

# INFLUENCE OF JOYCE, WEIL AND MARTORELLA MODELS IN DEVELOPMENT OF SCIENTIFIC THINKING AMONG THE STUDENTS OF FIFTH GRADE SECONDARY IRAQI

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## ABSTRACT:

*The aim of this research is to understand the effect of the Joyce, Weil and Martorella models on the development of scientific thinking in the fifth grade students. we chose an experimental design with a partial adjustment consisting of three groups (two experimental groups and one control group) In the fifth year of the academic year 2017-2018, the research sample consisted of one of the preparatory schools of the Directorate General of Education Baghdad Al-Karkh / 3, and the secondary school (Ezzedine Selim) was chosen for boys in a simple random way to be the sample of the research. (The previous knowledge, intelligence, the age of time calculated in months, the academic achievement of the parents, the test of scientific thinking), and after we identified the scientific material to be taught, which included natural geography book to see the extent of development Thinking Through teaching, we prepared instructional plans according to the Joyce and Will model steps of the first experimental group. In accordance with the steps of the Martorella model of the second experimental group and according to the steps of the traditional method of the control group, the researchers prepared a skills test for Paragraph consisting of (30 scientific thinking) have been confirmed sincerity, and the coefficient of the difficulty of its paragraphs, the power to distinguish, and stability, and continued to experiment procedures in full academic and at the end, and after testing the application of the study showed the following results:*

*1-The students of the two experimental groups who study according to the Joyce and Weil models, and Martorella, surpassed the students of the control group who studied according to the traditional method of scientific thinking test.*

*2-There are no differences between the students of the experimental group who study the geography according to the model Joyce and Weil and students of the second experimental group, which is taught according to the model of Martorella in the test of scientific thinking. In the light of the findings of the research, we concluded that the Joyce, Weil and Martorella models proved to be effective within the limits in which this research was carried out in the development of scientific thinking among the fifth grade students, balancing with the usual method. In light of this, we put forward a number of recommendations, and suggested applying the Joyce, Weil and Martorella model in other study stages.*

**Key words:** : teaching models, Joyce and Weil, Martorella .

**CHAPTER ONE: DEFINITION OF RESEARCH****I- Problem of The Research:**

The observant and follower of our educational reality that it did not keep pace with what the modern trends called for the need to follow modern methods and methods of education correspond to the amount of information and modern concepts produced by science as mankind progresses in development and our schools continue to follow the traditional methods that are no longer useful with this increase in the amount of information. We prepared a questionnaire that included a number of questions to identify and identify the main reasons for this problem. we distributed a sample of 13 teachers to the sample of the geography of the preparatory stage of the Directorate of secondary Education of Karkh. And find it suitable for teaching students to the material of geography and the development of their thinking, and the answer was 90% indicate a preference to use the traditional method, they believe it is appropriate to teach.

The problem is compounded by the fact that current teaching methods are useless methods that do not provide a classroom environment that stimulates students' scientific thinking. This is confirmed by (Yassin 2014) and (Al-Baydani 2016) which is a pattern of thinking. The development of scientific thinking is not an easy process. It needs to be achieved through the preparation of experiences and activities that are commensurate with different stages of thinking among students. Teaching methods are one of the main tasks for the development of scientific thinking (Abu Hatab 1983:132). Therefore, the research problem stems from the necessity of conducting this experimental study of two models of cognitive theory and verifying them empirically to find out their effect in the development of scientific thinking among students, especially that this study is the first in Iraq level to the knowledge of the researcher dealt with these two models for this stage of study.

**II-Important and Need of The Research:**

Education must fit the nature of the modern age and its new needs. Any educational system in the era of cognitive complexity must help students understand the complexity and complexity of their environment in all their different phenomena, as well as help them to understand the relationships between their various components. (Elephant, 2015: 23). In order to achieve this, several principles have been adopted, including the preparation of the student to practice various intellectual processes and skills, which help him to innovate and predict and give him the ability to make decisions and solve problems, and to emphasize the positive role of the student in the educational process. He practices mental processes, and his promise to practice is the goal of experimentation, not success or failure (Salama et al., 2009: 17). we agree with the literature and studies that the main axis of the educational process is the student, and that the basic function of the curriculum is to develop and raise it through a change in behavior and modify it as educational psychologists, insist that the behavior is the result of two factors are genetics and the environment and the interaction of genetics and Growth with the environment and the resulting learning result in behavior that we want the student to have and seek to achieve (Mari and Alhilah, 2009, 149). All theorists agree and agree that learning and thinking are active processes where new connections are made and where thinking is applied to meaningful real life situations. If thinking is to be developed, students need to have situations where they have opportunities to use their thinking (Jaber, 2010: 337).

