the role of school laboratories, from the perspective of science teachers in the southern region, was rated at a moderate level across all areas. It also indicated that there were no statistically significant differences between the mean responses of the study population regarding the dimensions of administrative factors, material and human factors, and the overall score of factors activating science laboratories.

The study by Bejli (2019) investigated the actuality of school laboratories and their apparatus in Jeddah's primary schools, as well as how much they are used in the teaching and learning process. Using a questionnaire as the instrument, the researcher used the descriptive analytical approach to survey 150 female primary school teachers in Jeddah. The most significant conclusion drawn from the study is that school laboratories should be activated at the elementary stage since they foster children's creativity and scientific innovation. However, in accordance with the controls indicated in this respect, the operational budget does not cover the deficits from the consumables in the science curriculum. The supplies and instruments at the school laboratory are inadequate, and the shortage is not corrected if any of the gadgets and tools are borrowed or transmitted.

Al-Sabah and Rawqa's (2017) study sought to determine the challenges general science instructors in the Irbid Governorate experienced when utilizing scientific labs to teach science. The descriptive analytical approach was used to choose a basic random sample of science instructors from Irbid Governorate public schools. According to the study, teachers encounter modest challenges while attempting to teach science in scientific laboratories. Additionally, it showed statistically significant variations in the degree of barriers to using scientific labs in favor of male professors at the significance level of 0.05. Regarding the degree of barriers depending on training programs, academic credentials, specialization, and years of experience, there were no statistically significant differences at the significance level of 0.05.

The study by Samili (2017) addressed the reality of using school laboratories in teaching chemistry in the Samtah Governorate in the Jazan region of Saudi Arabia. The study adopted the descriptive survey method and utilized a questionnaire as a data collection tool, with a study population of 80 female teachers and laboratory technicians. The results showed that the condition of the school laboratory was rated at a “moderate” level, safety and security in the school laboratory were also rated as “moderate,” while the obstacles to using the school laboratory in teaching chemistry were rated at a “high” level.

The study by Abu Samak (2015) aimed to identify the problems faced by laboratory technicians in secondary schools in the Gaza governorates and ways to reduce them. The researcher employed the descriptive analytical method. The study population consisted of all laboratory technicians in public secondary schools in the Gaza governorates, totaling 142. The entire study population was taken as the sample for the study. The study revealed that technical

issues ranked first, followed by administrative issues in second place. The overall score of the problems received a relative weight of 58.56%. Additionally, there were statistically significant differences at the significance level of (0.05) between the mean ratings of laboratory technicians regarding the administrative and technical problems they face in secondary schools, attributed to the variable of gender.

Second: Foreign Studies:

The goal of Shahzadi et al.'s study from 2023 was to find out how laboratories affect scientific instruction and student learning in public secondary schools. This qualitative research study determines the use, accessibility, and function of labs and scientific teaching resources in secondary science education and student learning. Science instructors are interviewed in order to gather data. Semi-structured interviews were conducted. The researcher employed open-ended inquiries. The study's findings demonstrated that science labs are crucial for raising student learning and have a significant impact on scientific education.

Jiang S. et al. (2022) investigated the navigation patterns and learning performance of secondary school students using augmented reality technology in laboratory environments. This technology helps students conduct practical laboratory experiments and explore scientific phenomena interactively in areas including biology, chemistry, and physics concepts. Using the descriptive-analytical approach, laboratory experiments were conducted in pairs to learn thermodynamics for seventy ninth-grade students. Cluster analysis was determined for the two study groups. The different navigation patterns revealed diverse ways for students to observe, describe, explore, and evaluate scientific phenomena. These patterns were associated with learning performance. The results indicated the need to provide multiple representations and different types of interactions to support effective scientific learning and raise students' scientific output. In addition, these representations and the connections between them should be designed to enhance scientific thinking skills and an in-depth understanding of scientific processes.

A 2019 study by Flores-Camacho et al. examined how information and communication technology-based science labs influence high school students' understanding and representation of scientific knowledge in a typical classroom setting. The research addresses whether technology resources impact students' comprehension, particularly when their use relies solely on individual teachers' visions and technical skills without any experimental control. Data and analysis show that introducing science laboratories equipped with a variety of technological resources creates a multi-representational environment that positively impacts students. This enhances their understanding and ability to represent concepts in Biology and Physics across various situations, influenced by the didactic approaches used by teachers.

Alexandre and Cossa (2015) conducted a study to identify the impact of an in-service training program on the perceptions of biology and chemistry teachers regarding the role of laboratory work in Mozambique. The study was conducted by the facilitators before and after a five-day training workshop and sought to understand the teachers' perceptions of and experiences with the aims of laboratory work and its importance in the teaching of Biology and Chemistry subjects. The study employed a participatory approach, with the study population consisting

of biology and chemistry teachers who participated in the program. A sample of 17 teachers was selected, and a questionnaire containing both open and closed questions, along with workshops, was used as the study tool. The study found that improving teachers' understanding of the importance of laboratory work adds value to the practical aspect of education. However, the lack of equipped laboratories in most of their schools presents a significant barrier to conducting laboratory work.

