

## **The Effectiveness of Modern Models on the Achievement of Academic Subjects and the Development of Scientific Thinking among University Students**

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### **Abstract:**

The aim of this work is to determine the effectiveness of modern models (John Zahorek Woods' model) in the achievement of teaching methods and the development of scientific thinking among third-stage students, Department of Science / Physics Branch, College of Basic Education / University of Babylon. The study was conducted in Iraq - Babil Governorate, and the experimental design was adopted under a partial control of two groups and a control group according to the experimental approach . The research community was the third year students. Sample students, and the result was that the groups are statistically equal. The researchers used the appropriate statistical means for their research procedures (analysis of mono-variance, Pearson correlation coefficient, Chi-square. The current results showed that the two experimental groups (John Zahorek and Woods) were superior to the control group and statistically significant (0.05).

**Keywords:** (teaching methods; development of scientific thinking; effectiveness; john zahorek model; woods model).

## Introduction

Al Khafaji (2007) conducted a study in Baghdad University of Baghdad Faculty of Education Ibn al-Haytham wh

ich aimed to observe the impact of training on self-questioning on second-grade physics students in terms of their scientific thinking development and achievement. The sample consisted of (55) women students and was randomly selected. The sample was divided into two experimental and control groups. The researcher compared the two groups of research in age calculated by months, grades of science, mathematics in the first grade, the academic achievement of the parents, the researcher prepared two tests for academic achievement and scientific thinking on their own data and analysis by means of the appropriate statistical means, including the T-test, Chi-Square equation and Pearson correlation coefficient and others. The study resulted in that the experimental group outperformed the control group in the average score of achievement and the development of scientific thinking and statistical significance at the level of (0.05), which indicates the importance of using the self-questioning model in the development of achievement and scientific thinking among second grade students average in physics (Al-Khafaji, 2007).

effectiveness of the John Zahorek model on the achievement of the history of ancient civilizations among the students of the first grade intermediate.

The research sample consisted of (70 students) of the first grade students who study history.

The researcher equalized statistically for two groups (experimental and control) of students' variables that could affect the results of the experiment. The researchers developed (140) behavioural objectives distributed at levels of knowledge,

understanding, application, and analysis of the Bloom's knowledge field. The three chapters were defined in the experiment. In order to treat the data statistically, the researchers used a number of statistical methods (i.e. Pearson correlation coefficient, Spearman Brown equation, Chi-Square, coefficient of difficulty coefficient for the thematic paragraphs and essay clauses, equation of the discriminating forces of the substantive paragraphs and the essay clauses, the equation of the effectiveness of the wrong alternatives, the Cooper equation and the coefficient of Aita).

This study outcomes indicated that the experimental group students who studied the history of ancient civilizations using the John Zahorek model, were superior to the control group students that follow the conventional method for the same subject (Ali, 2015).

This study goal is identifying the effectiveness of John Zahorek Woods' models in achieving the objectives of teaching methods and developing scientific thinking among third-stage students, Department of Science, Department of Physics, Branch of the College of Basic Education, University of Babylon. To investigate the research objective:

1. There are no statistically significant differences at the level of (0.05) between the average scores of the students of the three research groups, the first experimental group that studied teaching methods of John Zahwick's model, and the second experimental group studying the same course. In Woods' model and the control group that study the course the same thing in the

Mustafa (2010) conducted another study in Iraq, University of Mosul which aimed to identify the impact of the Woods model in the achievement of the fifth grade students in physics. The research sample consisted of (71) students distributed this sample

to two groups, one is the experimental group and this group taught according to Woods model and the other control group the researcher used the experimental design. The research tools consisted of the achievement test and the critical thinking test, and a number of statistical methods were adopted (the difficulty level of the paragraphs and the discriminating power of the paragraphs, the effectiveness of the wrong alternatives, and the equation of Kyudar-Regards on- 20) and t-test of two independent samples). This study demonstrated the advantage of the Woods model in raising the achievement level for the physics' fifth grade students; as well as their critical thinking development due to the experimental group procedure compared to the traditional method (Mustafa, 2010).