Scientific thinking is a complex cognitive process of information processing, based on the use of symbols, perceptions, language, physical concepts, and abstracts in order to reach certain outcomes. Thinking is one of the important educational topics. This importance stems from being one of the main goals that the educational process seeks to achieve among students. Thinking is a subject that directly affects the lives of students and develops their mental abilities. (Zogul, 2011: 287) In this sense, scientific thinking and skills work on the sustainability of education, in the sense that the student learns how to learn, and

thus learn how to get knowledge instead of learning the same knowledge, as the sense of pleasure produced by the mind exceeds the pleasure of achieving information preservation. To other people who produced it (alhilah, 2002:126). It has become important to teach the teacher methods and methods of multi-purpose, and not only taught in one way, but depends on several methods and teaching methods that create the educational situation and lead to the achievement of learning goals (alZubaidi, 2014: 185). We note that educational research in the modern era to build modern models to be a solution to the problem of memorization and memorization of students, without absorption, discrimination, and circulation, so that these models to acquire knowledge and stimulate scientific reflection (Ibrahim, 1987: 78). The researchers believe that the teaching models have an important, effective and effective role in delivering the material to the student in a systematic manner and make the student benefit from the experiences that pass through him in the school and in the classroom to the maximum extent if the teacher follows all the steps in a systematic manner and steps studied, Joyce & Weil and Martorella) are two models of cognitive theory. Hence, this study is an attempt by the two researchers to add research from experimental educational research to two models of models that have not been searched for their influence in Iraq for the preparatory stage, according to the researchers' knowledge. The main objective of all research, including this research, is to try to reach studies that prove their effectiveness in education and to overcome all the obstacles that hinder the progress of students and their assimilation of the study material, in order to make the best use of all the theories and the ensuing methods and teaching models to improve the educational reality. It is possible to summarize the importance of research in the following points:

- 1-The importance of the model Joyce, Weil and Martorella as modern models in teaching that require study and experimentation.
- 2-The importance of scientific thinking and its role in the development and maintenance of the knowledge base of students and how to deal with the surrounding and the problems that face them correctly and the

need to focus on how raised by students and develop them to build a conscious generation with mental abilities properly polished and orderly.

**III: Research Aims:** This research aims at identifying the effect of Joyce & Weil and Martorella on the development of scientific thinking among fifth graders.

**IV. Hypotheses of Research:** There was no statistically significant difference at (0.05) between the average scores of the students of the three groups who study geography in the scientific thinking test. To achieve this main hypothesis, the following sub-assumptions were formulated:

1-There is no statistically significant difference at the level of (0.05) between the average scores of the first experimental group who study the geography according to the Joyce and Weil model and the average score of the control group students who study the same material in the traditional way in the scientific thinking test.

2-There is no statistically significant difference at the level of (0.05) among the average scores of the second experimental group who study the geography according to the Martorella model and the average score of the students of the control group who study the same material in the traditional way in the test of scientific thinking dimension.

3-There is no statistically significant difference at (0.05) between the average scores of the first experimental group who study geography according to the Joyce and Weil model and the average score of the second experimental group according to the Martorella model in the post - scientific thinking experiment.

**V. Limitation of The Research:** This research is limited to

- 1-The fifth grade secondary students in the preparatory and secondary day schools of the Directorate General of Education Baghdad / Karkh third year (2017-2018), ministry of education.

2-Topics of natural geography book to be taught for the fifth grade literary in Iraq for the academic year (2017-2018).

## VI. Definition of Terms

**a. Impact The Effect:** Hefni defined 1991 as "the effect of the independent variable on the dependent variable and the amount of change that occurs" (Hafni, 1991: 253). Either procedural: it is the result that is expected to occur in the development of scientific thinking in the students of the fifth grade literary (experimental groups) in the natural geography after the use of models Joyce and Weil and Martorella.

**b. Model:** Khawalde et al, defined it as "a set of structured frameworks based on interpretive viewpoints, intended to achieve certain objectives, and how to provide the teacher with frameworks that enable him to understand the process of education" (Khawalde et al. 1995: 77). Either procedural: is the sum of the procedures and steps taken by the researcher in teaching the geography of the students of the experimental groups the first and second in terms of preparation of the material and the selection of educational means and activities appropriate to the goals.

**c. Joyce & weil model:** Ali defined A model of cognitive theory used in teaching is based on the processing of information and concepts among students in order to develop and acquire students' concepts of content and stimulate thinking by linking concepts, procedures and activities with each other in an integrated and coordinated framework (Ali, 2010: 25). Either procedural: Joyce and Howell's model of how to teach content is based on a set of procedural steps starting with giving an advanced interpreter, and then asking questions to get to extrapolating the concept through examples and examples while teaching the first experimental group students according to the model plans prepared by the researchers.

