

## ***Difficulties in activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers***

صعوبات تفعيل مختبرات العلوم في المدارس الثانوية الفلسطينية والأردنية من وجهة نظر معلمي الأحياء

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### **ABSTRACT:**

*The study aimed to reveal the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers in Jordanian public schools, in light of gender variables and years of experience. The study was conducted on a sample of Palestinian and Jordanian secondary school teachers affiliated with the Jordanian Ministry of Education. The study sample numbered (371) male and female teachers. During the second semester of the academic year (2018/2019).*

*The questionnaire was developed in its final form consisting of (42) paragraphs distributed into (5) areas, and from the recommendations of the study, equipping school laboratories and providing the tools and materials necessary for experiments in the school laboratory in sufficient quantities, and the necessity of reviewing the manual of activities and practical experiments in science courses in general and biology in particular, in term of specialization and amending it in proportion to the time of the prescribed quota for biology.*

**Keywords:** biology, high schools, science labs, teachers.

ملخص:

هدفت الدراسة إلى الكشف عن صعوبات تفعيل مختبرات العلوم في المدارس الثانوية الفلسطينية والأردنية من وجهة نظر معلمي الأحياء في المدارس الحكومية الأردنية، وذلك في ضوء متغيرات النوع الاجتماعي وسنوات الخبرة. وأجريت الدراسة على عينة من معلمي ومعلمات المدارس الثانوية الفلسطينية والأردنية التابعة لوزارة التربية والتعليم الأردنية، حيث بلغ عدد أفراد عينة الدراسة (371) معلماً ومعلمة. خلال الفصل الثاني من العام الدراسي (2018/2019).

وتم تطوير الاستبانة تكونت في صورتها النهائية من (42) فقرة موزعة إلى (5) مجالات، ومن توصيات الدراسة، تجهيز المختبرات المدرسية وتوفير الأدوات والمواد اللازمة للتجارب في المختبر المدرسي وبكميات كافية، وضرورة مراجعة دليل الأنشطة والتجارب العملية في مقررات العلوم بشكل عام والأحياء على وجه الخصوص من جهة الاختصاص وتعديله، بما يتناسب مع وقت الحصة المقررة لمادة الأحياء. كلمات مفتاحية: الأحياء، المدارس الثانوية، مختبرات العلوم، المعلمين.

## 1- Introduction:

Biology occupies a central position in many sciences and industries, as it is an essential subject in scientific applications and important technological developments, which has resulted in the emergence of trends calling for the necessity of building an educated society in a way that ensures the benefit from the applications of science in general and biology in particular, and the school is one of the most important educational institutions that contribute In achieving the spread of scientific culture among individuals and preparing them to be educated and able to deal with the applications of science, especially biology, and the modern educational process emphasizes attention to educational goals with their cognitive, emotional and skill dimensions, as practical skills are a basic goal of the goals of teaching biology and from this point the biology decisions came To emphasize this importance because the nature of biology depends on activity and practical experimentation, and what this requires in terms of the use of tools, devices and chemicals. Biology lessons are among the most developmental lessons of practical skills, as the student acquires the skills of dealing with tools and chemicals, conducting experiments, recording observations, and reaching results. Hence, these goals cannot be achieved without the availability of integrated laboratories that acquire the learner with practical skills, and learning becomes meaningful and functional in Learner life. (Mahmoud, 2012: 5)

The use of laboratory activities in teaching science in general and biology in particular, can be effective in helping students build their knowledge, develop logical and investigative skills, and the ability to solve problems, also it can help in developing motor skills. In addition, practical activities contribute to Promote positive attitudes towards biology, and provide opportunities for students to develop skills for collaboration and communication with classmates. Consequently, the laboratory is a unique educational environment that helps biology teachers to diversify their teaching methods and avoid monotony in the school environment. (Al-Dhafiri and Habib, 2012: 249)

Practical activities in teaching biology lead to making chemical phenomena more realistic through life experiences that students go through, and practical activities are the appropriate way to investigate science and its nature. Students 'perceptions of science are affected by how they implement and practice practical activities, their perceptions of practical activities, and how they interact together while doing those activities. (Khalif, 2010: 2)

The laboratory, with its practical activities, removes the barrier between the work of the brain and the work of the hands, it is an active interaction between ideas and experiences, and it is a pattern of thinking and performance in which planning, performance, reasoning, interpretation and problem solving interact with manual works, observations and some practical activities and the psychomotor. (Zaytoon 2010: 162)

