أثر التجارب المخبرية في العلوم على تصحيح التصورات الخاطئة وبناء الخرائط المفاهيمية لدى طالبات الصف التاسع الأساسي في المدارس الأساسية الفلسطينية التابعة لوكالة الغوث الدولية (UNRWA)

The effect of activating laboratory experiments while teaching science to the ninth-grade students on correcting misconceptions and building conceptual maps in Palestinian basic schools affiliated to UNRWA

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ملخص:

هدفت هذه الدراسة إلى تقصي أثر التجارب المخبرية في العلوم على تصحيح التصورات الخاطئة وبناء الخرائط المفاهيمية لدى طالبات الصف التاسع الأساسي في المدارس الأساسية الفلسطينية التابعة لوكالة الغوث الدولية (UNRWA)، وقد تكونت عينة الدراسة من (80) طالبة تم اختيارها بطريقة قصدية من طالبات الصف التاسع الأساسي خلال الفصل الثاني من العام الدراسي (2019/2018)، في مدرسة بنات العروب الأساسية التابعة لوكالة الغوث الدولية (UNRWA)، وقد اختيرت هذه المدرسة بطريقة قصدية، حيث تم تقسيم طالبات الصف التاسع الأساسي إلى مجموعتين متكافئتين وفق ترتيبهن حسب الشعب الدراسية في المدرسة، وتم تعيين إحداهما عشوائياً لتمثل المجموعة

التجريبية، والأخرى لتمثل المجموعة الضابطة درست باستخدام التجارب المخبرية في العلوم، والأخرى ضابطة وتكونت من (40) طالبة درست باستخدام التدريس المباشر.

استخدمت الدراسة اختباران قبلي وبعدي، تكون كل منهما بصورته النهائية من (40) فقرة من نوع الاختيار من متعدد بأربعة بدائل، أظهرت نتائج الدراسة وجود فرق دال إحصائيا بين متوسط علامات مجموعتي الدراسة (التجريبية، والضابطة) على اختبار بناء الخرائط المفاهيمية يعزى إلى استخدام التجارب المخبرية في العلوم. ووجود فرق دال إحصائيا بين متوسطي علامات مجموعتي الدراسة (التجريبية، والضابطة) على اختبار تصحيح التصورات الخاطئة يعزى إلى استخدام التجارب المخبرية في العلوم.

الكلمات المفاتيح: التجارب المخبرية، العلوم، الصف التاسع الأساسي، المدارس الأساسية الفلسطينية، وكالة الغوث الدولية

Abstract : This study aimed to investigate the impact of laboratory experiments in science on correcting misconceptions and constructing conceptual maps for the ninth-grade students in the Palestinian basic schools of UNRWA. The sample of the study consisted of (80) female students who were chosen in a deliberate way. The ninth grade during the second semester of the academic year (2018/2019), at the Banat al-Arrub Basic School of UNRWA, was chosen intentionally, where the ninth grade students were divided Primary to two groups (An experimental group, a control group), an experimental group studied using laboratory experiments in science, and a control group studied in the direct teaching.

The study used two tests (pre-test and post-test), each of the tests consists of (40) multiple-choice type of four alternatives, the results of the analysis of the variance monocular analysis (ANCOVA) showed a statistically significant difference between the average scores of the two groups of study (experimental and

control) on The conceptual mapping test is attributed to the use of laboratory experiments in science. A statistically significant difference between the mean scores of both study groups (experimental and control) on the misconception test was attributed to the use of laboratory experiments in science.

Based on these results, the study recommended that laboratory experiments should be used in teaching science because it helps in correcting misconceptions and constructing conceptual maps for ninth grade students. It also recommended conducting other studies dealing with laboratory experiments in teaching science and applying them at different grade levels.

Key words: Laboratory Experiments, Science, Grade 9, Palestinian Basic Schools, UNRWA.

Introduction

The educational practices in general and the teaching of science in particular have seen great leaps for the better to keep abreast of this era characterized by scientific and technological progress. The modernization and development have become a clear feature of the educational field because of their scientific and technological challenges. In light of the technological revolution and the development of the computer industry, there has been an increasing interest in improving students' learning outcomes. The focus is on helping students acquire strategies for building appropriate conceptual maps that enable them to deal with new life situations and scientific trends.