**:d. Martorella:** Leslie and Mora defined it as a model who has a great place in the acquisition and development of concepts based on procedures that make the student interact with the educational

situation and facilitate the process of acquiring the concept (Leslie, & Mora, 1999, p: 35). Either procedural: is the model developed by Martorella to teach the concepts based on a set of procedural steps based on induction, starting with giving the examples belonging to non-believing, to arrive at the definition of the concept while teaching students in the second experimental group geographical concepts in accordance with the model plans prepared by the researchers.

**e. Development:** Medbouli defined it as: "Keeping pace with changes and innovations in educational situations, progress and progress towards the better in the educational level" (Medbouli, 2002: 83). Either procedural: "The change and improvement in the level of the research sample represented by the degrees of the test of scientific thinking dimension, which can be measured by the test prepared for this purpose and compare the difference between the experimental and control groups".

**f. Scientific Thinking Scientific Thinking:** Saadani defined as "the set of skills needed to solve a particular problem in an objective way or the mental processes that the student is doing to achieve a certain goal" (Saadani 1999: 17). Either procedural is a group of mental activities that represent scientific thinking and include (identification of the problem and selection of hypotheses and test the validity of the imposition and interpretation and obscene) by the fifth grade literary students during the subject of experimentation according to the models Joyce and Will and Martorella, which can be identified and measured by answering the paragraphs of the test Scientific thinking prepared for this purpose for the experimental and control groups and the difference between them. And procedural for the development of scientific thinking: is the change for students of the three research groups in the degrees of post-test of scientific thinking.

**h. grade literary fifth:** The second grade of the preparatory stage of the three preparatory stage and the preparatory stage is the school stage that follows the intermediate stage and the duration of the study is three years and the specialization is scientific or literary. This stage consists of the fourth (scientific or

literary), fifth (scientific or literary), sixth (Scientific, literary ) from Republic of Iraq, 2008.

