

# **The Impact Of Using The Generative Teaching Strategy And Laboratory Work On The Achievement And Acquisition Of Chemical Concepts Among The Ninth Grade Students In The Bases Chemistry In Jordan**

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**Abstract:** *This study aimed to investigate the impact of using the generative teaching strategy and laboratory work on the achievement and acquisition of chemical concepts among the ninth grade students in the bases chemistry in Jordan. The study sample consisted of ( 53 ) students from the ninth grade primary school of boys ,divided into three division randomly divided into three group , the first experimental consisted of ( 18 ) student who were consecrated using by generative teaching strategy and the second experimental group also consisted of ( 18 ) student were recruited by using laboratory work , and the third group consisted of ( 17 ) student who were consecrated traditional method . The study found that there were statistical significant differences between the average performance of student in experimental and control group on the achievement test and the selection of the acquisition of good chemical concepts in the experimental groups. The study recommended use of chemistry teachers and science teacher’s general method of generative teaching strategy and laboratory work in teaching because of their impact on achievement and acquisition of chemical concepts.*

**Keywords:** *Generative teaching strategy, laboratory work, achievement, acquisition of chemical concepts, chemistry, ninth grade.*

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## **I. Introduction**

The science teaching strategies vary inside and outside the classrooms well as inside the laboratory in particular. Some of these strategies are taught through scientific presentations and the others through generative teaching strategies and laboratory work which is one of the most important and highly effective strategies specifically for teaching basic scientific concepts and principles. These strategies-when implemented in each class- are regarded cornerstone to draw student's attention, break routine and promote their academic and achievement level. This strategy is based on laboratory work experiments and scientific activities, being the most optimal means to attain knowledge through observation the results of these activities. The strategies lead students to profound understanding, long - term retention and an increase in their knowledge structure, as well as acquisition of scientific concepts and skills by learning through new strategies (Bashireh and Obedeem, 2014).

The achievement of science teaching aims requires implementation of variable and appropriate strategies to grant learning of high quality of the most effective strategies is generative teaching strategies and laboratory work strategy due to their use of teaching- learning activities that enable students to investigate scientific concepts and facts by themselves by organized work as Bronze called because experiments achieve learning based on understanding and place the learner at the center of teaching- learning process. They also provide the learner with opportunities to participate in learning processes and behave as scientists in research and question in that the learner identifies the problem, establish hypotheses, collect data and conduct an experiment to find results. By doing so, he/she feels self-confidence and the sense of accomplishment. In addition, he/she will develop positive attitudes toward learning science in general and chemistry in particular (Khaleefah, 2011).

The science teaching programs had witnessed several changes in the second half of the twentieth century.They were a reflection of economic, scientific and technological shifts, so there was no choice but to keep pace with these shifts and adopt new approaches in science which depend on the use of scientific strategies in research and thinking (Al Heelah, 2002).

It should be noted that effective learning is not merely a process to showcase concepts, facts , operations skills. Therefore, the learner has to conduct scientific operations. By this token, educationalists assert that one of the most important aims to teach science is development of thinking skills among students when

teachers use teaching strategies through which students practice many activities that trigger thinking and encourage asking questions. (Zaitoon, 2004).

Due to the significance of generative teaching strategies and laboratory work, this study appeared to investigate learning impact for generative teaching strategies and laboratory work on achievement and chemical concept acquisition among ninth grade students in chemistry.

### **STATEMENT OF THE PROBLEM AND QUESTIONS**

During my work as a chemistry teacher, I noticed that most of the teachers depend on traditional strategies which is based on rote learning and memorization rather than understanding, innovation, inquiries.

This has led to a great weakness in their achievement level, and their lack of scientific concept acquisition. Due to the variety and abundance of scientific concepts that chemistry curriculum has at this stage, it is vital to adopt modern teaching strategies that meet the status quo and student's aspirations, the material as well as best inclusion of concepts among students. The lack of traditional strategies to laboratory work which is the cornerstone of the teaching process because it combines the theoretical and practical side to sustain learning as long as possible.

### **STATEMENT OF THE PROBLEM IS TO ANSWER THE FOLLOWING MAIN QUESTION:**

What is the impact of using the generative teaching strategy and laboratory work on the achievement and acquisition of chemical concepts among the ninth grade students in the basic chemistry in Jordan?

### **THE MAIN QUESTION HAD THE FOLLOWING SUB- QUESTIONS:**

1. Does ninth grade students' level of achievement in chemistry differ according to teaching strategies (generative teaching strategy, laboratory work strategy and traditional teaching strategies)?
2. Does ninth grade students' acquisition of chemical concepts in chemistry differ according to teaching strategies (generative teaching strategy, laboratory work strategy and traditional teaching strategies)?

### **THE AIMS OF THE STUDY**

This study aimed to achieve the following:

1. To identify the effect of the use of generative teaching strategy, laboratory work on achievement in chemistry among the ninth grade students in Jordan.
2. To identify the effect of the use of generative teaching strategy, laboratory work on ninth grade students' acquisition of chemical concepts in chemistry in Jordan.