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2-There are no statistically significant differences in (0.05) between the mean scores of the three research groups' students. The first experimental group that studies the teaching methods course . is the John Zahwick model and the second experimental group that studies the same course as the Woods model and the control group studying the course Himself in the test of post-scientific thinking.

## **Limits of the Study**

This study is limited to:

1-Third stage students, Department of Science, Department of Physics, Branch of the College of Basic Education, University of Babylon

2-Topics for the first three semesters of the teaching methods curricula to be taught to the third stage students, Department of Science, Department of Physics, Branch of the College of Basic Education, Babel Basic University in Iraq for the academic year (2016-2017).

3- The first semester of the academic year 2016-2017.

## **Definitions of Terms**

A-John Zahorek's model was defined by:

1- Atiyah, 2008 has defined it as "A model due to its structural designer, John Zahorek, which is derived from the ideas of structural theory in learning and education. Perhaps the most important characteristic of this model is its emphasis on the need to provide the information in its entirety and then the parts, and emphasis on refining the information and concepts gained through and understanding information needs to discover the nuances between new learning content and previous learning "(Attieh, 2008).

2-Al.Ijrish, 2013 has defined it as "One of the models of structural theory. This model consists of five stages, namely, information activation, acquisition of information, understanding of information, use of information, thinking of information" (Al. Ijrish, 2013).

B-Operational definition: The researchers defined it as a set of steps based on activating, acquiring, understanding, using and reflecting information. The researchers continued in teaching students of the experimental group subjects of teaching methods to attain the research goal.

C-Woods model was defined by:

1- Al-Ijri, 2013 has defined it as "It is the teaching process that helps students to understand properly and agree with sound scientific theories" (Al. Ijri, 2013).

D- Practical definition: The researchers defined it practically as follows: The set of procedures that the researchers followed in teaching students of the experimental group subjects of the teaching methods subject according to the three stages of the model (prediction, observation, interpretation) to achieve the research objectives.

E- Achievement was defined by:

1-Al-Khayat, 2010 has defined it as "the extent of achievement of the objectives of learning in a subject or course previously studied or trained by the student through certain actions or tasks." (Al-Khayat, 2010).

2-Abu Jado defines it as: "a systematic procedure to determine the amount of what students learned in a given subject in the light of the specific objectives, and can be used in improving learning methods, and contributes to the mastery of planning and control implementation and evaluation of achievement (Abu Jado, 2011).

F-Operational definition: The researchers defined it as the amount of what the research groups students learned in the teaching methods subject after their answers to the subjects of the achievement test prepared to determine the extent to which the

research goal was achieved. . (What is the difference from the above definitions)?

G-Teaching methods: It is a set of principles and methods used in the teaching process, which usually includes class participation, recitation, memorization and practical demonstration, or a combination of them. The choice of teaching method or methods to use depends largely on the information or skills that are taught, and can also be influenced by the competence and enthusiasm of the students themselves.

G- Scientific thinking was defined by:

1. Al-Khalili, 1996 has defined it as "The way we look at things depends mainly on reason and convincing proof of experience and evidence, a method that cannot be available to a person who has not acquired special training in any branch of scientific knowledge" (Al-Khalili, 1996).

2. Al-Khatib, 2002 has defined it as: "Integrated science processes include data interpretation skills, procedural definitions, control of variables, imposition of hypotheses, and experimentation" (Al-Khataybah, 2002).

H- Operational definition of scientific thinking: The researchers defined it as a series of mental processes determined by the skills and identified by the researchers in the test and carried out by the students of the research sample to solve the problem facing them in their lives and measured from the total score they receive in the scientific thinking test prepared for the purposes of the current research, At the end of the search experience.

## Research Methodology and Procedures

Because it is more suitable for research procedures, the experimental approach was adopted in this study. In order to perform a practical experimental design, some concepts should be considered. Firstly, it is crucial to think about the best procedure to operationalize the measured variables; in addition, which statistical methods can be more adequate for the research question's answers. Secondly, the researcher should consider what the study's expectations and the analyzation methods of potential results. Last but not least, in an experimental design, the researcher should take into account the practical limitations of study; such as the availability of participants and how they represent targeted population. Finally, it is worthwhile to consider each of these elements before conducting any experiment (Ader, H. J. et al, 2008), see Table 1.