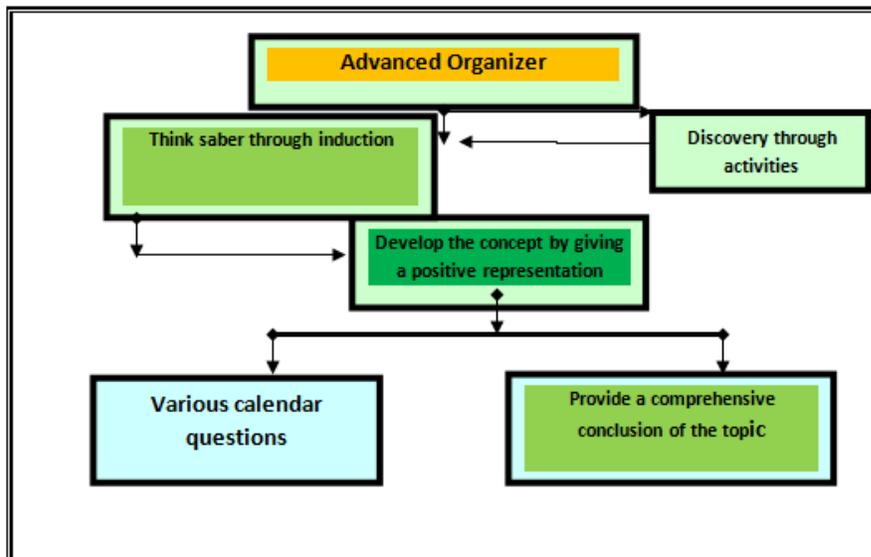
**CHAPTER TWO: A THEORETICAL FRAMEWORK AND PREVIOUS STUDIES**

**First: Theoretical framework**

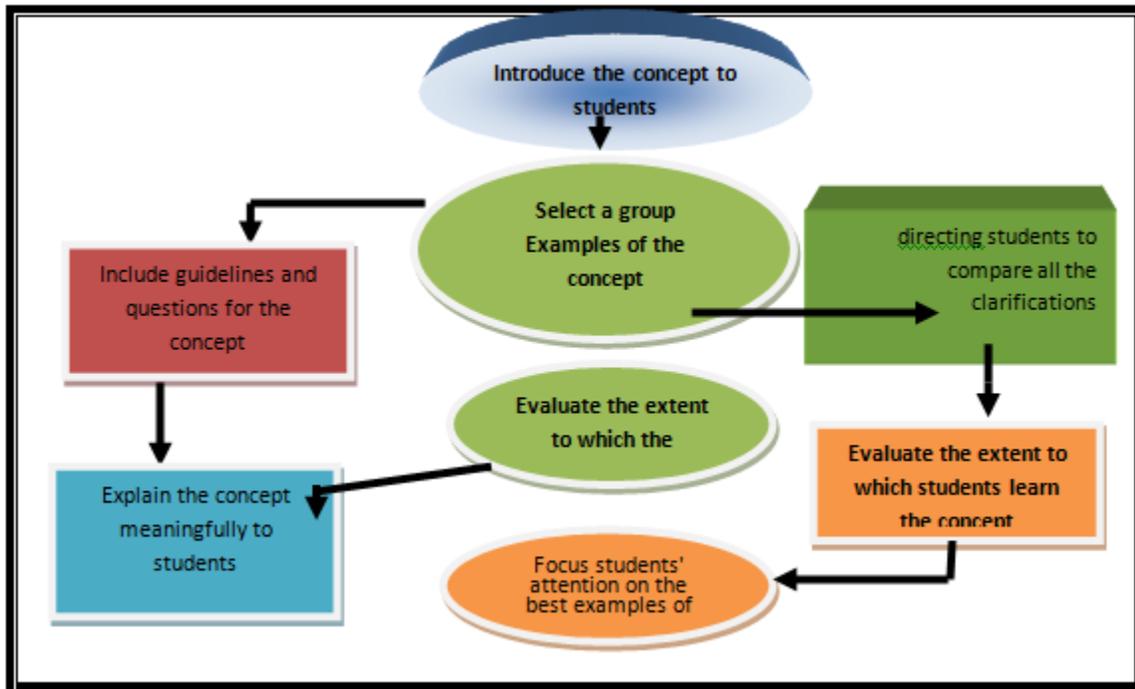
**A. Teaching Models:** In view of the discussions about the inability of educational trends to provide the educational situation with ready-made experiences, this has led to a more application-oriented

approach that is more responsive to the needs of students, teachers and educational content, namely, the development of educational models based on psychological principles; Principles and psychological foundations, and the main elements of each model (Qatami, 2011: 13). It is based on a specific idea of how the student learns. These models focused on different aspects of learning, as well as their views on the best procedures to help students learn and then translate it into a teaching model (Zatoun, 1988:34).

**B. Joyce & Weil model (1996:p242)based on the steps as shown in Figure(1):-**



**C. Model Martorola Based on the steps as shown in Figure (2):**



**D. Scientific Thinking:** AljamaI defines it as a pattern of thinking that the individual resorted to when faced with a problem in the external environment must find a solution or overcome it in order to achieve a specific goal or purpose, and usually the individual tries to make a number of attempts before reaching the right solution , And during these attempts to discover some mistakes do not repeat, and continue in this way until finally arrive at a proper way to solve the problem (AljamaI, 1997: 4-10) If it is an internal process that is not directly observable, it can be inferred through apparent behavior that can be observed or measured. Thinking is related to mental processes, so it is difficult to achieve direct recording of mind activities, Note the mental processes directly (AlRashidi et al., 2004: 180).

**Previous Studies Previous Studies:**

**1-Study Cano & Hewitt:** The study aimed at : addressing the interrelationship between thinking

methods, learning methods and educational achievement. The study was conducted on a sample of the students of the university in Spain consisting of (210) students with an average age of 19 years. The researchers used the list of methods of thinking prepared by (sitrange in 1991), a 104 paragraph for the measurement of thinking methods as well as a list to measure learning methods that include (sensory experience, effective experimentation, mental perception, contemplative observation). The results of these tools were used in Spanish. The researchers used average scores for students in the study sample as well as correlation coefficients, regression analysis, and variance. They also found a positive correlation between thinking methods and observational observation. They also showed a low correlation between thinking methods and learning methods (experience, experimentation). The regression analysis found that student achievement is linked to thinking and learning (Cano & Hewitt, 2000).

**2- Study Ghulam:** The aim of this study is to know the effectiveness of multimedia software in teaching geography and its effect in developing the skills of scientific thinking, collection and retention among the students of the first grade intermediate in Medina. This study was applied to a random sample of 95 female students in the first grade for the academic year 1427 - 1428H. The pilot approach was based on the design of the two populations: experimental group and control group. In order to measure the tribal and remote performance of the students of the two groups in both the academic achievement of the "climate unit" and the measurement of scientific thinking and retention, the researcher prepared a collection test that measures the following levels of the Bloom classification: memory, understanding, application, analysis. It includes five skills: problem identification, selection of hypotheses, hypothesis validity testing, interpretation, generalization. The research tools were applied tribally to both groups. The experimental group was taught using multimedia software. The control group was studied in the usual way. The experiment took five weeks and the tools were applied after graduation. To treat data statistically, the researcher used arithmetic averages, standard deviations, T test, and  $\pi$  (ghulam,2008). The results showed that:

- 1-The experimental and control groups are equal in the test of scientific thinking as a whole.
- 2-The experimental and control groups are equal in the following skills: problem identification hypothesis validity test - interpretation - generalization.
- 3-The experimental group was superior to the control group in the skill selection of hypotheses.
- 4-The experimental group surpassed the control in the achievement test. In light of the findings of the current study, the researcher made a number of recommendations and suggestions that can be introduced in the teaching of geography.