Commentary on Previous Studies:

The previous studies addressed the topic of school laboratories and their role in enhancing scientific outcomes among students from various perspectives. In Al-Husseini's (2023) study, the impact of developing school laboratories on developing scientific thinking skills among primary school students in Kuwait was explored. The study found statistically significant differences in favor of the experimental group that utilized the school laboratory. The study by Al-Sulh (2023) examined the impact of the physics laboratory on developing curiosity and acquiring scientific concepts among second grade intermediate students. The results indicated that there were significant differences attributed to the use of laboratories. In the same context, Darwish's (2023) study investigated the factors that activate the role of laboratories from the perspective of science teachers in southern Jordan, revealing a moderate assessment of the activation factors with no statistically significant differences among the dimensions. In Bejli's (2019) study, the reality of laboratories and their equipment in primary schools in Jeddah was examined. The findings showed that activating the school laboratory enhances creativity and innovation, despite a shortage of necessary consumables and tools.

On the other hand, the study by Al-Sabah and Rawqa (2017) addressed the obstacles to using laboratories in teaching science in Irbid Governorate. The findings indicated that the obstacles were at a moderate level, with significant differences in favor of male teachers. Similarly, Samili's (2017) study examined the reality of using laboratories in teaching chemistry in the Samtah Governorate, indicating a moderate level of laboratory conditions while also highlighting significant obstacles to their use. Additionally, Abu Samak's (2015) study aimed to identify the problems faced by laboratory technicians in Gaza. The results showed that technical issues were the most prevalent problems encountered. In other studies, Shahzadi et al. (2023) emphasized the importance of laboratories in improving learning for high school students, while Jiang et al. (2022) examined the impact of augmented reality in enhancing learning in laboratories. Flores-Camacho et al. (2019) investigated the impact of information technology-based science laboratories, highlighting a positive effect on students' understanding of science. Additionally, Alexandre and Cossa (2015) found an improvement in teachers' understanding of the importance of laboratory work; however, the lack of equipped laboratories posed a significant barrier to implementing laboratory activities.

Distinguishing the Current Study from Previous Research

The current study is distinguished from previous studies in several aspects. It specifically focuses on the importance of science laboratories in public schools in the Qalqilya Governorate, adding a localized and precise dimension to the topic of activating science laboratories. While previous studies generally addressed the topic of laboratories. The current

study measures the impact of activating scientific laboratories on students' practical outcomes in science at the basic education level. However, the previous studies explored the impact of laboratories generally. Finally, the study is geographically specific, focusing on public schools in the Qalqilya Governorate. This contributes valuable data on the educational reality in this region, which has not been explored in depth in previous studies. Thus, the current study contributes to providing a comprehensive perspective on the activation of scientific laboratories in education, with a focus on both the practical and theoretical aspects that are relevant to the local community.

Study Methodology

In this study, the researcher employed the descriptive method, which is based on examining the phenomenon as it exists in reality. This approach involves a series of research procedures that rely on collecting facts and data. Also, classifying, processing, and analyzing them thoroughly and accurately to extract their significance. Then it arriving at conclusions or generalizations about the phenomenon under study. In addition to relying on the descriptive-analytical method, which examines the levels of the study variables, it quantitatively describes the degree of the relationship between these variables and compares their results using quantitative measures. For this reason, the descriptive-analytical method is considered the most suitable for this study, as it ensures the achievement of its objectives in a manner that guarantees accuracy and objectivity. The study focused on identifying the impact of activating scientific laboratories in schools on students' practical outcomes and revealing the differences in responses according to certain categorical variables (gender, academic qualification, and years of experience).

Study Population:

The study population consisted of all science teachers in public schools at the basic education level in Qalqilya Governorate, totaling 170 teachers.

Sample Size:

To calculate the sample size, the researcher used the Kergcie and Morgan formula:

$N= x^2\ np(1-p)/d^2\ (n-1) +x^2\ p(1-P)$ …… (1)

Where:

1. N: represents the total population size or the overall sample size to be studied.

2. X^2: the squared value of the standard score (Z) associated with the confidence level, typically using a 95% confidence level.

3. p: represents the expected proportion of the characteristic present in the population. In the absence of a prior estimate, a value of 0.5 can be used as a conservative estimate, as it provides the maximum sample size.

4. d^2: is the acceptable quality level (margin of error), typically expressed as the allowable difference between the true value and the estimated value. For example, if the required quality is ±5%, then (d^2) equals 0.05.

5. n: represents the required sample size.

6. 1-p: is the proportion of the population that does not have the specified characteristic, which is calculated as (1-p).

According to the above equation, the study sample consists of 119 science teachers from basic education in public schools in Qalqilya Governorate, selected using the simple random sample method. A total of 100 valid questionnaires were retrieved for analysis, indicating a response rate of 84% from the total distributed questionnaires after verifying their accuracy and proper completion. The following is a description of the characteristics of the study sample according to its demographic variables:

Table (1): Distribution of the study sample according to the study's demographic variables

Variable	Level	Frequency	Percentage %
Gender	Male	38	%38
	Female	62	%62
	Total	**100**	**%100**
Academic qualification	Diploma	7	%7
	Bachelor	67	%67
	Graduate Studies	26	%26
	Total	**100**	**%100**
Years of experience	Less than 5 years	15	%15
	5 to less than 10 years	35	%35
	10 years or more	50	%50
	Total	**100**	**%100**

Based on the results presented in the previous table, the percentage of females was higher than that of males, with females representing 62% and males 38% of the study sample. Regarding the academic qualification variable, the largest portion of the study sample held a bachelor's degree, making up 67% of the sample. This was followed by those with graduate degrees at 26%, while the smallest percentage, 7%, held a diploma. The results related to the years of experience variable indicated that the largest portion of the study sample had 10 years or more of experience, representing 50% of the sample. This was followed by the group with 5 to less than 10 years of experience at 35%, while the smallest percentage, 15%, had less than 5 years of experience.