The use of the laboratory in conducting chemical experiments by teachers or students is the most important thing that distinguishes biology from other subjects, so teaching in the laboratory is one of the most important characteristics of teaching biology in schools. (Al-Bashaira and Alfteanat, 2009: 411)

Experimentation in the laboratory is closely **related** to the concept of modern science. The basic components of science from facts, concepts, principles, laws and theories can only be reached through observation and practical experience. (Abu Jalalah, 2005: 36)

The experiments in the school laboratory can be illustrative by the teacher as a practical presentation and the students' role is limited to watching, or practical experiments that depend on the participation of students in their implementation. (Nashwan, 2001: 126)

## **2-The study Problem**

In view of the effective role that science laboratories play in enhancing scientific concepts and skills, acquiring scientific investigation skills, scientific methods in implementing practical experiments, and creating opportunities to reveal creativity and innovation among students. The fact that the two researchers work as a supervisor of biology and noted that there is a deficiency in the use of school laboratories in Teaching biology, as the researchers identified the study problem in revealing the reality of laboratory use and the obstacles to its use in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

The study problem can be identified through the following question:

What are the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers?

## **3-Study questions**

The study questions are represented in the following question: What are the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers? The following questions are divided into:

- Are there statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) in the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers due to the gender variable?
- Are there statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) in the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers due to the years of experience variable?

## **4-Objectives of the study**

This study aims to achieve the following:

- Knowing the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.
- Knowing the impact of gender variables, years of experience, on the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

## **5-The importance of study**

- This study derives its importance by addressing the issue of difficulties in activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers, and the importance of the study can be determined by the following points:

- This study comes in response to recent educational trends that call for the necessity to focus on educational laboratories, and to provide all the material and moral capabilities that enable the student to research, excavate, and probe the sciences by himself to reach the truth.
- The study acquires its importance through uncovering the difficulties of activating science laboratories in teaching science in general and biology in particular, and identifying the most important difficulties that reduce the conduct of practical experiments.
- The two researchers hope that the results of the study will provide the Ministry of Education and the planning authorities with field information on the difficulties of activating science laboratories, which may be useful in preparing training programs for teachers during service in order to improve the level of use of the science laboratory, which may lead to reducing the impact of these difficulties.
- The results of the study contribute to providing universities and colleges of education concerned with preparing teachers in Jordan with field information about the difficulties of activating science laboratories, which may draw the attention of universities and colleges of education to reconsidering teacher preparation programs in order to improve the use of school laboratories in the future.

#### **6-The limits of the study:**

- Place limits: This study was conducted in Palestinian and Jordanian secondary schools
- Human limits: This study was conducted on biology teachers in Palestinian and Jordanian secondary schools.
- Time limits: This study was conducted during the second semester of the academic year (2018/2019)

#### **7-Terminology of study**

- **Difficulties:** “These are obstacles that are difficult to overcome that transform between the individual and the goal he wants to achieve.” (Taha, 2008: 35)

They are defined procedurally for the purposes of this study: they are the problems that prevent the use of the science laboratory by teachers, and it is measured by the paragraphs of the questionnaire related to identifying the difficulties of operating the science laboratories.

- **Science Lab:** “A special place where devices and tools are available, and the opportunity is prepared to conduct an experiment in order to achieve limited practical goals, and the students themselves conduct experiments” (Al-Nashif, 2004: 96)

It is defined procedurally for the purposes of this study: as one of the school facilities designated for conducting laboratory experiments, and equipped with all the necessary supplies to carry out these activities, and is used in science teaching for the purposes of preparing and implementing the lesson and evaluating students' learning.

- **Biology teachers:** They are the teachers who teach science and / or biology, and still work in Palestinian and Jordanian secondary schools during the second semester of the academic year (2018/2019). (Jordanian Ministry of Education, 2018), (Palestinian Ministry of Education and Higher Education, 2018).

## **8-Previous studies**

**Kahili (2011)** conducted a study aimed to identify the obstacles to using laboratory techniques in teaching biology from the viewpoint of science teachers, and to identify the most important obstacles that prevent the optimal use of educational laboratories using the descriptive curriculum, and the research sample consisted of (21) secondary school teachers in Damascus. And taking into account the variable of gender, experience and academic qualification, the study found that the obstacles to the use of laboratory techniques that came in a high degree from the teachers' point of view were respectively : laboratory work, laboratory equipment and laboratory location, while the obstacles that came with a medium degree were related to security and practical safety, The results also showed that the obstacles for female teachers were higher than for male teachers. Also, there were differences with respect to years of experience, with regard to laboratory safety and security, and they were in favor of less experience, while there were no differences according to the scientific qualification variable.