### CHAPTER THREE : RESEARCH METHODOLOGY AND PROCEDURES:

This chapter includes a description of the procedures used by the researchers and the methodology used in the research, the choice of empirical design of the research, the research community and its sample, the tool used and the application of the experiment, the statistical means as follows:

**First: Research Methodology:** The researchers followed the experimental approach in the application of the research, and aims to change some or all of its independent variables by conducting actual experiments, such as changing the teaching method, teaching methods used, or managing the educational environment (Ibrahim, 2009:185).

**Second: Experimental Design:** In order to understand the effect of the two independent variables (Joyce, weil and Martorella models) in the development of scientific thinking, the researchers adopted the design, which is called the design of equal groups (Van Dalen, 1985: 366).

**Third: Research Society:** The society of this research is the students of the fifth grade literary in the schools and junior high school day for boys in the province of Baghdad for the academic year 2017 – 2018.

**Fourth: Research Sample:** The sample refers to a distinct and selected group of the study population. It is distinguished in that it has the same characteristics of the society and is chosen in terms of being selected from the study society according to specific procedures (Batsh, Abu Zayna, 2007: 96). To ensure that the experiment is conducted properly, the Ezzedine Selim junior high school was selected. The researchers found that the people of the fifth grade literary in the school of the number of three divisions (A, B, C), and for the distribution of the people according to experimental design, the researchers adopted the method of random clouds to identify them, and showed the following distribution: The first group is the experimental group taught Joyce and Weil (A). The second group is the experimental group, which is taught in the Martorella model, and the third group is the control group, which is taught in the traditional way and is assigned to Division B.

The number of students in the three research groups after the exclusion of students who failed to possess the experience of (92) students, (31) students in Division (A), and (31) students in Division (B), and (30) Division (c).

**Fifth: equality of groups:** before the experiment began to equalize the students of the three research groups statistically in some variables we referred to literature and previous studies, which may affect the

safety of the experiment and the accuracy of their results, these variables are:

**1- the chronological age calculated months:** we obtained the chronological age of the search groups of students' school records, and after the processing of the data statistically, The results showed that the difference is not statistically significant at the significance level (0.05), and Table (1) shows that.

**Table (1) Results of analysis of the variance of the age of the students of the three research groups calculated in months.**

Source of Contrast	Total squares (s.s)	Degree of freedom	Average squares (s.m)	Value (F)		Statistical significance at (0.05)
				Calculate d	tabular	
Between groups	29.755	2	14.878	0.678	3.15	Not functional
Within groups	1952.365	89	21.937			
Total	1982.120	91				

**2- Parents' achievement: a-** With the help of the school administration, the researchers obtained the special data on the educational achievement of the parents. After calculating the frequency of each educational level. To find and find differences between the three research groups in the level of the father's educational attainment and using the key square of X<sup>2</sup>, the results showed that the difference is not statistically significant at the level of (0.05) Table (2).

**Table (2) Frequency of the academic achievement of the parents of the students of the research groups and their calculated values (X<sup>2</sup>) And the degree of freedom and level of significance.**

group	The father's educational attainment					Total of sample	Degree of freedom	Kay Square Value (X <sup>2</sup> )		Statistical significance at (0.05)
	Reads and writes	Primary	Secondary	Diploma	Bachelor and above			Calculate d	tabular	
second trial	3	5	6	8	8	30				
Control	4	7	5	9	6	31				
Total	8	16	17	30	21	92				

**b-The mother's achievement:** To calculate the significance of the statistical differences between the three groups of research in relation to the mother's achievement level. After analyzing the data statistically and using the key square of X2, the results showed that the difference is not statistically significant at the significance level (0.05), Table (3) illustrates this.

**Table (3) Frequency of Study Achievement of Students' Mothers and Values (X2) And the degree of freedom and level of significance**

group	The father's educational attainment					Total of sample	Degree of freedom	Kay Square Value (X2)		Statistical significance at (0.05)
	Reads and writes	Primary	Secondary	Diploma	Bachelor and above			Calculated	tabular	
second trial	5	5	7	8	5	30				
Control	4	5	8	9	5	31				
Total	13	14	22	28	15	92				

**3-Test the intelligence:** After looking at the literature and previous studies and consult the specialists of the type of test suitable for the sample of the research were chosen researchers to test (Raven), and after the application of the test and corrected by one degree of the correct paragraph and the paragraph of the wrong and abandoned and for the purpose of knowing the significance of differences between the three search groups, The results showed that the difference is not statistically significant at the significance level (0.05) and Table (4) shows that.