Study Tool:

The researcher used a questionnaire as the study tool, consisting of 27 items distributed across three domains, which are:

First Domain: The importance of science laboratories in schools, consisting of 8 items.

Second Domain: The role of schools in activating science laboratories, consisting of 9 items.

Third Domain: The degree of improvement in students' practical outcomes through science laboratories, consisting of 10 items.

Correction of the Tool:

The response scale for these items included five responses (1-5) according to the five-point Likert scale, which is:

- Very high degree (5 points)

- High degree (4 points)

- Moderate degree (3 points)

- Low degree (2 points)

- Very low degree (1 point)

Questionnaire Validity:

The tool, in its initial form, was presented to five experts with experience and specialization in the field of educational sciences. Based on the judges' feedback, their modifications, and the rephrasing of some items, the scale was approved.

Questionnaire Reliability:

The researcher used the internal consistency method, applying Cronbach's alpha equation. The overall internal consistency reliability coefficient of the questionnaire was found to be 0.874. This indicates the validity of the tool. It is worth mentioning that the reliability coefficients for the study domains ranged from 0.710 to 0.911. The following table presents the results related to this.

Table (2): Reliability Coefficients of the Questionnaire Domains Using Cronbach's Alpha

Domain	**Reliability Coefficient (Cronbach's Alpha)**
First Domain: The importance of science laboratories in schools	0.710
Second Domain: The role of schools in activating science laboratories	0.849

Third Domain: The degree of improvement in students' practical outcomes through science laboratories	0.911
The tool as a whole	**0.874**

Study Variables:

Demographic Variables:

These included the following variables:

• Gender: with two levels (Male and Female)

• Academic Qualification: with three levels (Diploma, Bachelor's, Graduate)

• Years of Experience: with three levels (Less than 5 years, 5 to less than 10 years, 10 years or more).

• **Independent Variable:** Activation of science laboratories.

• **Dependent Variable:** Students' practical outcomes.

Statistical Treatments:

To answer the study questions, the researcher used the Statistical Package for the Social Sciences (SPSS). The following statistical methods were employed: frequencies (Fre.) and percentages (%), arithmetic means (AM), and standard deviations (Std.). Calculate the reliability of the questionnaire using Cronbach's Alpha and the one-sample t-test to examine the differences in the study sample's responses. That is regarding the impact of activating science laboratories in schools on students' practical outcomes. The Independent Samples t-test was used to examine hypotheses related to two-level demographic variables, such as gender. The One-Way ANOVA was employed to test hypotheses concerning demographic variables with more than two levels, such as academic qualification and years of experience. The LSD test was used for post-hoc comparisons.

To interpret the results, the researcher calculated the means and standard deviations for the items in the domains. The researcher established five intervals to differentiate between high and low scores; the range was calculated as (5 -1 = 4), which was then divided by 5 intervals (4/5 = 0.8). Consequently, the length of each interval is 0.8. The researcher adopted the following scale to distinguish between scores, as outlined below:

• AM (21.4 and above, equal to 84.2% and higher): Very high degree.

• AM (20.4 – 41.3, equal to 68.2% - 84.0%): High degree.

• AM (40.3 – 61.2, equal to 52.2% - 68.0%): Moderate degree.

• AM (60.2 - 81.1, equal to 36.2% - 52.0%): Low degree.

• AM (below 60.2): Very low degree.

To answer the main research question and reach overall conclusions regarding the impact of activating science laboratories in schools on students' practical outcomes for the study sample. The Fre., AM, and levels of agreement related to the sample's responses were calculated. Table (3) presents the AM, Std, and % for the study domains as a whole.

Table (3): AM and Std. for the Study Domains and Overall Score

No.	Rank	Domain	AM	Std	%	Level
1	**2**	The importance of science laboratories in schools	4.31	0.379	86.2	Very high
2	**3**	The role of schools in activating science laboratories	3.92	0.463	78.4	High
3	**1**	The degree of improvement in students' practical outcomes through science laboratories	4.36	0.448	87.2	Very high
Overall total			4.20	310.1	84	Very high

The results in Table (3) indicate that the domain of "the degree of improvement in students' practical outcomes through science laboratories" ranked first, with an AM of 4.36 and a percentage of 87.2%, reflecting a very high level of agreement. The domain of "the importance of science laboratories in schools" ranked second, with a mean of 4.31 and a percentage of 86.2%, indicating a very high level of agreement. The domain of "the role of schools in activating science laboratories" ranked third and last, with a mean of 3.92 and a percentage of 78.4%.

To answer the main question, which is, "What is the impact of activating science laboratories in schools on students' practical outcomes?" the overall mean was found to be 4.20, with a percentage of 84% and a very high level of agreement. This indicates that, from the perspective of science teachers in the basic stage at public schools in Qalqilya Governorate, the impact of activating science laboratories in schools on students' practical outcomes was significant.

The researcher interprets these results as reflecting the significant importance of activating science laboratories in schools on students' practical outcomes. The educational process is not limited to receiving information theoretically. It also requires students to engage with concepts through experimentation and practice. Science laboratories provide students with the opportunity to acquire knowledge through hands-on experiments, enhancing their understanding and enabling them to apply what they have learned in real-life situations. Additionally, these laboratories promote critical thinking and problem-solving skills as

students learn how to conduct experiments, collect data, and analyze results. Despite recognizing the importance of laboratories, the study results also indicate the need to improve their activation within schools. This requires directing more efforts and resources towards training teachers and providing the necessary infrastructure. Therefore, investing in activating science laboratories is not merely an addition to the curriculum; it is a fundamental component in developing students' skills and achieving positive educational outcomes that prepare them to face future challenges in a rapidly changing world.