Table.1 Experimental design.

Test tools	Dependent variable	Independen t variable	Pre-test	Group
Achievemen t and scientific thinking tests	Achievemen t	Zahorek model	Scientifi c thinking pre-test	Experimenta l 1
		Woods model		Experimenta l 2
		Traditional way		Control

## Research Population

The current research community is determined by third-stage students, Department of Science, Physics Branch, Branch of the College of Basic Education, University of Babylon. (There are (No links in this paragraph)

Fourth: Research Form:

Of the current research requirements. Choose three study groups from the research community. The sample came from two divisions of third-grade students, Department of Science, Physics Branch, Branch of the College of Basic Education, University of Babylon, and the following table and the number of its members see Table No. 2

Table.2 Study Sample.

Name of class and department	Sample sex	Section	Name of the group	Number of the group members
٤٦	First experimental	A	Mixed	Third grade / Physics 1
٥٢	Control	B		
٥٠	Second experimental	C	Mixed	Third grade / Physics 2
١٤٨		٣		Total

### **The two-research-group equivalence**

The effect of the independent variable on the dependent variable needs to adjust the variables that the researchers can adjust. Therefore, the researchers tried to improve the experiment's control. (Please rearrange and clarify it, and make it with a logical numbering)

1. The student ages are calculated in months.
2. Test previous information.
3. Educational degree of parents :
  - A) The educational achievement of parents.
  - B) Educational level of mothers.
4. Career Father
5. Mother's career.

The researchers note that the groups were equal in the variables that were treated statistically and by the appropriate statistical means and not statistically significant.

#### **Teaching Plan Preparation**

The daily plan is a notable guide to the teacher's preparation, which is likely to be taught more effectively and successfully (Al-Ameen et al., 2006). The teaching plan is a structured, pre-defined and written process (Qatawi, 2007).

And since the preparation of teaching plans is one of the teaching requirements, the researchers prepared the curriculum for teaching methods to be taught during the period of the experiment. (14) teaching plans were made to teach the first experimental subject a group similar to the second and control experiment. The researchers presented a model for a group of experts in Arabic

language, literature and teaching methods and educational and psychological sciences, and the article teachers to know their opinions, observations and suggestions to improve the formulation of plans and make them sound to ensure the success of Roba and make the experiment go in a predetermined direction.

### **Research Tool**

The researchers has adopted two tools for all groups, namely the post-academic achievement test and the other in scientific thinking (Please rearrange and clarify it)

Exploration Experience:

In order to ascertain the relevance of the subject to the students, it was found that it is necessary to apply the test to a sample of the survey to determine the clarity and suitability of the tests and for the students of research groups and the appropriate time to answer them and their stability. Therefore, it was utilized to a sample of 63 students in the Third grade of the Faculty of Basic Education Babylon University:

Using the Pearson correlation coefficient, the researchers reached the stability coefficient. The correlation coefficient between the test halves (0.80), if the researchers used the half-way method to reach the stability value.

The coefficients of the correction stability are good in both cases for non-standardized tests whose stability coefficient (0.68) is good (Hedges 1966). The researchers confirm the clarity of the test content and suitability for the students and the time of the test, the test is ready for implementation.

Application of the Test: The researchers applied the test on Wednesday, 4/1/2017, at 10:30 am as the test was applied to the three groups at one time. (Please rearrange and clarify it)

Statistical means: (Please rearrange and clarify it)

Use the researchers to reach the results of his research by the following statistical means:

Analysis of mono - variance. (One-Way ANOVA)

Method of Sivet (S):

$$(1 / n_1) + [1 / N_k] (x_1 - x_k)^2 / (MSW (K-1))$$

(1)

As:

x: value of a distribution table [at a significance level of 0.05]

m<sub>sw</sub>: Average squares within groups

K: The number of transactions. .

N: Number of sample members. (Al. Bayati, 2008: 266)

3. Chi-Square

The researchers used him to find parity between the two research groups in the educational achievement of parents.