The study (**Admas & Adane, 2011**) aimed to investigate students' opinions about safety when doing biology experiments in laboratories. A sample consisted of (123) students who were selected by the random sampling method, and the researchers used the questionnaire and followed the descriptive approach. The study found that students learn better when using laboratories to conduct chemical and scientific experiments. And that laboratories greatly help students to reach the objectives of the subject by understanding its concepts and carrying out experiments to solve scientific problems. And that teachers face problems with students when using scientific laboratories in terms of safety standards.

**Mahmoud's study (2010)** aimed to explain the difficulties that science teachers face (biology, biology, biology) in using the laboratory, and the study sample consisted of (60) teachers of (biology, biology, and biology) subjects in (22) secondary schools in Diyala province, Iraq. The researchers used the questionnaire and followed the descriptive approach, and the study found : insufficient lessons, the absence of a room designated as a laboratory, the volume of textbook content impedes the use of the laboratory, the ministerial examination questions are not based on laboratory experiments, and the absence of an employee as a laboratory assistant.

**Ali and Muhammad (2009)** conducted a study aimed at surveying the opinions of biology teachers about the reasons for their reluctance to use the laboratory and its practical activities while they were teaching biology at the secondary level. The data, and the study found: the lack of sufficient time to prepare practical experiments, the lack of lessons in the schedule devoted to the practical side, the lesson time is insufficient to conduct practical experiments and the large number of students per class, and the lack of basic requirements of water, electricity and heat in the laboratory, The absence of incentives for the teacher to

encourage him to conduct experiments, and the absence of a supervisor or laboratory assistant to prepare practical experiments.

### 9-Study Approach:

In this study, the descriptive survey approach was followed due to its suitability and nature. In this approach, data are collected and statistical analysis conducted to extract the required results and draw recommendations.

### 10-Study population:

The study population consisted of biology teachers in Palestinian and Jordanian secondary schools during the second semester of the academic year (2018/2019).

### 11-The study sample:

The study was conducted on a sample of biology teachers in Palestinian and Jordanian secondary schools, where their number reached (371) male and female teachers. During the second semester of the academic year (2018/2019). They were randomly selected and tables (1) and (2) show the distribution of the study sample according to its independent variables.

**Table No. (1): Distribution of the study sample according to the gender variable**

Gender	frequency	standard deviation
Male	173	47%
Female	198	53%
<b>Total</b>	<b>371</b>	<b>100%</b>

**Table No. (2): Distribution of the study sample according to the years of experience variable**

Years of experience	frequency	standard deviation
Less than (05) years	98	26%
From (15-15) years	89	24%
From (16-25) years	87	23%
More than (25) years	97	26%
<b>Total</b>	<b>371</b>	<b>100%</b>

### 12-Study tool :

Based on the research literature, previous studies, and expert advice, a questionnaire was constructed to collect data from the study sample. It included (42) items distributed into (5) areas, as shown in Table (3)

**Table No. (3): the paragraphs of the questionnaire according to the fields of study**

#	Dimension	Number of paragraphs	paragraphs
1	Lab hall and its basic supplies	10	01-10
2	devices, tools and laboratory arterials	07	11-17
3	school program	05	18-22
4	teacher	12	23-34
5	students	08	35-42

### 13-Legalization of the study tool:

The study tool was presented to a group of specialists and biology supervisors in the Jordanian Ministry of Education, and they recommended its validity after modifications to it. These modifications were made and the questionnaire was produced in its final form.



#### 14-Tool stability:

To verify the stability of the tool, the Cronbach alpha equation was used to extract the stability. Its total percentage on the paragraphs of the questionnaire was (0.88), which is a stability ratio that confirms the possibility of using the tool.

#### 15-Statistical treatment:

After collecting the data, its data were entered into the computer to be processed by the Statistical Program for Social Sciences (SPSS). Standard deviation, Balanced arithmetic averages, (T) test, and monocontrast analysis were used.

#### 16-Study results and discussion:

First: The results related to the question that he stated: What are the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers?

In order to answer this question, the arithmetic averages and the standard deviation were used for each of the paragraphs of each of the areas of the questionnaire.

The paragraphs with positive content were given (3) scores for each answer (high), two degrees for each answer (medium), and one score for each answer (weak). For the interpretation of the results, the following scale was adopted for the arithmetic averages of the responses:

**Table No. (4): The balance of the standard deviation of the responses**

arithmetic average	The degree of response
01-1.67	Low form
1.68-2.34	Medium form
2.35-03	High form

Tables (5), (6), (7), (8), (9) show the results, and Table (10) shows a summary of the results.