Since the curriculum is a tool for educating the individual who can correct misconceptions and construct conceptual maps, and where teaching methods are a component of these curricula, it was incumbent on those in charge of the educational process to

review the methods of indoctrination and to seek new teaching methods, which renders them capable of understanding, correcting misconceptions and constructing conceptual maps **(Crowell, 1989; Tropez, Pape, and Paul, 2004).**

There is no special way to teach all scientific subjects, while there are strategies and teaching methods organized by the teacher to guide the educational process in terms of planning, implementation and follow-up. There are other strategies and methods of teaching where the teacher guides the learner where the learner is a major participant in the educational process, and this type of methods emphasize the practice of building different conceptual maps and help learners to acquire positive behaviors such as: independence and self-confidence and the spirit of competition and cooperation between them **(Abu Lebda, 2009).**

Natural sciences materials are the most materials depend on school laboratory to teach their concepts, and also it helps students gain diverse experiences **(Al-Shaer, 1994).**

The laboratory is an integral part of the scientific education and teaching of science. It is the heart of science teaching in different stages of education, and science is not a science unless it is accompanied by experimentation and laboratory work. Therefore, modern trends in scientific education and laboratory activities take great importance and a prominent role in teaching science. The role of the laboratory is to link with scientific materials and the methodological study that is supposed to be accompanied by activities and scientific inquiry on the one hand, and to achieve the objectives of teaching science on the other **(Zaitoun, 2004).**

Therefore, the interest in teaching science as the most relevant subject to the progress of technology, where science and technology became two sides of the same coin and they are linked to each other ; so many educators stressed the importance of integrating ICT in science education for its close association with the growth of integrated science student who seeks To be a meaningful education **(Al-Hafiz and Jawhar,2012).**

The laboratory is one of the most important areas that contribute to the transformation of abstract concepts into concrete concepts. The laboratory also contributes to raising the level of scientific and practical experience for both teacher and student. It also helps to provide a variety of sensory experiences, which form the basis for understanding many facts, concepts, laws and scientific applications **(Shaheen and Hattab, 2005).**

Experience is more comprehensive than knowledge. Knowledge is simply the information that a person acquires about his life from multiple sources such as the book, television or friend. Experience is the living knowledge that man lives in multiple life situations, including information, attitudes, tendencies, values and ways of thinking **(Khatib, 1988).**

Thus, the laboratory contributes to achieving one of the most important objectives of science teaching. Scientific concepts play a role in increasing students' understanding of the nature of science **(Al-Khalili, 1996).**

Correcting misconceptions is the backbone of organized knowledge. It is a fundamental turning point in many curricula. Concepts are no longer just a part of learning but are of great

importance as they help predict, interpret and understand natural phenomena**. (Abu Zaida, 2006).**

Correcting misconceptions is one of the most important characteristics of thinking and has a great impact on organizing experience, remembering knowledge, following up phenomena, linking them to sources and facilitating access to them. Since correcting misconceptions is the basis of science curricula in the basic stage, and since most of the students of this stage grow into the first stage - the sensory motor - according to Piaget classification, the choice of correcting misconceptions that are compatible with the cognitive level of the learner must be chosen and presented in a variety of experiences, And that the concept is the unit of building scientific knowledge **(Qatami, Abu Jaber and Qatami, 2008).**

Correcting and shaping misconceptions needs to engage in thought processes in interaction with natural and sensory experiences, as well as an experienced teacher who is capable of developing and directing **(Khalili et al., 1996).**

The school lab also contributes to the scientific trends of students and deepen them, which is one of the main objectives of teaching the main science and work to increase the motivation of students towards learning science **(Alhadhifi, 1994).**

In view of the importance of using scientific laboratories and increasing the benefit of experimentation and laboratory activities, new methods of laboratory testing have emerged using modern technological techniques of virtual education through the use of computers. The aim of these programs is to facilitate students 'understanding of scientific concepts, to contribute to

positive attitudes towards students' science learning, to increase student motivation and to increase their interest in science; by providing students with fun while performing computer-based laboratory activities, To open the horizons of knowledge in front of him to build new knowledge, and to solve the problem of shortage faced by schools in material resources **(Shunak et al., 2004).**

The use of labs contributes to helping students correct their underlying misconceptions based on observation and measurement, and helps them acquire skills to correct misconceptions and build conceptual maps, especially higher mental skills such as analysis, synthesis, and evaluation. The construction of conceptual maps is the other side of science. It is the group of capacities that constitute the scientific thinking that is characterized by the generality of its practice in all branches of science, where the effect of learning and acquiring it moves from one scientific branch to another. It is acquired by an individual in an article that it can use in another subject, does not end once the study of a particular subject learned through actual practice **(alkhalili,1996; Zeitoun,2004).**

The importance of the study and its justifications: First; The theoretical importance:

This study contributes to highlighting the importance of laboratory experiments in science as it is one of the modern strategies in the teaching of science in public schools in the West Bank. It also helps to highlight the effect of laboratory experiments on science in correcting misconceptions and building conceptual maps among 9th graders (UNRWA) schools in Palestinian primary schools.