Representing

(L): Repetition observed

(S): expected repetition (Al-Bayati and Athanasius, 1977: 293)

4. Pearson correlation coefficient used by the researchers to calculate the coefficient of the correction stability in the test in

terms of agreement over time and agreement with another corrector.

$$R = \frac{\text{total number} * \text{sum } xy - (\text{sum } x) * (\text{sum } y)}{\sqrt{[n * \text{sum } x^2 - (\text{sum } x)^2][n * \text{sum } y^2 - (\text{sum } y)^2]}}$$

(2)

Where:

R: Correlation coefficient

n: Sample size

x ,y: The variables (Al-Bayati 1977:183)

## Results

### Reviewing Results:

To verify the objective of this research and its mandate for the academic achievement, the researchers used the analysis of one-way ANOVA to find the significance of the differences between the groups and as shown in Table 3.

The first hypothesis:

To verify the first zero hypothesis, which states: "There are no statistically significant differences at (0.05) between the average

scores of the students of the three research groups. The first experimental group studying Material Teaching Methods is the John Zahorek model and the second experimental group The same model Woods and the control group, which taught the same course in the traditional way in the achievement test)) The researchers used the analysis of the mono-variance and the result was as follows:

Table (3)

Results of the analysis of the variance of scores for students of the three research groups in the achievement test

Significance at 0.05	(F) (define)		S. m	d.f. (define)	Sum. of squares	Source of variance
	Calculated	Tabulated				
			٤٩٢٦.١٩	٢	٩٨٥٢.٣٨	Between the groups

Statistically significant	3.07	١٩٦.٠٩	٢٥.١٢٢	١٤٥	٣٦٩٣	Among the groups
				١٤٧	١٣٥٤٥.٣٨	Total

Table (3) shows that the calculated value (196.09) is greater than the numerical value of (3.07) in the freedom classes (147,2) and the significance level (0.05). (0.05). In light of this result, the first zero hypothesis is rejected. There is no difference between the groups and the experimental groups.

Interpreting the result:

The researchers hold that the reason for the superiority of the experimental groups on the control group in the achievement variable is due to the following reasons:

1 - The two educational models that were applied in the experiment helped to increase the effectiveness of students in the

classroom and this work positively to increase the academic achievement of students.

2 - The two educational models which according to the experience allow the students to participate in the lesson and to express opinion and this increased the effectiveness of students in the field of academic achievement.

3. Both the Woods model and the Zahorek model are modern models, and this is the last time students are attracted to the subject. This has helped to increase academic achievement.

The second hypothesis:

To verify the second zero hypothesis, which states: "There are no statistically significant differences at the level of (0.05) between the average scores of the students of the three research groups".

The first experimental group that teaches Teaching Methods is the John Zahwick model and the second experimental group The same model Woods and the control group, which examines the same course in the test of scientific thinking dimension)) used the

researchers analysis of the variance of the mono and the result as follows:

Table (4)

Results of the analysis of the single variance of the scores of the students of the three research groups in the scientific thinking test

Significance at 0.05	(F)		S. m	d.f.	Sum. Of squares	Source of variance
	Calculated	Tabulated				
Statistically significant			2744.805	2	5488.81	Between the groups
	3.07	99.363	27.624	145	4005.48	Among the groupss
				148	9494.29	Total

Table (4) shows that the calculated alpha value of (99.363) is greater than the tabular value of (3.07) at freedom score (147.2)

and the significance level (0.05). (0.05). In light of this result, the first zero hypothesis is rejected. There is no difference between the groups and the experimental groups.

Interpreting the result:

The researchers holds that the reason for the superiority of the experimental groups on the control group in the scientific thinking variable is due to the following reasons:

1. The Woods model and the Zahorek model are modern models that help students to think accurately and properly.
- 2 - The steps of the two educational models in teaching help to develop the scientific thinking of students as they are two models of modern education.

### **Conclusions**

Through the results of the research concludes the following conclusions:

1. The models of Woods and Zahurik have positively affected the achievement of students in the curriculum and textbooks, which means that they are influential in the educational process within the article mentioned
2. The Woods and Zahorek model have a clear impact on the performance of students in terms of scientific thinking when teaching syllabus curricula and textbooks.
3. Teaching these models increases the interaction of students among themselves and makes their participation in the classroom an effective and positive influence.

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