**Table (4) Results of the analysis of the variance of the scores of the students of the three research groups in the Raven IQ test.**

Source of Contrast	Total squares	Degree of freedom	Average squares	Value (F)		Statistical significance at level (0.05)
				Calculated	tabular	
Between squares	2.298	2	1.149	0.026	3.15	Not functional
Inside the boxes	3883.354	89	43.633			
Total	3885.652	91				

**-4-Testing the prior knowledge of the subject of geography:** To find out what the students possessed of prior knowledge in the geography and the extent of differences between the three research groups in this variable, we prepared a collection test containing the previous geographical information and consists of (30) After the application of the test to the students of the research groups, and correct the two students' answers to each group of the sample of the research, and after processing the data statistically and using the equation of the analysis of mono-variance, the results showed that the difference is not statistically significant at the level of significance (0.05) Table (5) illustrates it.

**Table (5) Results of the analysis of the variance of the scores of the students of the groups in the previous knowledge test**

Source of Contrast	Total squares	Degree of freedom	Average squares	Value (F)		Statistical significance at level (0.05)
				Calculated	tabular	
Between squares	7.565	2	3.782	0.662	3.15	Not functional
Inside the boxes	508.555	89	5.714			
Total	516.120	91				

**4-Testing scientific thinking tribal scientific thinking test:** The researchers applied the test of scientific thinking to the students of the three research groups. After correcting the test by one degree for each of its paragraphs (30) paragraph and when the budgets between the averages of grades obtained by the students, the results showed as shown in Table (6).

**Table (6) Arithmetic mean and standard deviation of group scores in the test of tribal scientific thinking**

Groups	Number (n)	Arithmetic mean (X)	standard deviation (SD)
first experimental	31	10.52	2.278
second trial	30	11.10	2.551
Control	31	11.48	2.669

The results of the analysis of mono-variance showed that there were no statistically significant differences between the three research groups in the pre-test of scientific thinking. The calculated alpha value (1.173) is less than the tabular value of (3.15) And two degrees of freedom (2, 89) and Table (7) illustrates this.

**Table (7) Results of the analysis of the single variance of the scores of the students of the three groups in the scientific thinking test.**

Source of Contrast	Total squares	Degree of freedom	Average squares	Value (F)		Statistical significance at level (0.05)
				Calculated	tabular	
Between squares	14.718	2	7.359	1.173	3.15	Not functional
Inside the boxes	558.184	89	6.272			
Total	572.902	91				

**Preparation of research requirements:** In order to achieve the objectives of the research and hypotheses, it is necessary to prepare the study requirements as follows:

**1-Determination of scientific material:** The researchers determined the scientific material, depending on the context of the vocabulary textbook (natural geography) to be taught to students in the fifth grade.

**2- Formulation of behavioral objectives:** The behavioral goal is defined as the final performance that can be observed and measured which the student is expected to do after passing through the educational situation (Al-Rawadiyya et al., 2011: 230-231). Based on this, the two researchers prepared behavioral goals related to the concepts identified in the chapters of the book based on the classification of concepts (definition, discrimination and generalization).

**3- Preparing the teaching plans:** Preparation of the teaching plans for the application of the experiment as follows:

**First Class:** There were (28) teaching plans for the first experimental group studying the Joyce and Will model, 28 teaching plans for the second experimental group studying the Martorola model, and 28 teaching plans for the control group taught in the traditional way.

**Second class:** The plans were (20) plan for each of the three research groups.

**4- The research tool:** To find out the effect of independent variables (Joyce, Weil and Martorola models) in the development of scientific thinking in the research sample, and the absence of a ready test through which the researcher can know the development of scientific thinking among students, the researchers consulted a number of experts and specialists in the field of education and science Self, measurement and evaluation, as well as access to some of the literature and previous studies that dealt with scientific thinking as one of their variables as a study (Albaidani, 2016). and through the two researchers:

**a. Determining the skills of scientific thinking that will be included in the test:** The researchers saw the preparation of a test of scientific thinking problem - solving method, which includes five skills of scientific thinking skills (determination of the problem, testing hypothesis, choice of validity hypotheses, interpretation, generalization), being a subjective approach And accuracy.

**b. Formulation of the test paragraphs:** The researchers formulated the test paragraphs for the first four skills (problem identification, hypothesis selection, hypothesis validity test, interpretation). Each of these skills consisted of five test paragraphs of the type of objective tests - multiple choice. ), It may be ten test paragraphs.

**c. Formulation of the test instructions:** The researchers set the following instructions:

**1 - instructions to answer the paragraphs:** After the completion of the preparation of the paragraphs of the test, the researchers put a number of instructions for the test as a whole and each skill of the five skills and how to answer the paragraphs.