Results Related to the First Question: what is the importance of science laboratories in schools?

To answer the first research question, the first domain of the study included eight different items to measure the importance of science laboratories in schools from the perspective of the study sample. Frequencies, means, and levels of agreement regarding the sample's responses were calculated, and the results were as follows:

Table (4): AM and Std. for the items in the first domain related to the importance of science laboratories in schools

No.	Items	AM	Std.	%	Level
1	Helps increase students' understanding of the nature of science.	4.35	0.716	87	Very high
2	Science laboratories contribute to stimulating cooperation and teamwork among students through joint activities and experiments.	4.40	0.739	88	Very high
3	The science laboratory adds realism to some of the theoretical information and concepts that students encounter.	4.36	0.523	87.2	Very high
4	Students can touch and see some theoretical concepts practically and realistically.	4.48	0.541	89.6	Very high
5	Science laboratories enhance the ability to make precise and direct scientific observations among students.	4.30	0.628	86	Very high
6	Science laboratories develop logical thinking to draw appropriate conclusions based on the observations students make during experiments.	4.22	0.660	84.4	Very high

7	Science laboratories contribute to improving students' academic performance by enhancing their understanding and application skills	4.21	0.574	84.2	Very high
8	Science laboratories foster students' interests and inclinations	4.15	0.833	83	High
Overall degree for the domain: The importance of science laboratories in schools		**4.31**	**0.379**	**86.2**	**Very high**

Table (4) shows that the means of the study sample's responses regarding the importance of science laboratories in schools ranged between 4.48 and 4.15. The domain included eight items, with the level of agreement ranging from high to very high. The item "Students can touch and see some theoretical concepts practically and realistically" ranked first, with a mean of 4.48, a percentage of 89.6%, and a very high level of agreement. This was followed by the item "Science laboratories contribute to stimulating cooperation and teamwork among students through joint activities and experiments," which ranked second with a mean of 4.40, a percentage of 88%, and a very high level of agreement. Next came the item "The science laboratory adds realism to some of the theoretical information and concepts that students encounter," which ranked third with a mean of 4.36, a percentage of 87.2%, and a very high level of agreement. Meanwhile, the item "Science laboratories foster students' interests and inclinations" ranked last with a mean of 4.15, a percentage of 83%, and a high level of agreement. The overall mean for the domain of the importance of science laboratories in schools was 4.31, with a percentage of 86.2% and a very high level of agreement. This indicates that the level of agreement was very high regarding the importance of science laboratories in schools from the perspective of science teachers in the basic stage at public schools in Qalqilya Governorate, as represented by the study sample.

The researcher believes that there is a strong consensus among the sample participants regarding the essential value of these laboratories. The various items point to the role of laboratories in enhancing students' understanding of the nature of science, reflecting the laboratories' ability to bridge theoretical knowledge with practical applications. When students can observe and interact with theoretical concepts in a realistic manner, their ability to grasp scientific concepts is significantly strengthened. This is evident from the high means associated with the items related to this aspect. Additionally, laboratories contribute to fostering cooperation and teamwork among students, enhancing both their social and practical skills. Shared experiments in the lab create a learning environment that encourages dialogue and interaction, which is a key factor in improving students' academic performance.

The emphasis on developing skills such as precise observation and logical thinking indicates that laboratories are not just places for experimentation but are also effective educational platforms that shape students' scientific thinking and nurture their interests. Although some

items received lower levels of agreement compared to others, the overall results demonstrate a consensus on the significant importance of laboratories in the educational process.

Results Related to the second question: What is the role of the school in activating science laboratories?

To answer the second research question, the second section of the study included nine different items to measure the role of the school in activating science laboratories from the perspective of the sample included in the study. The frequencies, means, and degrees of agreement related to the responses of the sample were calculated, and the results were as follows:

Table (5): Am and Std for the second domain related to the role of schools in activating science laboratories

No.	Items	AM	Std	%	Level
1	The school administration encourages a spirit of creativity and innovation by activating science laboratories in the school	4.27	0.548	85.4	Very high
2	The school administration allows science teachers to participate in decision-making regarding the preparation and setup of the laboratory.	4.19	0.506	83.8	High
3	The school organizes workshops and training courses for teachers on how to effectively use science laboratories.	3.59	0.877	71.8	High
4	The school administration continuously meets the laboratory's needs for educational materials and tools.	4.22	0.773	84.4	Very high
5	The school administration monitors the activation of science classes in the laboratory.	4.11	0.665	82.2	High
6	The school administration provides advice and support to teachers who find it difficult to manage the educational situation in the laboratory.	3.76	0.515	75.2	High
7	The school raises awareness of the importance of science laboratories in developing students' practical and cognitive skills.	3.89	0.567	77.8	High
8	The school allocates sufficient time in the academic schedule for activities and practical experiments in the laboratories.	3.60	0.899	72	High
9	The school provides a learning environment that encourages scientific research and discovery through the use of laboratories.	3.62	0.708	72.4	High

Overall degree for the domain: school's role in activating scientific laboratories	**3.92**	**0.463**	**78.4**	**High**