Results related to the first dimension (laboratory room and its basic requirements)

**Table No. (5): The arithmetic means and the standard deviation are arranged in descending order according to the arithmetic means of the first dimension**

Rank	Number	Paragraphs	Average Response *	Standard Deviation	Response Score
1	5	The arrangement of seats and tables inside the laboratory does not suit the nature of the activities and experiments.	2.23	0.77	medium
2	8	lab benches are not easy to move and flexible enough	2.2	0.81	medium
3	2	Lack of the necessary installations of water, electricity and heat sources in the laboratory	2.17	0.87	medium

4	9	Unavailability of a gas tank to prevent harmful gases from leaking from it during the experiments	2.1	0.8	medium
5	7	The laboratory is not provided with adequate and continuous ventilation	2.07	0.83	medium
6	3	Limited space inside the laboratory room	1.97	0.72	medium
7	4	The lack of a separate room in the laboratory to prepare the materials needed for scientific experiments (preparation room).	1.83	0.79	medium
8	10	Poor lighting needed in the laboratory room	1.77	0.63	medium
9	1	The lack of a laboratory hall	1.73	0.74	medium
10	6	The lack of security and safety means in the laboratory (fire extinguishers, first aid kit, fire detection device).	1.63	0.07 2	the low
<b>Overall score</b>			<b>1.97</b>	<b>0.70</b>	<b>medium</b>

\* Maximum score for paragraph (3) degrees

It is evident from Table No. (5) that the paragraphs after the difficulties related to the laboratory hall and its basic requirements were of a moderate degree, with the exception of one paragraph that was of a low grade. Paragraph (06) was resolved which stipulates “the lack of security and safety means in the laboratory (fire extinguishers, first aid kit). The primary, fire detection device) was in the last order, where the average responses to it reached (1.63), while Paragraph No. (05) came in the first order, which states : “The arrangement of seats and tables inside the laboratory does not fit with the nature of activities and experiments” with an arithmetic average of (2.23, and the average of the total responses was average with arithmetic average of (1.97). The ranking of the first dimension was (05) on all dimensions that measure the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

The result of obtaining paragraph (05) in the first order can be explained that the reason for this may be due to the fact that the practical activities that are carried out in the school laboratory focus mostly on practical presentations, which leads to arranging the seats and tables in the laboratory in a way that is not suitable for conducting chemical experiments in such a way that make it easier for students to do chemical experiments.

While paragraph (06) came in the last order and with a low degree, it can be interpreted that one of the priorities of work in the school laboratory is to focus on providing means of safety and security, especially in biology lessons where hazardous materials are sometimes dealt with, which pushes the school administration and officials in the Ministry of Education on the importance of focusing on providing means of safety and security in the school laboratory.

Results related to the second dimension (devices, tools, and laboratory materials)



**Table No. (6): The arithmetic averages and the standard deviation are arranged in descending order according to the arithmetic averages of the second dimension**

<b>Rank</b>	<b>Number</b>	<b>Paragraphs</b>	<b>Average Response *</b>	<b>Standard Deviation</b>	<b>Response Score</b>
1	17	expiration date of some chemicals	2.73	0.52	high
2	13	The need for long practical experiments in preparation	2.57	0.73	high
3	11	The lack of equipment and tools necessary to conduct practical experiments in the laboratory.	2.5	0.73	high
4	14	Not maintaining laboratory equipment and tools periodically.	2.43	0.77	high
5	12	Insufficient financial resources to fund experiments.	2.37	0.81	high
6	15	Weak interest in organizing tools and devices and placing them in appropriate places.	2.07	0.74	medium
7	16	There is no biology laboratory in the school	1.77	0.86	medium
<b>The overall score</b>			<b>2.35</b>	<b>0.74</b>	<b>high</b>

\*The maximum score for paragraph (3) degrees

It is evident from Table No. (6) that the paragraphs after the difficulties related to equipment, tools and laboratory materials came between high and medium degrees, where (5) paragraphs refer to a high degree of difficulties, while there were two paragraphs indicating a medium degree of difficulties. Paragraph (17) which stipulates “the expiration of some chemicals” in the first order with an arithmetic average (2.73) and a high degree, while Paragraph (16) which states “There is no biology laboratory in the school” came in the last order with an arithmetic average (1.77) and a medium degree. The average dimension of the dimension was (2.35), which means that the degree of difficulties was high for the dimension as a whole, and the second dimension was ranked (02) on all dimensions that measure the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

And the fact that paragraph (17) came in the first order, from the researchers' point of view, this result does not constitute a direct obstacle in the sample schools, but it can be attributed to the fact that teachers do not resort to using these materials, which leads to their damage sometimes before using them.