Second; Research importance:

This study helps to provide scientific and research horizons for researchers in the field of curriculum, where this study is - within the science of researchers - one of the first studies that try to identify the impact of laboratory experiments in science, especially with regard to correct misconceptions and build conceptual maps of students Ninth grade.

Third; Practical importance:

The results that may result from this study and how to benefit from them in educational institutions. The Ministry of Education and Higher Education also helps in preparing training programs and studies for teachers in public schools and helps overcome the difficulties facing teachers in the use of laboratories.

Objectives of the study

This study aimed to achieve the following:

- Identifying the impact of the use of laboratory experiments in science on the construction of conceptual maps of the ninth-grade students in the Palestinian elementary schools of the UNRWA.

- To identify the effect of using laboratory experiments in science to help the ninth-grade students to correct misconceptions.

The problem of the study and its questions

Palestinian schools suffer from poor achievement of students in various subjects, especially science, as confirmed by the results of the study of the achievement of students in science and mathematics (TIMSS), due to several factors, including: the

use of traditional methods in the presentation of scientific content, And the adoption of teachers in teaching students to indoctrination instead of practical activities (hands on activities), and mental activities **(Minds on activities) (Zauton, 2007).**

Hence, this study contributes to the addition of a new strategy in the teaching of science through the use of laboratory experiments in science, which may lead to the opportunity for students to learn according to their own abilities and build conceptual maps of the ninth grade students and correct the misconceptions related to science. The problem of the study is the following questions.

- Is there a statistically significant difference at the level of significance ($\alpha \leq 0.05$) between the arithmetical averages of the students of the two groups of study (experimental and control) on the conceptual mapping test due to the use of laboratory experiments in science?

- Is there a statistically significant difference at the mean level ($\alpha \leq 0.05$) between the mean scores of the students of the two groups of study (experimental and control) on the test of correcting misconceptions due to the use of laboratory experiments in science?

Study limits and limitations

Spatial limits: UNRWA's Al-Orub Elementary Girls School

Time limits: The second semester of the academic year (2018/2019).

Human limits: Ninth grade students.

Academic limits: The unit (chemical elements and reactions in our lives) from the science and life book of the ninth grade.

Terminology of study

Laboratory experiments in science: is a procedure carried out to support, refute, or validate a hypothesis. Experiments vary greatly in goal and scale, but always rely on repeatable procedure and logical analysis of the results.

The scientific concept: A general idea or term agreed by individuals as a result of passing through multiple experiences about something that shares specific characteristics in which all members of this species agree **(Peter, 2004).**

Conceptual mapping: a teaching tool used in schools and universities. It aims at clarifying all the main and secondary concepts that include the subject. containes a set of concepts and definitions organized hierarchical structure which contributes to their division into several sections or classifications, which are linked by "lines" shares through a set of main relationships And its subsidiaries. (Zauton, 2004).- Correcting misconceptions: The incorrect ideas of scientific concepts, which are meaningful to students, are contrary to the sound scientific point of view **(Atiya, 2006: 300).**

Previous studies

Rosenquist (2000) studied the effect of using a computer simulation program as an alternative to real work in science experiments. The study sample consisted of 34 primary ninth graders in the United States. The researcher used the tribal and remote test as a tool to study it. The study concluded that there

were no statistically significant differences in scholastic achievement between the experimental and control groups.

Change (2002) conducted a study in Taiwan aimed at investigating the effect of laboratory technology in problem-solving science on student achievement and attitudes towards science. The study sample consisted of a group of 294 students divided into two groups: experimental (156) male and female students, and control (138) male and femalestudents, and reached positive results for the group used in the teaching of laboratory experiments in science.