### **PREVIOUS STUDIES**

(Bashireh and Obedeen, 2014) conducted a study aiming to investigate " the effect of two methods of laboratory work: the teacher's practical presentation in front of students and guided investigation in the laboratory on the academic achievement among secondary stage female students in chemistry in Jordan. The study sample consisted of (58) female students divided into two groups. The first one was taught through guided investigation in the laboratory, the second one was taught through laboratory practical presentation. The results showed that there were statistically significant differences among the averages of the female students' scores in scientific concept achievement of the two groups in favor of the group taught through laboratory work and presentation.

The study of (Al Jaman, 2013) aimed to investigate "the effectiveness of generative teaching in retention in chemistry and the scientific deduction for ninth grade students "compared to the traditional method before and after conducting the experiment research. The study sample consisted of ( 61)ninth grade female students from two sections in Al Khaledia secondary school for girls in Western Northern Badia, directorate, Mafraq. (31)Female students for the experimental group and (30) students for the control group. The experimental group was taught through generative teaching strategy while the control group was taught through traditional method. The study was conducted in the second semester 2012/ 2013. To achieve the aims of the study, an achievement test in the unit and scientific deduction had been prepared. The results showed that there were statistically significant differences at the level ( $0.05 = \alpha$ ) in the average on ninth grade female students in chemistry retention in favor of the experimental group taught through generative teaching strategy.

## **II. Methodology**

This chapter identified the Methodology of the research, a description of sample and population of the study. It also described the study tools in terms of validity and reliability in addition to procedures followed by the researcher in the study.

## **STUDY METHODOLOGY**

The study used quasi-experimental approach to be appropriate to the nature of this study where three groups were taught: two experimental groups, one of them was taught through generative teaching strategy and the other through laboratory work strategy .the third group was a control one and was taught through traditional strategy.

## **STUDY INSTRUMENT**

An achievement- test in material unit in eighth grade science book was developed .it consisted of (20) multiple-choice items and every student had to choose one correct answer out of four choices. The other test was scientific concept developments test which consisted of (20) multiple- choice items.

## **THE STUDY SAMPLE**

The study sample was a purposive sample, because the researcher worked as a teacher at al-Karak secondary school, the sample was chosen from that school which had a well- equipped science laboratory. The study sample consisted of (53) students divided into three sections chosen randomly. The first group was experimental and it had (18) students who were taught through generative teaching strategy whereas the second group (18 students) was taught through laboratory work strategy. The third group (17 students) was taught through traditional method.

## **STUDY VARIABLES**

### **THE STUDY INCLUDED THE FOLLOWING VARIABLES:**

**THE INDEPENDENT VARIABLE:** teaching strategies which had three levels:

1. Generative teaching strategy.
2. Laboratory work strategy.
3. The traditional method.

### **THE DEPENDENT VARIABLES:**

1. Achievement.
2. Chemical concept acquisition.

## **STATISTICAL TREATMENT**

Statistical processing had been carried out using SPSS (Statistical Package for the Social Sciences) to answer the study questions as follows:

1. The arithmetic means and standard deviations for responses of the study sample in divide also to the achievement- test and the test of scientific and chemical concept acquisition
2. One Way Anova to verify the equivalence among the groups according to the achievement- test and to examine the differences among the groups in the post measurement of both the achievement- test and the test of scientific and chemical concept acquisition.
3. (Kuder - Richardson 20) to verify the reliability of the achievement- test.
4. Person's correlation coefficient to calculate the validity of internal consistency of the achievement- test items as well as the test of and chemical concept acquisition.

## **THE ANSWER TO THE FIRST QUESTION**

1- Does ninth grade students' level of achievement in chemistry differ according to teaching strategies (generative teaching strategy, laboratory work strategy and traditional teaching strategies)?

The researcher applied the achievement test to the three groups and then extracted the arithmetic mean and standard deviation of the level of performance in the achievement test according to the group variable as shown in table (1).

**TABLE (1) ARITHMETIC MEAN AND STANDARD DEVIATION FOR PERFORMANCE LEVEL IN POST ACHIEVEMENT MEASUREMENT**

<b>GROUP</b>	<b>(N)</b>	<b>MEAN</b>	<b>STANDARD DEVIATION</b>
Traditional method	17	14.12	3.83
Generative teaching strategy	18	18.39	4.45
Laboratory work strategy	18	18.83	2.96

It is clearly noted that there were differences in performance level in achievement measurement according to group variable. To examine if there were statistically – differences, the researcher used (One Way Anova). Table (2).