Paragraph (16) came last, with a medium degree. This result is logical and expected, since most of the sample schools have a laboratory for biology in the school, as the Ministry of Education in Jordan takes into account when establishing schools, the availability of

buildings necessary for the practice of various educational activities, including school laboratory buildings, especially in secondary schools.

Results related to the third dimension (school program)

**Table No. (7): The arithmetic averages and the standard deviation are arranged in descending order according to the arithmetic averages of the third dimension**

Rank	Number	Paragraphs	Average Response *	Standard Deviation	Response Score
1	22	Experiments in the guide of activities and practical experiments take a long time to implement.	2.67	0.61	high
2	20	Insufficient study time to conduct experiments.	2.6	0.62	high
3	18	The absence of laboratory classes in the study program	2.57	0.63	high
4	21	The large number of activities and practical experiences in one lesson.	2.53	0.63	high
5	19	Tests focus on theoretical evaluation.	2.47	0.51	high
<b>Overall score</b>			<b>2.57</b>	<b>0.60</b>	<b>high</b>

\*The maximum score for paragraph (3) degrees

It is evident from Table No. (7) that the paragraphs after the difficulties related to the school program came in a high degree. Paragraph (22) has been resolved, which states “Experiences in the guide of activities and Practical Experiments need a long time to implement” in the first order, with arithmetic average of (2.67) and a high degree While Paragraph (19) which states “Tests focus on theoretical evaluation. ” came in the last order with an arithmetic average (2.57) and a high degree. The average dimension of the dimension was (2.57), which means that the degree of difficulties was high for the dimension as a whole, and the third dimension was ranked (01) on all dimensions that measure the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

The result of paragraph (22) is consistent with Mahmoud's study (2010), the results of which showed the inadequacy of the time allocated to the quotas for biology courses, especially the lack of time allocated for conducting chemical experiments. This result can be explained by the fact that the class time of the biology course does not take into account the practical nature of the biology course content, as the researchers believe that the nature of the activities and practical experiments in the biology course does not correspond to the time of the class, as conducting some experiments in the biology course may require more than two lessons. However, the study program is equal to the distribution of time on the lessons for the various educational courses, regardless of what the applied courses such as biology requires a long time to carry out practical activities.

While paragraph (19) came in the last order with a high degree. This result, although it came in the last order, represents a high degree of impediment. It is an expected result, especially in tests that do not often include a focus on the practical application in evaluating students' learning. This result is consistent with the result of Mahmoud's study (2010), which showed that the non-reliance of exam questions on laboratory experiments is one of the important difficulties that prevent the use of the laboratory in teaching science courses, including the biology course.

Results related to the fourth dimension (Teacher)

**Table No. (8): The arithmetic averages and the standard deviation are arranged in descending order according to the arithmetic averages of the fourth dimension.**

<b>Rank</b>	<b>Number</b>	<b>Paragraphs</b>	<b>Average Response*</b>	<b>Standard Deviation</b>	<b>Response Score</b>
1	23	Increasing the quorum of a biology teacher from classes.	2.77	0.43	high
2	33	Teacher training courses focus more on theory than on practicality in the laboratory.	2.7	0.47	high
3	34	Curriculum development does not accompany teacher training in the scientific aspect.	2.7	0.53	high
4	27	Insufficient time to prepare and prepare experiments.	2.5	0.68	high
5	30	Lack of adequate training for the teacher while serving on modern methods of using the laboratory.	2.47	0.57	high
6	26	The lack of incentives for the biology teacher to encourage him to conduct experiments.	2.37	0.67	high
7	28	Some biology teachers have poor knowledge of laboratory experiment skills.	2.07	0.64	medium
8	29	Weak tendencies and attitudes of teachers towards working in the laboratory.	2.03	0.56	medium
9	24	The teacher's belief that some simple topics do not require practical experiments and applications.	1.93	0.64	medium
10	25	The biology teacher does not know about operating and maintaining laboratory equipment.	1.67	0.66	low

11	32	The school administration assigns the biology teacher to other tasks that hinder his work in the laboratory.	1.6	0.72	low
12	31	The biology teacher feels that the laboratory complicates difficult concepts but does not simplify them.	1.57	0.73	low
<b>The overall score</b>			<b>2.20</b>	<b>0.60</b>	<b>medium</b>

\* The maximum score for paragraph (3) degrees.