Jensen et al. (2004) conducted a study in Germany aimed at identifying the effect of the use of laboratory experiments in science on the achievement of students in the field of natural and engineering sciences. The results showed no significant differences between the experimental and control groups, That the use of laboratory experiments in science encouraged users to reduce the errors of education and this will improve the output of education and leads to the acceptance of students and their interaction with this technology.

Balmush and Dumbravenu (2005) conducted a study in Moldova aimed at developing a virtual laboratory in physics to teach undergraduate students and found that the virtual laboratory had a positive impact on student performance, leading to a deeper understanding of physical phenomena with the possibility of examining the underlying physical phenomena Which can not be identified in the real laboratory and thus improve their assimilation of physical phenomena.

Lal (2008) studied the goal of using labs in education and its relation to some creative abilities in a sample of students of general secondary education in the city of Makkah Al Mukarramah, Saudi Arabia. The researcher used the questionnaire to use the laboratories in e-learning, The sample of the study consisted of (200) students, (100) students from the scientific section, (100) students from the literary branch. The results found that there is a statistically positive relationship between the trend towards the use of laboratories In e-learning and some creative abilities (Fluency - flexibility - originality), male students are highly oriented toward the use of laboratories in e-learning in the third grade secondary.

Al-Shihri (2009) conducted a study aimed at identifying the impact of laboratory use in helping third-secondary students in Saudi Arabia to gain the skills of laboratory experiments in the biology course. The study found that there were differences between the experimental group and the control group in acquiring anatomy, physiology and overall skills, while differences in morphology skills did not appear.

Study Approach:

Due to the nature of the study that examines the effect of using laboratory experiments in science on correcting misconceptions and constructing conceptual maps, the appropriate approach for this study is the empirical approach, which is semi-experimental, because of their relevance to the nature of the study and its objectives.

The study population consists of (80) female students in the ninth grade in the Palestinian elementary schools of UNRWA

during the second semester of the academic year (2018/2019), as shown in Table (1):

Table 1: Number of Ninth Grade Students in Palestinian Basic Schools of UNRWA during the second semester of the academic year (2018/2019).

Numbers of classes	Number of female students
5	80

The study sample The study sample consisted of 80 female students from the ninth grade in the Palestinian elementary schools of UNRWA during the second semester of the academic year (2018/2019) at the UNRWA Girls Primary School, which was chosen The primary school is divided into two groups. One was assigned randomly to represent the experimental group, and the other to represent the control group.

- The experimental group: consisted of (40) students, and were taught the experiments of science included in the unit (the unit of elements and chemical reactions in our lives) using laboratory experiments in science.

- The control group: consisted of (40) students, and were taught concepts contained in the unit (unit elements and chemical reactions in our lives) within the classroom bydirect teaching.

Study Tools

First; Test the construction of conceptual maps:

This test is formed of a 20-paragraph, multi-choice type of four alternatives, and is a collection test designed to validate the effectiveness of laboratory experiments in science in building basic conceptual maps for ninth graders on the subject of chemical elements and reactions in our lives of the science and life book for the ninth grade, which is scheduled to be taught during the second semester of the academic year (2018/2019) .

The test was presented in its preliminary form to a group of arbitrators, and the test was modified according to their opinions as some of the paragraphs were redrafted to become clearer and more precise.

The test, consisting of (20) items, was applied to an exploratory sample from Abu Ali Iyad Secondary School for Girls under the Directorate of Education / Qalqilya. The sample was composed of (38) female students of the ninth grade, the duration of the application (40) minutes, and after that The responses of the students of the survey sample were corrected on this test, and the difficulty and discrimination coefficients were found for each of its paragraphs.

The persistence coefficient was calculated by applying and retesting with a two-week interval between application and Pearson correlation coefficient **(0.75),** which is a high stability coefficient and fulfills the study objectives

Second; Correcting misconceptions:

This test is in the final form of a 20-paragraphmulti-choice type of four alternatives, and is a collection test designed to validate the effectiveness of laboratory experiments in science in concepts among ninth grade students and to measure their

understanding of the concepts involved in chemical elements and reactions Our life from the science and life book for the ninth grade to be taught during the second semester of the academic year **(2018/2019).**

The test was presented in its preliminary form to a group of arbitrators, and the test was modified according to their opinions. Some of the paragraphs were redrafted to make them clearer and more precise.