It is evident from Table (5) that the mean scores of the responses from the study sample on the domain of the school's role in activating scientific laboratories ranged between (4.27 and 3.59). The section included (9) items, with the level of agreement varying between high and very high. The item "The school administration encourages creativity and innovation by activating scientific laboratories in the school" ranked first, with a mean score of (4.27), a percentage of (85.4%), and a degree of agreement classified as very high. Next, the item "The school administration continuously meets the laboratory's needs for educational materials and tools" ranked second, with a mean score of (4.22), a percentage of (84.4%), and a degree of agreement classified as very high. Next, the item "The school administration allows science teachers to participate in making decisions related to the preparation and setup of the laboratory" ranked third, with a mean score of (4.19), a percentage of (83.8%), and a degree of agreement classified as very high. Meanwhile, the item "The school organizes workshops and training courses for teachers on how to use the scientific laboratories effectively" ranked last, with a mean score of (3.59), a percentage of (71.8%), and a degree of agreement classified as high. The overall mean score for the axis of the role of the school in activating scientific laboratories was (3.92), with a percentage of (78.4%) and a degree of agreement classified as high. This indicates that the level of agreement was significant regarding the role of the school in activating scientific laboratories, according to the views of science teachers in the basic education stage at public schools in Qalqilya Governorate, who were included in the study sample.

These results reflect, from the researcher's perspective, a clear commitment from school administrations to create a supportive and encouraging educational environment for activating scientific laboratories. The results showed a strong consensus among the sample members regarding the importance of the administration encouraging creativity and innovation through laboratories. That indicates their deep awareness of the significance of practical experimentation in enhancing learning. Laboratories are not just places for experiments; they are a means to develop students' practical and cognitive skills. The item regarding meeting the laboratory's needs for materials and educational tools on an ongoing basis ranks second, indicating that the administration recognizes the importance of providing the necessary resources to ensure the effectiveness of scientific experiments. This reflects the significance of good planning and preparation.

Also, allowing teachers to participate in decision-making regarding the preparation and setup of the laboratory reflects a culture of partnership and empowerment within the school environment. These fosters increased interaction between teachers and administration, which enhances the development of educational performance. However, the results indicate that there are areas that need improvement, such as organizing workshops and training sessions, which received a lower average compared to other items. This highlights the importance of providing

appropriate training for teachers to effectively use the laboratories, thereby enhancing the quality of education.

Results related to question three: What is the degree of improvement in students' practical outcomes through science laboratories?

To answer this question, the third section of the study included 10 different items to measure the degree of improvement in students' practical outcomes through science laboratories from the perspective of the study sample. Frequencies, means, and levels of agreement regarding the sample's responses were calculated, and the results were as follows:

Table (6): AM and Std., for items related to the degree of improvement in students' practical outcomes through scientific laboratories

No.	Items	AM	SD	%	Level
1	The practical experiments in the laboratory help you understand scientific materials better.	4.37	0.525	87.4	Very high
2	Scientific laboratories enhance the necessary educational skills among students.	4.31	0.615	86.2	Very high
3	The scientific laboratory contributes to improving the practical application of academic subjects.	4.51	0.522	90.2	Very high
4	The scientific laboratory increases students' interaction with subject matter.	4.36	0.644	87.2	Very high
5	The scientific laboratory helps improve students' grades in scientific subjects.	4.27	0.601	85.4	Very high
6	The scientific laboratory stimulates students' desire to learn and discover.	4.36	0.560	87.2	Very high
7	The scientific laboratory helps develop students' critical thinking and problem-solving skills.	4.46	0.626	89.2	Very high
8	The scientific laboratory provides an encouraging educational environment for innovation and creativity among students.	4.36	0.628	87.2	Very high
9	The scientific laboratory positively affects students' performance in practical experiments.	4.38	0.582	87.6	Very high

10	The scientific laboratory contributes to enhancing students' self-confidence during experiments.	4.27	0.694	85.4	Very high
Overall degree for the domain: the degree of improvement in students' outcomes through scientific laboratories		**4.36**	**0.448**	**87.2**	**Very high**

It is evident from Table (6) that the mean scores of the study sample's responses regarding the degree of improvement in students' outcomes through scientific laboratories ranged between (4.51 – 4.27). All 10 items included in this section received a very high level of agreement. The item "The scientific laboratory contributes to improving the practical application of academic subjects" ranked first with a mean score of (4.51) and a percentage of (90.2%) with a very high level of agreement. This was followed by the item "The scientific laboratory helps develop critical thinking and problem-solving skills among students," which ranked second with a mean score of (4.46) and a percentage of (89.2%) with a very high level of agreement. The item "The scientific laboratory positively affects students' performance in practical experiments" ranked third with a mean score of (4.38) and a percentage of (87.6%) with a very high level of agreement. Meanwhile, the items "The scientific laboratory contributes to enhancing students' self-confidence during experiments" and "The scientific laboratory contributes to improving students' grades in scientific subjects" both ranked last with a mean score of (4.27) and a percentage of (85.4%) with a very high level of agreement. The overall mean score for the aspect of improving students' practical outcomes through scientific laboratories was (4.36), with a percentage of (87.2%) and a very high level of agreement. This indicates that the level of agreement was very high regarding the degree of improvement in students' practical outcomes through scientific laboratories from the perspective of science teachers in the primary stage at public schools in Qalqilya Governorate, who were included in the study sample.