It is evident from Table No. (8) that the paragraphs after the difficulties related to the teacher came between the high and the low grade, where (6) paragraphs indicating a high degree of difficulties, (3) paragraphs indicating a medium degree of difficulties, and also (3) paragraphs It refers to a low degree of difficulties. Paragraph (23) which states “increasing the quorum of a biology teacher from the classes” came first, with an arithmetic average (2.77) and with a high degree, while Paragraph (31) which states that “the biology teacher feels that The laboratory complicates difficult concepts but does not simplify them "in the last order, with an arithmetic average (1.57) and with a low degree. The mean of the dimension was (2.20), which means that the degree of difficulties was medium for the dimension as a whole, and the ranking of the fourth dimension was (04) on all dimensions that measure the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

The result of Paragraph (23) is in the first order and with a high degree, and this result may be due to the fact that teachers see that the use of the school laboratory, especially in conducting experiments, requires a long time in preparation, implementation and evaluation. They do not find sufficient time to do so except in the break classes, which in some cases, they take the lessons off the absent teacher.

Paragraph (31) came last, with a low score. The researchers explain this result that teachers are aware of the importance of employing the school laboratory in simplifying the educational material for the biology course, which students often complain about its difficulty.

Results related to the fifth dimension (students)

**Table No. (9): The arithmetic averages and the standard deviation are arranged in descending order according to the arithmetic averages of the fifth dimension**

Rank	Number	Paragraphs	Average Response *	Standard Deviation	Response Score
1	35	The large number of students per class.	2.73	0.52	high
2	40	Lack of student understanding of requirements and implementation of experiments and practical applications.	2.43	0.57	high
3	41	Students' lack of interest in practical experiences.	2.3	0.7	medium

4	42	The students 'lack of interest in safety and security precautions while conducting practical experiments.	2.3	0.6	medium
5	37	Students do not maintain order in the laboratory.	2.23	0.73	medium
6	39	The student feels that practical experiences and applications are not related to the realities of daily life.	2.07	0.69	medium
7	38	Students are not convinced of the importance of the laboratory.	2.03	0.72	medium
8	36	Lack of discipline of students in the laboratory room.	1.8	0.76	medium
<b>The overall score</b>			<b>2.24</b>	<b>0.66</b>	<b>medium</b>

\*The maximum score for paragraph (3) degrees

It appears from Table No. (9) that the paragraphs after the difficulties related to students came between high and medium degrees, as two paragraphs indicated a high degree of obstacles, and (6) paragraphs indicating a medium degree of obstacles. Paragraph (35) which states on the "large number of students in one class" in the first order with an arithmetic average (2.73) and with a high degree, while paragraph (36) which states "Lack of discipline of students in the laboratory room" came in the last rank with an arithmetic average (1.80) and with a medium degree. The average of the dimension was (2.24), which means that the degree of difficulties was average for the dimension as a whole, and the ranking of the fifth dimension was (03) on all dimensions that measure the difficulties of operating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers.

Paragraph (35), which came in the first order with a high degree, can be explained by the fact that the number of students in one class often does not correspond to the nature of the practical activities that are carried out in the school laboratory, where the devices, tools and chemicals are required in large quantities commensurate with the number of students. In the classroom, and this may not be provided in most schools of the current study sample.

Paragraph (36) came last, with a medium degree. The reason for this may be due to the ease of dealing with students at this stage because of their maturity in behavior, which makes them committed to self-discipline in the laboratory room.

Summary of results, arrangement of dimensions and total score of responses :

**Table No. (10): The arithmetic averages and the standard deviation are arranged in descending order according to the arithmetic averages of the dimensions and the total degree of responses**

<b>Rank</b>	<b>#</b>	<b>Dimension</b>	<b>Average Response *</b>	<b>Standard Deviation</b>	<b>Degree of Response</b>
1	3	School program.	2.57	0.6	high
2	2	Laboratory devices, tools and materials.	2.35	0.74	high
3	5	Students.	2.24	0.66	medium
4	4	Teacher.	2.2	0.6	medium
5	1	Laboratory hall and its basic supplies.	1.97	0.7	medium
<b>The overall score</b>			<b>2.23</b>	<b>0.66</b>	<b>medium</b>

\*The maximum score for paragraph (5) degrees

From the foregoing it is clear that the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers came within the intermediate level, with an arithmetic average (2.23).

The result, which showed that the difficulties related to the school program came first and with a high degree, can be explained by the fact that the school program and the number of lessons prescribed for biology do not correspond to the nature of the content in the sciences in general and the biology course in particular in the required manner, as the nature of biology is based primarily on Experimentation, and therefore the teaching of biology and the implementation of the experimental guide in it require more lessons than it is now, especially the lessons that are implemented in the school laboratory.