The sample was composed of (38) female students of the ninth grade, the duration of the application (40) minutes, and after that the answers of female students in the survey sample were corrected on this test and found the degree of difficulty and discrimination coefficients for each of its paragraphs. Paragraphs of less than 0.20 and greater than 0.80 were deleted **(Abdo, 1999).**

The stability coefficient was calculated by applying and retesting with a two-week interval between application and calculating the stability coefficient using Pearson correlation coefficient (0.86), which is a high stability coefficient and satisfies the study objectives **(Abdo, 1999).**

Study Procedures:

The study procedures were as follows:

Determination of a unit of science and life book for the ninth grade (the unity of elements and chemical reactions in our lives).

Distribution of the unit of elements and chemical reactions in our lives in four lessons, distributed on (20) Lectures, by the month, so that was given (5) Lectures per week for each group.

- The selection of a school from the UNRWA schools for the implementation of the study, which is the primary school of girls. This school consisted of 5 classes from the ninth grade. The ninth-grade students were divided into two groups according to their rank according to the school population, one randomly assigned to represent the experimental group, and the other to represent the control group.

▪ Experimental group : Science experiments were taught using laboratory experiments in science.

▪ Control group: Science experiments were taught using direct teaching (theoretically)

- Preparation of tools used in this study according to the following procedures

-The formulation of the paragraphs of the test of building conceptual maps in its initial form, number of (20) paragraph of the type of multiple choice with four alternatives.

- Analyzing the scientific content of the elements and chemical reactions in our lives to determine correcting the misconceptions contained in the content.

-Identify and formulate the educational objectives of the subject of chemical elements and reactions in our lives, according to Bloom's classification of goals in the cognitive field, which includes the following levels: knowledge (memory), understanding, application, higher levels.

- Preparation of the specifications of the test table according to the levels of the above objectives, and determining the percentage of each level.

- Formulation of the paragraphs of the concept test in its initial form and the number of (20) paragraph of the type of multiple choice with four alternatives.

- Validation of tools: Presented to a group of experts and specialists in science curricula and teaching methods, and supervisors of science in the Palestinian Ministry of Education and Higher Education, in order to ascertain the following:

- The association of the test subjects with the scientific content contained in the unit of chemical elements and reactions in our lives.

- The concept test sheets belong to the levels of goals they represent according to Bloom's classification of goals in the cognitive field.

- Clarity of the test paragraphs and their scientific and linguistic integrity.

To verify the stability of the study tools in the manner of application and re-application of the test as stated previously

- preparation the school laboratory and its tools to carry out experimental experiments of the experimental group.
- Presenting the experiments to the members of the jury, asking them to express an opinion on the extent to which the experiments designed for the level of the ninth grade students, the content of the elements and the chemical reactions in our educational life, and their compatibility with the strategy specified in the study.
- Apply the concept test to the exploratory sample in order to determine the time taken to answer, calculate the degree

of difficulty and the discrimination coefficients for each of the paragraphs of this test and the coefficient of its stability.

- Applying the test to correct the misconceptions on the sample of the study prior to the experiment to verify the previous knowledge in the students of the experimental and control groups.
- Application of the conceptual mapping test on the exploratory sample in order to determine the time taken to answer, calculate the degree of difficulty and the discrimination coefficients for each of the paragraphs of this test and the coefficient of its stability.
- Application of the test of the construction of conceptual maps on the sample of the study before the experiment in order to verify the equivalence of the members of the study sample on this test.
- Application of the experimental treatment to the study sample; a teacher of science at the UNRWA Girls Elementary School, taught the elements and chemical reactions in our educational life and carried out experiments for the experimental group using laboratory experiments in science. Of the academic year (2018/2019), between the period (03/02/2019) until (28/02/2019) where the treatment lasted for one month, (5) lectures per week for each group.
- Apply the test to correct misconceptions on the study sample after the completion of experimental treatment.

- Application of the test of building conceptual maps on the study sample after completion of the experimental treatment.
- Data collection, identification and interpretation of results.
- A number of recommendations and proposals were developed according to the results.

Study variables

- Independent variable:

Method of teaching and has two levels: the method of laboratory experiments in science, and the direct teaching (theoretically).

- Dependent variables :

building conceptual maps, and correcting misconceptions.

- Stable variables:

Gender, where the sample was limited to female students in the ninth grade.