Based on the above results, the vital role that scientific laboratories play in improving students' practical outcomes is evident. Teachers indicated that practical experiments significantly contribute to enhancing students' understanding of scientific materials and developing critical thinking and problem-solving skills. The items with high means reflect the teachers' awareness of the importance of laboratories as interactive learning environments, which enhances students' desire to learn and explore. This also helps them apply theoretical knowledge in practical contexts, thereby improving their academic performance. Furthermore, the positive impact of laboratories on enhancing students' self-confidence is significant for building their character and increasing their motivation to learn. These results demonstrate that laboratories are not just educational spaces but vital platforms for interaction and practical application. This necessitates that school administrations provide adequate support for these laboratories in terms of resources and teacher training to ensure the maximum educational benefit for students. Therefore, investing in the development of scientific laboratories should be a priority to enhance the educational process and achieve sustainable, positive academic outcomes.

In fact, it is not possible to make an accurate judgment on the levels of the areas and domains of the impact of activating scientific laboratories in schools on student outcomes if we rely solely on the mean scores of the overall grade and the domains. This judgment does not take into account the standard deviations, which are essential for accurately assessing the levels of the areas of the mentioned axes and the overall score. The appropriate method to accurately evaluate the mean scores and standard deviations is to conduct a One-Sample T-Test on the study sample. This test is used to compare the sample mean for each domain of the tool and the overall score with the theoretical population mean. Since the adopted scale is a five-point Likert scale, the population mean can be considered as the value (3), which separates high and low ratings. Accordingly, the sample mean was compared with the benchmark value (3), and the following table illustrates this.

Table (7): Results of the One-Sample T-Test for the difference between the sample AM and the population mean for the questionnaire domains related to the impact of activating scientific laboratories in schools on student outcomes

No.	Domains	Sample		T value	DF	Sig.
		AM	SD			
1	The importance of science laboratories in schools	4.31	0.379	34.554	99	0.000*
2	The role of schools in activating science laboratories	3.92	0.463	19.812	99	0.000*
3	The degree of improvement in students' practical outcomes through science laboratories	4.36	.448	30.440	99	0.000*
Overall score		4.20	.311	38.520	99	0.000*

* Statistically significant at the significance level ($0.05 \geq \alpha$) with a test value of (3).

The results from Table (7) indicate that there are statistically significant differences at the significance level ($0.05 \geq \alpha$) between the sample mean for the domains of the impact of activating scientific laboratories in schools on student outcomes and the overall score, in favor of the sample means. All values of (t) were statistically significant and positive, indicating that the impact of activating scientific laboratories in schools on student outcomes and the overall score for the study sample was high and statistically significant at a moderate level. This reflects the importance or value of the domains related to the impact of activating scientific laboratories in schools on students' outcomes from the perspective of the sample included in the study, whose ratings were all high.

Results Related to the Study Hypotheses

• The results concerning the first hypothesis, which addresses the fourth research question, state: There is no statistically significant effect at the significance level ($\alpha \leq 0.05$) of activating scientific laboratories in schools on students' practical outcomes in science subjects in primary schools in Qalqilya Governorate.

To clarify the result of the previous hypothesis, a simple linear regression (SLR) test was conducted to verify the significance of the relationship, and the results are shown in the following Table (8):

Table (8): Results of the One-Sample T-Test for the difference between the sample mean, and the population mean of the questionnaire domains related to the impact of activating scientific laboratories in schools on student outcomes

Variable	SLR	T value	R	R Square	F	Sig.
Independent (Activating Scientific Laboratories)	3.914	10.210	0.119	0.014	1.405	0.039
The practical outcomes of students in science	0.115	1.185				

*Statistically significant at the significance level (α=0.05).

It is evident from the previous Table (8) that the significance level is (0.039), which is less than the value set in the hypothesis. Therefore, we reject the hypothesis and conclude that there is a statistically significant effect of activating scientific laboratories in schools on the practical outcomes of students in science for the basic stage in public schools in Qalqilya Governorate.

Based on the mentioned results, it is clear that activating scientific laboratories in schools has a statistically significant effect on the practical outcomes of students in science for the basic stage in public schools in Qalqilya Governorate. This indicates that activating scientific laboratories has a positive impact on improving students' performance in practical experiments. This is further supported by the high mean levels associated with laboratory experiments, which highlights the importance of these laboratories in enhancing students' practical understanding. Therefore, schools should direct more efforts and resources toward activating scientific laboratories and improving the educational environment within them to support practical experiments and develop students' skills.

The results related to the second hypothesis, which addresses the fifth research question, state: There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the respondents' responses regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variables (gender, academic qualification, years of experience).

- There are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in the respondents' answers regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of gender.

An independent samples t-test was used to answer the first sub-hypothesis and determine the differences based on the gender variable. The results are shown in Table (9):

Table (9): Results of T-Test for the Significance of Differences in the Impact of Activating Scientific Laboratories in Schools on Students' Practical Outcomes Attributed to the Variable of Gender

Domain	Gender	No.	AM	Sdt	T value	Sig.
The importance of scientific laboratories in schools	**Male**	38	4.22	0.388	0.037	0.847
	Female	62	4.36	0.366		
The role of schools in activating scientific laboratories	**Male**	38	3.95	0.330	3.462	0.066
	Female	62	3.90	0.530		
The degree of improving students' practical outcomes through scientific laboratories	**Male**	38	4.32	0.497	0.904	0.344
	Female	62	4.40	0.417		
Overall score	**Male**	38	4.16	0.308	0.030	0.864
	Female	62	4.22	0.313		

***** Statistically significant at the significance level ($\alpha \leq 0.05$)

It is evident from Table (9) that the computed significance level for the overall impact of activating scientific laboratories in schools on students' practical outcomes, attributed to the variable of gender, was more significant than the specified significance level for the study ($0.05 \leq \alpha$), which was (0.191). Therefore, we accept the null hypothesis and state that "there are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in the respondents' responses regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of gender." The results presented in the table also indicated that there were no statistical differences in the study domains (the importance of scientific laboratories in schools, the role of schools in activating scientific laboratories, and the degree of improving students' practical outcomes through scientific laboratories), as the significance levels for these domains were (0.847), (0.066), and (0.344), respectively.