**TABLE (2)(ONE WAY ANOVA) DIFFERENCES SIGNIFICANCE AMONG GROUPS' INDIVIDUALS IN POST APPLICATION OF THE ACHIEVEMENT TEST.**

SOURCE OF VARIATION	SUM OF SQUARES	D.F	MEAN SQUARES (MS)	F VALUE	LEVEL OF SIGNIFICANCE
Between groups	234.929	2	117.465	8.129	.001
Inter groups	722.542	50	14.451		
Total	957.472	52			

**(0.05≥a).Significance at the level statistically**

Data indicated that there were statistically significant differences at the level (0.05≥a) between the groups in post application of the achievement test (F value) and the accompanying level of significance. Scheffe's Test for post comparisons was used to determine in favor of which group were the differences. Table (3).

**TABLE (3) THE RESULTS OF SCHEFFE'S TEST FOR POST - COMPARISONS TO DETECT DIFFERENCES AT THE ACHIEVEMENT LEVEL ACCORDING TO GROUP VARIABLE.**

ARITHMETIC MEANS	GROUP	DIFFERENCES		
		TRADITIONAL METHOD	LABORATORY WORK STRATEGY	GENERATIVE TEACHING STRATEGY
14.12	Traditional method	—	-4.27*	-4.27*
18.39	Laboratory work strategy	4.27*	—	-0.44
18.83	Generative teaching strategy	4.21*	0.44	

**(0.05≥a).significance at the level statistically**

The results showed that there were statistically significant differences between the strategies of (laboratory work and generative teaching) on the one hand and the traditional method on the other hand and in favor of the two experimental groups.

This emphasized that there was an instruction effect of the strategies of (laboratory work and generative teaching) regarding students' achievement in chemistry compared to the traditional method. This was ascribed to advantages of these strategies in that they help students depend on themselves as to investigation and research, in addition to their enthusiasm to learn and find answers to what they have in mind.

#### THE ANSWER TO THE SECOND QUESTION

2- Does ninth grade students' acquisition of chemical concepts in chemistry differ according to teaching strategies (generative teaching strategy, laboratory work strategy and traditional teaching strategies)?

The researcher applied the chemical concept acquisition test to the three groups and then extracted the arithmetic mean and standard deviation of the level of performance in the achievement test according to the group variables shown in table (4).

**TABLE (4) ARITHMETIC MEAN AND STANDARD DEVIATION FOR PERFORMANCE LEVEL IN POST ACHIEVEMENT MEASUREMENT**

GROUP	(N)	MEAN	STANDARD DEVIATION
Traditional method	17	13.47	4.12
Generative teaching strategy	18	17.61	4.69
Laboratory work strategy	18	17.33	4.41

It is clearly noted that there were differences in performance level in scientific concept test according to group variable. To examine if there were statistically – differences, the researcher used (One Way Anova).

**TABLE (5)(ONE WAY ANOVA) DIFFERENCES SIGNIFICANCE AMONG GROUPS' INDIVIDUALS IN POST APPLICATION OF THE SCIENTIFIC CONCEPT TEST.**

SOURCE OF VARIATION	SUM OF SQUARES	D.F	MEAN SQUARES(MS)	(F) VALUE	LEVEL OF SIGNIFICANCE
Between groups	185.600	2	92.800	4.752	0.013
Inter groups	976.513	50	19.530		
Total	1162.113	52			

**(0.05 ≥ a).significance at the level statistically**

Data indicated that there were statistically significant differences at the level (0.05 ≥ a) between the groups in post application of the chemical concept test (F value) and the accompanying level of significance. Scheffe's Test for post comparisons was used to determine in favor of which group were the differences. Table (6).

**TABLE (6) THE RESULTS OF SCHEFFE'S TEST FOR POST - COMPARISONS TO DETECT DIFFERENCES AT THE ACHIEVEMENT LEVEL ACCORDING TO GROUP VARIABLE.**

ARITHMETIC MEANS	GROUP	DIFFERENCES		
		TRADITIONAL METHOD	LABORATORY WORK STRATEGY	GENERATIVE TEACHING STRATEGY
13.47	Traditional method	—	-3.86*	-4.14*
17.33	Laboratory work strategy	3.86*	—	-0.28
17.61	Generative teaching strategy	4.14*	0.28	

**(0.05 ≥ a).significance at the level statistically**

The results in table (6) showed that there were statistically significant differences between the strategies of (laboratory work and generative teaching) on the one hand and the traditional method on the other hand and in favor of the two experimental groups. The results didn't show that there were differences between the laboratory work and the generative teaching in chemical concept acquisition among ninth grade students. This was attributed to characteristics of these strategies in that they create inquisitive students searching for information more than usual due to the lack of balanced thinking which requires finding answers and instilling concepts, data and facts in their mental and cognitive structures.

**RECOMMENDATIONS**

1. It is vital for science teachers generally and chemistry teachers particularly to adopt the strategies of generative teaching and laboratory work in instruction due to their effect on increase students' achievement and chemical concept acquisition.
2. Activation of laboratory work by science and chemistry teachers because of its great effect in increase achievement and retention of chemical concepts for a longer time.
3. Conduct similar studies dealing with other materials at different age stages, given the continuous change in curricula and the modern strategies in the field of education.

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