Statistical treatments

To achieve the objectives of the study and test hypotheses, researchers used the statistical packages of social sciences (SPSS), using the following statistical tests:

- Calculation of the arithmetical averages, and the standard deviations of the marks of the study groups (control and experimental) on the conceptual tests and the construction of conceptual maps.

- ANCOVA analysis of the results of the sample students in both groups (experimental and control) on the tests of correcting misconceptions and constructing conceptual maps.

Results and discussion of the study:

Results for the first question:

Is there a statistically significant difference at the mean level ($\alpha \leq 0.05$) between the mean scores of the students of the two groups of study (experimental and control) on the conceptual mapping test due to the use of laboratory experiments in science?

Table(2): Pre-test and post-test conceptual mapping according to the variable of teaching method

The group		Pre-test	Post test

	Teaching strategy	Number of members of the group	Arithmetic mean	Standard deviation	Number of members of the group	Arithmetic mean	Standard deviation
Experimental group	**Experimental laboratory experiments in science.**	40	3.55	1.87	40	8.50	3.41
Control group	**Direct Teaching**	40	3.55	1.932	40	4.60	2.137

Maximum marks on the test (20)

It is noted from Table (2) that the mean of the scores of students who studied using laboratory experiments in science to test the construction of postmodern conceptual maps reached (8.50), which is higher than the arithmetic means of the students who studied in the direct teaching (4.60). To determine whether there was a significant difference between the two averages at the level of significance ($\alpha \leq 0.05$), the ANCOVA analysis of the students' sample marks was done on the post-test of constructing the concept maps according to the variable of the teaching

method. After taking into account their signs of the same test, which was applied before starting the experimental treatment as an associated variable. Table (3) shows the results of the analysis:

Table (3): Results of the ANCOVA analysis of the students' sample marks on the post- test of the construction of the concept maps according to the variable of teaching method

Source of variance	Total squares	Freedom scores	Mean squares	Value(F)	Level of significance
Pre-test	6.074	1	6.074	0.745	0.394
Post-test	154.946	1	154.946	19.001	0.000
The error	301.726	37	8.155		

It is noted from Table (3) that there is a statistically significant difference at the level of significance ($\alpha \leq 0.05$) between the mean scores of the two groups of study (experimental and control) in the test of building the conceptual maps for the benefit of the members of the experimental group where the value of statistic (F) (19.001) The results indicate that there is a statistically significant difference ($\alpha \leq 0.05$) between the mean scores of the study groups (experimental and control) on the post-test of building theconceptual maps of the ninth grade students.

To calculate the magnitude of the effect of laboratory experiments in science on the construction of conceptual maps, the ETA square (η^2) was calculated. Table 4 illustrates this:

Table (4): Test Results (η^2) for Dimensional Comparisons between Arithmetic Means by Variable Teaching Method.

Contrast source	**Pre-Test (Tribal accompaniment)**	**Teaching Method**
ETA square	0.02	0.339

It is clear from Table (4) that the magnitude of the effect of laboratory experiments in science on the construction of conceptual maps of the experimental group is significant. It was found that (0.339) of the effect is due to the method of teaching using laboratory experiments in science. Thus, there is a statistically significant difference due to the teaching method for female students Who have studied laboratory experiments in science, demonstrating the effectiveness of this method in helping students build their conceptual maps compared to the direct teaching.

The results of the study showed a statistically significant difference between the mean scores of the students of the experimental group and the scores of the students of the control group on the post-test of building theconcept maps in favor of the experimental group. The reason for the difference in laboratory experiments in science is that the conceptual maps of the ninth grade students are based on the nature of laboratory experiments in science, which presents scientific experiments in a clear and

organized manner. Experimental experiments in science contribute to the presentation of skilled expertise close to direct experience, on traditional laboratories, if not available appropriately, which contributes to the construction of basic conceptual maps for students, such as observation and measurement, and helps students to correct misconceptions and build conceptual maps.The study also agreed with Al-Shihri (2009) that the use of laboratory experiments in science helped the laboratory skills (anatomy and physiology skills) of the students in the experimental group.

The technology of laboratory experiments in science develops students' self-confidence and motivates them towards self-learning. This is what modern theories of education call for- to acquire skills and to understand concepts and information, thus keeping learning longer. This study is consistent with Khalid's (2008) study, which found a positive relationship between the use of a virtual learning environment and the retention of learning in the experimental group. The study also concurs with the study of methamprempheno, which concluded that the virtual laboratory has a positive effect on the formation of a deeper understanding of the experimental group and improving their absorption. This study is also consistent with Lal's (2008) study, which found a positive relationship between the use of laboratory experiments in science and the development of students' creative abilities.