**2. The correction instructions:** The researchers prepared the sample answer for all the test paragraphs. These answers were put in a key to correct the test paragraphs. The researchers assigned one score to the correct answer, and the zero to the wrong answer. The left or more than one answer Treatment of invalid paragraphs is given zero.

**d. Validation of the test:** To verify the validity of the tool based on two types of honesty.

**1- The apparent honesty:** To verify the authenticity of the tool ostensibly the researchers presented the test paragraphs to a group of experienced and competent, in order to express their views and observations on the validity of the paragraphs and their clarity and the correct formulation, to measure scientific thinking, and the researchers relied on the proportion of agreement (80%) of opinions At a minimum, and after collecting their views, all paragraphs were approved without deletion except for some of the test paragraphs modified by the experts in their formulation and alternatives.

**2- Construction validation:** The validity of the construction indicates the ability of the test to predict the theoretical predictions of the attribute or capacity or measured behavior (Al-Batash, Abu Zeina, 2007: 131-132). This type of honesty has been achieved through a sample of statistical analysis as follows:

a- by the method of the upper and lower groups and find the discriminatory force of the test paragraphs.

b- Using the Paiserial correlation coefficient to find the relationship between the score of each paragraph and the total score of the test.

**Application of test paragraphs on the survey sample:** we applied the subjects of the scientific thinking test on a sample of the fifth grade students from the preparatory students (Al-Shorouq) and (Al-Sabtin) of the General Directorate for Karkh Education. (200) students from both preparatory schools. The purpose of this procedure was to verify the following:

**1-Determination of the appropriate time for the test:** The appropriate time for the test was calculated by calculating the time of the fastest student of the sample took the answer to the test and missed them in the answer, and by that time was extracted, and reached (50) minutes.

**2 - Clarity of the test paragraphs and lack of confusion:** The researcher asked the students during the application of the test for any problem about the clarity of the test instructions and paragraphs and the researcher did not record a note about it as they were clear, but some inquiries and so the researchers kept the paragraphs and instructions unchanged.

**3- Analysis of the paragraphs of the test statistically:** The purpose of the analysis of the paragraphs of the test of scientific thinking, to verify the validity of each paragraph, and improve through knowledge of paragraphs that are very easy or very difficult or not distinctive or that are characterized by bad alternatives, and invalid exclusion (Scannell, 1975, P. 211). In order to calculate the difficulty and discrimination coefficients and the effectiveness of the wrong alternatives for the test, after correcting the answers of the sample of the statistical analysis, the researchers ranked the scores of the students in descending order from the highest grade to the lowest grade, then took 27% of the top answers and 27% of the lower answers. As follows:

**a-Difficulty factor:** After we calculated the difficulty factor between (0.32 & 0.56), when the literature indicate that the test paragraphs are acceptable if the rate of difficulty is between 0.20 and 0.80. This means that all the test paragraphs are acceptable and applicable.

**b- The discriminatory power of the paragraphs:** The authors point out that the discriminative power

of each paragraph of the test is found to be between 0.33 and 0.50. The literature indicates that the paragraphs of which the discriminant power factor is less than 0.20 should be deleted or modified (Amatanius, 1997: 100). Which means that the test paragraphs are all distinct, so the researchers kept the paragraphs without deletion or modification.

**C. Effectiveness of wrong alternatives:** A good alternative is the alternative that attracts a number of lower group students than the students of the higher group and is otherwise ineffective and should be deleted (udah, 1993: 125). In order to extract the effectiveness of the wrong alternatives, the researchers used the equation of the effectiveness of the alternatives. The researchers found that the

effectiveness of the alternatives was good, which gives an indication of the effectiveness of these alternatives.

#### Procedures for applying the experiment:

- 1- The duration of the experiment was one of the three groups of research, which took a full academic year.
- 2- The researchers completed the application of the experiment on the three research groups on Thursday, 3/5/2018.
- 3- The researchers applied the research tool to the three research groups on 3/5/2018.

### CHAPTER FOUR: RESULTS

**View results: Zero Hypothesis:** There is no statistically significant difference at (0.05) between the average scores of the students of the three groups who study geography in the scientific thinking test. The results showed that the average score is as shown in Table (8).

**Table (8) Arithmetic mean and standard deviation of group scores in the scientific thinking test.**

Groups	Number (n)	Arithmetic mean (X)	standard deviation (SD)
first experimental	31	20.61	3.343
second trial	30	19.40	3.286
Control	31	16.93	3.172

To find out the significance of the statistical differences between these averages, we used the analysis of one way Analysis of Vaince. The results as shown in Table (9).