This indicates that both male and female respondents largely agree in their assessment of the impact of scientific laboratories on students' practical performance, suggesting that gender does not significantly affect perceptions of this issue. Both male and female teachers may have similar experiences in using scientific laboratories, leading to a consensus in their opinions regarding their importance and impact on practical performance.

- There are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in respondents' answers regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of academic qualification.

To answer the second sub-hypothesis, the means and standard deviations were extracted according to the variable of academic qualification. Then, a one-way ANOVA was used to identify the significance of differences based on the variable of academic qualification. Tables (10) and (11) illustrate this.

Table (10): AM and Std of the impact of activating science laboratories in schools on students' practical outcomes according to the variable of academic qualification

Domain	Level	No.	AM	SD
The importance of scientific laboratories in schools	Diploma	7	4.27	.334
	Bachelor	67	4.30	.369
	Graduate Studies	26	4.34	.425
	Total	**100**	**4.31**	**.379**
The role of schools in activating scientific laboratories	Diploma	7	4.25	.516
	Bachelor	67	3.96	.341
	Graduate Studies	26	3.71	.626
	Total	**100**	**3.92**	**.463**
The degree of improving students' practical outcomes through scientific laboratories	Diploma	7	4.36	.522
	Bachelor	67	4.36	.417
	Graduate Studies	26	4.38	.520
	Total	**100**	**4.36**	**.448**
Overall score	Diploma	7	4.29	.406
	Bachelor	67	4.21	.278
	Graduate Studies	26	4.14	.365
	Total	**100**	**4.20**	**.311**

Table (11): Results of One-Way ANOVA on the overall impact of activating science laboratories in schools on students' practical outcomes according to the variable of academic qualification

Items	Source of variation	SS	DF	Std	Calculated (F)	SIG.
The importance of scientific laboratories in schools	Between-group	.044	2	.022	.151	.860
	Within group	14.158	97	.146		
	Total	14.202	99			
The role of schools in activating scientific laboratories	Between-group	2.107	2	1.053	5.354	.006
	Within group	19.088	97	.197		
	Total	21.194	99			
The degree of improving students' practical outcomes	Between-group	.014	2	.007	.033	.968
	Within group	19.894	97	.205		

through scientific laboratories	Total	19.908	99			
Overall score	Between-group	.146	2	.073	.750	.475
	Within group	9.411	97	.097		
	Total	9.557	99			

It is evident from Table (11) that the calculated significance level for the overall impact of activating science laboratories in schools on students' practical outcomes attributed to the variable of academic qualification was greater than the specified significance level for the study ($\alpha \leq 0.05$), which was (0.475). Thus, we accept the null hypothesis and state that "there are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in the respondents' responses regarding the impact of activating science laboratories in schools on students' practical outcomes attributed to the variable of academic qualification". The results presented in the table also indicate that there are no statistical differences in the domains of "the importance of science laboratories" and "the degree of improving students' practical outcomes through science laboratories," with significance levels of (0.860) and (0.968), respectively. While there were statistical differences in the domain of "the role of the school in activating scientific laboratories," where the significance level was (0.006) across all items. The following tables clarify the results related to these differences.

Table (12): Results of the (LSD) Test to show differences between categories of academic qualification variable according to the domain of the role of the school in activating scientific laboratories

Academic Qualification (I)	**Academic Qualification (J)**	**Differences in mean (I-J)**	**Error rate**	**SIG.**
Diploma	Bachelor	0.290	0.176	0.103
	Graduate Studies	0.549*	0.189	0.005
Bachelor	Diploma	-0.290	0.176	0.103
	Graduate Studies	0.258*	0.102	0.013
Graduate Studies	Diploma	-0.549*	0.189	0.005
	Bachelor	-0.258*	0.102	0.013

Regarding the domain of "the role of the school in activating scientific laboratories," differences were observed between the categories of "Diploma" and "Graduate Studies," favoring the "Diploma" category. As well as between the categories of "Bachelor's" and "Graduate Studies," which favor the "Bachelor's" category.

The above results indicate that the teachers' qualifications did not significantly impact their assessment of the impact of activating scientific laboratories. As the significance levels for the importance of scientific laboratories and the degree of improvement in student outcomes were

above 0.05. This indicates that all academic categories (Diploma, Bachelor's, Graduate Studies) may share similar perspectives on the importance of laboratories. That suggests the activating laboratories is a shared value in education, regardless of the teachers' formal academic level. Despite the absence of differences in the other domains, significant differences were observed in the domain of "The role of the school in activating scientific laboratories" at a significance level of 0.006. This indicates a greater acknowledgment of the school's role in activating scientific laboratories among certain groups of teachers, with noticeable differences between the diploma and graduate studies categories and the bachelor's category.

Thus, the results indicate that teachers with a diploma perceive the school's role in activating laboratories as greater than that of teachers with graduate degrees, while teachers with a bachelor's degree also prefer the school's role compared to those with graduate degrees. This may indicate that diploma-holding teachers feel a greater enthusiasm or ability to effectively activate laboratories. It is possible that these teachers have practical experiences in educational environments that make them more aware of the actual role of laboratories. In contrast, the academic focus of teachers with graduate degrees may go beyond practical aspects, affecting their evaluations.