Results for the second question: Is there a statistically significant difference at the mean level ($\alpha \leq 0.05$) between the arithmetic averages of the students of the two groups of study (experimental and control) on the test of correcting misconceptions due to the use of laboratory experiments in science?

To answer this question, the arithmetical averages and standard deviations of the students' sample marks were calculated on the test of correcting tribal and remote misconceptions according to the variable of teaching method, as shown in Table 5:

Table (5): Arithmetic averages and standard deviations for marks of female students of the study sample on the test correcting misconceptions pre and post according to the variable teaching method

The group	Teaching strategy	Pre-test			Post test		
		Number of members of the group	Arithmetic mean	Standard deviation	Number of members of the group	Arithmetic mean	Standard deviation
Experimental group	Experimental laboratory	40	8.40	3.42	40	16.00	4.96
Control group	Direct Teaching	40	7.25	3.110	40	11.20	4.200

Table (5) shows that the arithmetical mean of the female students who studied using laboratory experiments in science on the test of correction of post-misconceptions was 16.00, which is higher than the arithmetic average of students who studied buy

direct teaching (11.20) There was a difference between the two averages with a statistical significance at the level of significance (α≤0.05). The ANCOVA analysis of the students' sample marks was done on the test of correcting the misconceptions according to the variable of the teaching method. After taking into account their marks on the same test, which was applied before starting experimental treatment as a companion variable. Table (6) shows the results of the analysis:

Table (6): ANCOVA results for the scores of female students of the study sample on the post-test correcting misconceptions according to the variable teaching method

Source of variance	Total squares	Freedom scores	Mean squares	Value(F)	Level of significance
Pre-test	65.352	1	65.352	3.515	0.069
Post-test	182.331	1	182.331	9.808	0.003
The error	687.848	37	18.590		

It is noted from Table (6) that there is a statistically significant difference at the level of (α≤0.05) between the mean scores of the study groups (experimental and control) The results indicate a statistically significant difference (0.05)) between the mean scores of the study groups (experimental and control) on the

post-test of correcting the secondary misconceptions in the ninth grade students.

To calculate the magnitude of the effect of laboratory experiments in science on correcting scientific misconceptions, the ETA square (η2) and Table (7) were calculated as follows:

Table (7): ETA square results (for dimensional comparisons) between arithmetic averages according to variable (teaching method)

Contrast source	**Pre-Test (Tribal accompaniment)**	**Teaching Method**
ETA square	0.087	0.210

It is clear from Table (7) that the magnitude of the effect of laboratory experiments in science on correcting the scientific misconceptions of the experimental group is significant. It was found that (0.210) of the effect is due to the method of teaching using laboratory experiments in science. Thus, it is clear that there is a difference of statistical significance due to the method of teaching for students who studied using laboratory experiments in science, which indicates the effectiveness of this method in helping students to correct scientific misconceptions compared to the direct teaching.

The results of the study revealed that there is a statistically significant difference between the averages of correcting the scientific misconceptions of the experimental group and the control group and for the benefit of the experimental group. The reason for this difference lies in correcting the scientific misconceptions between the students of the two groups because

laboratory experiments in science are an evolution in the methods of teaching general science experiments.

This is in line with the Radhi (2008) study, which concluded that the use of laboratory experiments in science positively affects the effectiveness of collection. This study also agrees with the study of Jensen et al. (2004), Which found that the use of laboratory experiments in science improved learning outcomes, although there were no statistically significant differences. Laboratory experiments in science contribute to transforming abstract misconceptions into valid and concrete concepts. It also helps to provide diverse sensory experiences, which helps to facilitate students' understanding of scientific concepts, especially that primary stage students tend to possess sensory skills in acquiring Piaget knowledge.This finding is in line with the study of Al-Qarni (2006), which found statistically significant differences in the achievement of concepts at the three levels (remembering, understanding, applying) when using laboratory experiments in science and for experimental group students.

Recommendations:

According to the results, the researchers recommend:

- The application of experimental laboratory technology in science in teaching science experiments in the basic stage because of its effect in correcting misconceptions and building conceptual maps among students.

- Training the science teacher (in-service) to use the skill of laboratory experiments in science during teaching.

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