**Table (9) Results of the analysis of the single variance of the scores of the three research groups in the scientific thinking test**

Source of Contrast	Total squares	Degree of freedom	Average squares	Value (F)		Statistical significance at level (0.05)
				Calculated	tabular	
Between squares	217.531	2	108.765	10.185	3.15	functional
Inside the boxes	950.426	89	10.679			
Total	1167.957	91				

The results of the above table show that the calculated numerical value of (10.185) is greater than the numerical value of the table (3.15) at the level of significance (0.05) and the degrees of freedom (2, 89). This indicates that there are significant differences. The results of the scientific thinking test for the three research groups were as follows:

1- the balance between the first experimental group that studied the geography according to the model (Joyce and Will), and the control group that studied the same article according to the usual method. In Table 10, the mean scores of the first experimental group of students who studied geography according to the Joyce and Weil model in the scientific thinking test were (20.61). The mean scores of the students in the control group were (16.93). Using the Sheffe method, there was a difference between them for the benefit of the first experimental group. The calculated value of Sheffe (3.68) was greater than the value of the table (2.08) at the level of (0.05), thus rejecting the hypothesis "There is no statistically significant difference between the mean scores of the first experimental group studying the geophysics according to the Joyce and Will model and the average scores of control group students who study the same material in the traditional way in the scientific thinking test"

**Table (10): Balance between the average scores of the first experimental group and the control group**

Groups	Number (n)	Arithmetic mean (X)	Value (F)		Statistical significance at level (0.05)
			Calculated	tabular	
first experimental	31	20.61	3.68	2.08	Static functional
Control	31	16.93			

-2-The balance between the second experimental group, which studied the geography according to the model Martorella, and the control group, which studied geography according to the traditional method.

Table (11) shows that the average scores of students in the second experimental group were (19.40), and that the average score of the control group was (16.93). When the significance of the differences between the scores of these two groups was tested and the Sheffe method of the balances was found, there was a difference between them for the benefit of the second group. The calculated value of Schweis was (2.47), At the level of significance (0.05), thus rejecting the second zero hypothesis, which stated that: "There is no statistically significant difference between the average scores of students of the second experimental group who study the geography on the model of Martorella and the average scores of students of the control group studying the same material In the traditional way of testing scientific thinking.

**Table (11): The balance between the average of the second experimental group and the average of the control group**

Groups	Number (n)	Arithmetic mean (X)	Value (F)		Statistical significance at level (0.05)
			Calculated	tabular	
Second experimental	31	19.40	2.47	2.09	Static functional
Control	31	16.93			

-3-The balance between the first experimental group that studied geography according to the Joyce and Will model and the second experimental group that studied the geography according to the Martorella model. In Table 12, the mean scores of the first experimental group that studied geography according to the Joyce and Will model in the scientific thinking test were (20.61). The average scores of the second experimental group, which studied the geography according to the Martorella model, in the test of scientific thinking was (19.40). When we examined the significance of the differences between the mean scores of these two groups and using the Schiffe method of the budgets, it was found that the difference between them is not statistically significant. The calculated value of Schwei (1.21) At the level of (0.05), thus accepting the third zero hypothesis that stated: "There is no statistically significant difference between the average scores of students of the first experimental group who study the geography according to the Joyce and Will model and the average scores of students of the second experimental group studying the material itself according to the Martorella model in the test of scientific thinking".

**Table (12): Balance between the mean of the first experimental group and the average of the second experimental group**

Groups	Number (n)	Arithmetic mean (X)	Value (F)		Statistical significance at level (0.05)
			Calculated	tabular	
first experimental	31	20.61	1.21	2.09	Not Static functional
Second experimental	30	19.40			

## CHAPTER FIVE: CONCLUSIONS - RECOMMENDATIONS - PROPOSALS

**Conclusions:** Based on the findings of the study, the researchers concluded the following:

The models of Joyce, Weil and Martorella have an impact on the development of scientific thinking among students. The topics studied by the researcher during the duration of the experiment of this research of the subjects that can be taught the models Joyce and Will and Martorella in the development of scientific thinking more than the usual way.

**Recommendations:** In the light of the results reached, the researchers recommend the following:

the attention of teachers and teachers of geography using the Joyce, Will and Martorella models instead of the traditional methods of teaching geography, because they have the potential in the development of scientific thinking. Attention to thinking as the highest levels of mental activity, and the need to see the teachers and teachers of geography and other materials on different thinking patterns, including scientific thinking and how to employ these patterns within a room and through the presentation of subjects and thus contribute to increase the ability of students to think and solve problems in different situations.

**Proposals:** In light of the results of the current research, the researchers propose the following: Conduct studies on the effect of using the Joyce, Weil and martorella model with other educational models to ascertain their impact on the development of scientific thinking such as the (Hilda Taba model). Conducting a study dealing with the impact of the two models in other variables such as achievement, and the development of creative or critical or innovative thinking and the development of attitudes of learners towards geography.

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