The result of the obstacles related to devices, tools and practical materials that came in the second order and in a high degree can be explained by the fact that the practical materials that are used in the biology lessons are characterized by their consumer nature and that they have an expiration date, and therefore their frequent use may not be available continuously, which hinders the use of the laboratory in Teaching biology as a result of running out of materials necessary to conduct practical experiments, especially since the school laboratory budget allocated from the school budget is often limited within the sample schools on which the study was conducted, and therefore there is difficulty in providing practical materials, and school principals do not prefer to use practical devices and tools Frequent in laboratory classes - although few - for fear of spoilage, which exposes them to accountability to officials.

As for the obstacles related to the laboratory hall and its basic requirements that came in the fifth and last rank and with a medium degree, the reason for this result is that the Ministry of Education is concerned when establishing schools in Jordanian schools that the school building is equipped with appropriate equipment in terms of facilities and buildings, including the school laboratory, and it works on Providing the necessary supplies in it so that it contributes to achieving the educational goals of the school, and this in turn led to the difficulties related to the laboratory hall and its basic requirements among the least difficulties facing the use of the laboratory in teaching biology.

Results related to the question: Are there statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) in the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers due to the gender variable?

To answer this question, and in order to reveal the significance of the differences in the estimates of the sample members, the difficulties of activating the science laboratories in the Palestinian and Jordanian secondary schools from the viewpoint of biology teachers are attributed to the gender variable (male, female). A study tool related to the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers. The T-test was used for independent samples, T-tests, and the results were as in Table (11)



**Table No. (11): The results of the Independent Samples T-test to reveal the significance of the differences in the estimates of the study sample individuals of the difficulties of activating the science laboratories in the Palestinian and Jordanian secondary schools from the viewpoint of the biology teachers due to the gender variable.**

#	Dimensions of difficulties in activating science laboratories	gender	arithmetic average	standard deviation	computed value (t)	level of significance
1	Lab hall and its basic supplies	Male	1.97	0.51	0.491	0.625
		Female	1.90	0.52		
2	Devices, tools and laboratory materials.	Male	2.35	0.54	0.467	0.642
		Female	2.29	0.38		
3	School program.	Male	2.57	0.34	1.038	0.304
		Female	2.47	0.34		
4	Teacher.	Male	2.20	0.26	0.248	0.805
		Female	2.18	0.31		
5	Students.	Male	2.24	0.45	0.197	0.845
		Female	2.21	0.49		
<b>Total score</b>		<b>Male</b>	<b>2.26</b>	<b>0.42</b>	<b>0.609</b>	<b>0.545</b>
		<b>Female</b>	<b>2.21</b>	<b>0.41</b>		

Table No. (11) shows that there are apparent differences between the study sample's estimates of the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools in their five dimensions, depending on the gender variable. A "T" analysis of the independent samples was performed to reveal the significance of the differences in light of a variable Gender, as the results showed that the differences between male and female estimates were not statistically significant, as the calculated "T" values ranged between (1.038) and (0.197). These values are not statistically significant at the level of significance ( $\alpha \leq 0.05$ ), which means that the estimates of individuals the sample for difficulties in activating science laboratories in Palestinian and Jordanian secondary schools from the point of view of biology teachers is similar regardless of gender.

This result can be explained by the fact that the difficulties that came high from the teachers' and female teachers' point of view are general difficulties felt by all those dealing with the school laboratory, whether male or female, and not related to factors directly related to sex, as it is noticed that the difficulties related to the school program came in the first order and with a high degree, and the difficulties related to devices, tools and practical materials came in the second order with a high degree. While the teachers agreed in the middle class, arranging the difficulties related to the students, the difficulties related to the teacher, as well

as the difficulties related to the laboratory hall and its basic requirements. Through this presentation, it becomes clear that the difficulties that were ranked first and second and came at a high level, neither male nor female teachers had a role in it, and that the difficulties that came with a medium degree there was a similarity between the ranking of male and female teachers for her, and therefore the teachers have reflected the actual reality of the difficulties facing the use of laboratories science through their answers to the study tool, which resulted in no statistically significant differences between their estimates.

Results related to the question: Are there statistically significant differences at the level of significance ( $\alpha \leq 0.05$ ) in the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers due to the variable of years of experience?

To answer the question, we used arithmetic averages and standard deviations. The results of Table (12) show that.