- There are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in the respondents' responses regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of years of experience.

To answer the third sub-hypothesis, the means and standard deviations were extracted according to the variable of years of experience. Then, a one-way ANOVA was used to determine the significance of the differences based on the variables of years of experience. Tables (13) and (14) illustrate this.

Table (13): AM and Std of the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of years of experience

Domain	Level	No.	AM	Std
The importance of scientific laboratories in schools	Less than 5 years	15	4.18	.231
	5 to less than 10 years	35	4.33	.402
	10 years or more	50	4.34	.396
	Total	**100**	**4.31**	**.379**
The role of schools in activating scientific laboratories	Less than 5 years	15	3.73	.588
	5 to less than 10 years	35	3.84	.486
	10 years or more	50	4.02	.378
	Total	**100**	**3.92**	**.463**
	Less than 5 years	15	4.19	.196

The degree of improving students' practical outcomes through scientific laboratories	5 to less than 10 years	35	4.49	.387
	10 years or more	50	4.33	.519
	Total	**100**	**4.37**	**.448**
Overall score	Less than 5 years	15	4.03	.226
	5 to less than 10 years	35	4.22	.240
	10 years or more	50	4.23	.361
	Total	**100**	**4.20**	**.311**

Table (14): Results of One-Way ANOVA on the overall impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of years of experience

	Source of variation	**SS**	**DF**	**Std**	Calculated (F)	**SIG.**
The importance of scientific laboratories in schools	Between-group	.280	2	.140	.974	.381
	Within group	13.922	97	.144		
	Total	14.202	99			
The role of schools in activating scientific laboratories	Between-group	1.309	2	.655	3.193	.045
	Within group	19.885	97	.205		
	Total	21.194	99			
The degree of improving students' practical outcomes through scientific laboratories	Between-group	1.066	2	.533	2.744	.069
	Within group	18.842	97	.194		
	Total	19.907	99			
Overall score	Between-group	.482	2	.241	2.576	.081
	Within group	9.075	97	.094		
	Total	9.557	99			

It is clear from Table (14) that the calculated significance level for the overall effect of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of years of experience was greater than the significance level set for the study ($0.05 \leq \alpha$), which amounted to (0.081). Therefore, we accept the null hypothesis and state that "there are no statistically significant differences at the significance level ($0.05 \geq \alpha$) in the respondents' responses regarding the impact of activating scientific laboratories in schools on students'

practical outcomes attributed to the variable of years of experience". The results presented in the table indicate that there are no statistically significant differences in the two domains (the importance of scientific laboratories and the degree of improvement in students' practical outcomes through scientific laboratories), with significance levels of (0.381) and (0.069), respectively. However, there were statistically significant differences in the study domain (the role of the school in activating scientific laboratories), with a significance level of (0.045). To understand these differences, the following tables present the related results.

Table (15): Results of the LSD test to indicate differences between categories of the experience variable regarding the role of the school in activating scientific laboratories

Academic Qualification (I)	**Academic Qualification (J)**	**Differences in mean (I-J)**	**Error rate**	**SIG.**
Less than 5 years	5 to less than 10 years	-.119	.140	.398
	10 years and more	-.299*	.133	.027
5 to less than 10 years	Less than 5 years	.119	.140	.398
	10 years and more	-.180	.100	.074
10 years and more	Less than 5 years	.299*	.133	.027
	5 to less than 10 years	.180	.100	.074

In relation to the domain of "the role of the school in activating scientific laboratories," differences were observed between the categories of "less than 5 years" and "10 years and above," favoring the category of "10 years and above."

The above results indicate that there are no statistically significant differences in respondents' answers regarding the impact of activating scientific laboratories in schools on students' practical outcomes attributed to the variable of years of experience, except for the domain of "the role of the school in activating scientific laboratories." The results showed that teachers with 10 years of experience or more perceive the role of the school in activating scientific laboratories more positively compared to teachers with less than 5 years of experience. This can be attributed to the fact that experienced teachers have witnessed practical applications of scientific laboratories and their direct impact on student outcomes, which enhances their awareness of the importance of this role. Teachers with longer experience may have richer practical experiences in effectively activating and utilizing laboratories, which influences their assessment of the school's role in this regard. In contrast, new teachers may not have the same level of exposure to these experiences. Thus, the differences observed among the various groups emphasize the importance of experience in shaping opinions about the school's role. However, the results still indicate no significant differences in other aspects related to activating the laboratories.

Recommendations:

In conclusion, the researcher provided the following recommendations based on the results obtained from the study:

1. Schools should improve and update science laboratories to provide a suitable learning environment, equipping them with the necessary tools and materials to activate experimental activities.
2. It is recommended that workshops and training courses be offered for teachers on how to effectively use science laboratories, enhancing their ability to manage experiments and motivate students.
3. Schools should allocate sufficient time within the academic schedule for activities and practical experiments in laboratories to ensure the maximum benefit from the experiments.
4. It is recommended to organize experimental activities that encourage collaboration and teamwork among students, thereby enhancing their social skills and increasing their understanding of scientific concepts.
5. The school administration should provide guidance and support to teachers who face difficulties in managing educational situations within the laboratories.
6. Periodic evaluations of the effectiveness of science laboratories and their impact on students' practical outcomes are recommended to gather information and improve the strategies in place.

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