**Table No. (12): The arithmetic averages and standard deviations of the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools from the viewpoint of biology teachers due to the years of experience variable.**

#	Dimensions of difficulties in activating science laboratories	Less than (05) years		From (05-15) years		From (16-25) years		More than (25) years	
		Average	deviation	average	deviation	average	deviation	average	deviation
1	Lab hall and its basic supplies.	2.07	0.57	2.00	0.54	1.53	0.42	2.13	0.25
2	Devices, tools and laboratory materials.	2.67	0.22	2.29	0.60	2.05	0.22	2.71	0.14
3	School program.	2.80	0.14	2.53	0.37	2.40	0.20	2.73	0.31
4	Teacher.	2.33	0.14	2.18	0.29	2.03	0.13	2.33	0.22
5	Students.	2.29	0.29	2.18	0.48	2.63	0.38	2.21	0.38
	<b>Overall score</b>	<b>2.43</b>	<b>0.27</b>	<b>2.23</b>	<b>0.46</b>	<b>2.13</b>	<b>0.27</b>	<b>2.42</b>	<b>0.26</b>

Table No. (12) shows that there are apparent differences between the estimates of the study sample individuals of the difficulties of activating science laboratories in Palestinian and Jordanian secondary schools in their five dimensions. To find out the level of statistical significance for the differences in the arithmetic averages according to the variable number of years of experience, one-way ANOVA was used, and the results were as shown in Table No (13).

**Table No. (13): The results of the (One Way ANOVA) analysis to reveal the significance of the differences in the estimates of the study sample individuals of the difficulties of activating the science laboratories in the Palestinian and Jordanian secondary schools from the viewpoint of the biology teachers due to the years variable:**

#	Dimensions of science labs activation difficulties	Source of variance	Sum of squares	degree of freedom	Average squares	value (F) calculated	Level of significance
1	The laboratory hall and its basic supplies	Between groups	0.693	3	0.231	0.870	0.469
		Within groups	6,910	26	0.266		
		Total	7.603	29			
2	Devices, tools and laboratory materials.	Between groups	1.042	3	0.347	1.228	0.319
		Within groups	7,351	26	0.283		
		Total	8,393	29			
3	school program.	Between groups	0.353	3	0.118	1.044	0.390
		Within groups	2.933	26	0.113		
		Total	3,287	29			
4	Teacher.	Between groups	0.201	3	0.067	0.960	0.427
		Within the groups	1.819	26	0.070		
		Total	2,020	29			
5	students.	Between groups	0.535	3	0.178	0.871	0.469
		Within groups	5.320	26	0.205		
		Total	5,855	29			
	<b>Total score</b>	<b>between groups</b>	<b>0.218</b>	<b>3</b>	<b>0.073</b>	<b>0.767</b>	<b>0.623</b>
		<b>Within groups</b>	<b>2,460</b>	<b>26</b>	<b>0.095</b>		
		<b>Total</b>	<b>2,678</b>	<b>29</b>			

Table No. (13) indicates that there are no statistically significant differences between members of the study sample due to difficulties in activating science laboratories in Palestinian and Jordanian secondary schools in its five dimensions, depending on the years of experience variable, where the calculated “F” values ranged between (1,228) and (0.767) and these values are not statistically significant at the level of significance ( $\alpha \leq 0.05$ ), which means

that the estimates of the study sample individuals of the difficulties of activating the science laboratories in Palestinian and Jordanian secondary schools are the same, regardless of their years of experience.

This result is explained by the fact that teachers from the four categories of expertise work in a similar educational environment that follows a unified policy for training teachers regardless of their experience, as the training courses that teachers have undergone in previous years and teachers are currently subjected to do not focus on how to face the difficulties of activating science laboratories in their teaching to the required degree, which led to the experience factor being an ineffective factor in the teachers' assessments of the difficulties of activating science laboratories in their teaching, as the training courses over the years did not lead to finding suitable experiences in dealing with these difficulties, especially since most of the difficulties that came with a high degree. It is not related to factors related to the efficiency of the teacher in the first place, especially with regard to the school program, or with regard to materials, devices and practical tools.

### **17-Recommendations**

In light of the results of the study, the two researchers concluded the following recommendations:

- In-service training for teachers on activating science laboratories, focusing on the planning and design dimensions to activate the laboratory in teaching and further evaluating teaching.
- Preparing school laboratories and providing tools and materials necessary for experiments in the school laboratory, in sufficient quantities.
- Training of biology teachers on the use of modern methods to evaluate teaching in the school laboratory, such as the use of assessment ladders, and the presentation of practical reports by students to identify their acquisition of skills related to the practical experiments that have been conducted.
- Reviewing the guide to activities and practical experiences in science courses in general and biology in particular from the point of view of specialization and amending it in accordance with the prescribed quota time for the biology lesson.

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**Appendix : Study Tool**

