

## **The Impact Of Cosgrove's Model On The Achievement Of Fifth-Grade Female Students In Preparatory School In Biology**

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### **Abstract**

The aim of the current research is to identify the impact of Cosgrove's model on the achievement of fifth-grade students in middle school in biology, where the experiment started on Sunday (11/29/2020), and the experiment ended on Tuesday (16/2/2020), and the research sample was chosen randomly, which was represented by Aisha Preparatory School for Girls affiliated to the Baghdad Education Directorate / Karkh II, as the sample size reached (36) students, and the experimental design with partial control was chosen for the two equal groups (experimental and control), the sample size was divided into two groups, the experimental group (18) female students who study according to Cosgrove's model, and the control group (18) female students who study according to the usual method, and the two research groups were statistically rewarded in some variables (intelligence test, previous achievement, previous information test), the researcher formulated (246) behavioral objectives for the educational content, which included the first four chapters of the biology book for the fifth grade scientific (biological), the research tool represented by the achievement test was built, the results were treated statistically and showed the superiority of the students of the experimental group who studied according to Cosgrove's model over the students of the control group those who study according to the usual method in the achievement test.

**Keywords:** Cosgrove's model, academic achievement

### **Chapter One: Introduction to the Research**

#### **First: Research Problem**

Scientific progress has led to many important scientific discoveries through the use of technology and its applications in the life of the individual and thus have a positive or negative impact on the individual's life from within his life social environment, therefore, it has become the duty of these educational institutions to produce outputs that are compatible and keep pace with this development and at all levels of life. Educators confirm the existence of several problems that concern everyone involved in education and education, and these problems are related to the low level of achievement of students, or that is due to the use of old methods in the teaching sciences, which are based on memorization and information preservation, and this calls for a search for alternative methods (Jaber, 1985: 11). The old traditional methods lead to the loss of the element of excitement and suspense among the students towards the study

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material, which leads to the generation of rigid minds and unable to research and think in all scientific fields and these methods do not take into account the individual differences between the learners, unless they study the scientific material imposed on them and memorize it deaf without understanding (Al-Jabri and others, 2011: 1). The reason for the poor achievement of female students is due to the reluctance of most female teachers to follow modern teaching methods, which in turn helped in raising female students' achievement in biology, so the researcher relied on experimenting with new teaching methods that might contribute to alleviating the burden of this problem, as well as the researcher concluded that teaching according to Modern models contribute to and increase the level of academic achievement for female students, so the researcher intends to choose Cosgrove's model as an experimental attempt to identify what may contribute to raising the level of academic achievement among the fifth scientific students, and accordingly the researcher identified the research problem by answering the following question:

**What is the impact of Cosgrove's model on the achievement of fifth-grade female students in preparatory school in biology?**

**Second: Research Importance:** The importance of the research can be summarized as follows:

- The use of Cosgrove's model in response to modern trends in teaching, due to the necessity of adopting modern methods of teaching biology, so that the learner becomes a positive interaction.
- This research is one of the first empirical studies (according to the researcher's knowledge), which aims to know the impact of Cosgrove's model on the level of female students' achievement.
- The importance of academic achievement as it is one of the basic academic variables in achieving the goals of education.
- Teachers may benefit from it as an effective teaching model in the process of teaching scientific subjects in general and biology in particular, and to obtain positive results for achievement.
- The possibility of benefiting from the research results that may benefit those in charge of planning and developing curricula and teaching methods in the Ministry of Education in terms of applying this model, which depends on modern trends in science teaching.

**Third: Research Objective:** This research aims to identify:

The impact of Cosgrove's model on the achievement of fifth-grade middle school students in biology.

**Fourth: Research Hypothesis**

There is no statistically significant difference at the level (0.05) between the average scores of the experimental group students who will study according to Cosgrove's model and the average scores of the control group students who will study according to the usual method in the biology achievement test.

**Fifth: Research Limitations:** The current research was limited to:

- The human limit: a sample of the students of the fifth scientific (biological) grade.

- Time limit: the first semester of the academic year (2019-2020)
- Spatial limit: Aisha Public School for Girls (day study) affiliated to the Baghdad Education Directorate / Al-Karkh II
- The cognitive limit: the first study chapters (nutrition and digestion, gas exchange, excretion, movement)

### **Sixth: Define terms**

**Cosgrove's model:** (Borich) A teaching model that includes generative processes performed by the learner to link new information with previous knowledge and experiences that reflect Vygotsky's vision of learning and consists of four educational stages or stages

(The introductory phase, the concentrating phase, the opposition phase, the challenge phase, and the application phase). (Borich, 2000, p:26)

**Achievement:** defined by Alderman, 2007): "It is to prove the student's ability to achieve what he has acquired from the educational experiences that were developed for him" (Alderman, 2007: 101).

### **Chapter Two / Theoretical Framework**

#### **The first axis: the theoretical framework**

**Cosgrove's Model:** This model was proposed by Mark Cosgrove and Roger Osborne (Mark Cosgrove and Roger Osborne, 1985) as an embodiment of Vygotsky's social constructivism theory, but this model depends on the intellectual processes that result from the work of the brain while learning concepts and solving problems that may arise in everyday life , Cosgrove's model arises when the teacher uses cognitive and metacognitive models and strategies to reach meaningful learning, therefore, Cosgrove's model is based on learning for understanding or meaning-based learning, by linking the learner's prior knowledge with his subsequent experiences, forming connections and relationships between them, and building the learner knows his knowledge through generative processes that he uses to modify concepts in the light of correct scientific knowledge. This model suggests that learning occurs when students link between the previous information they have and the new information to build new ideas that fit with their network of concepts. Cosgrove's model is a theoretical model that includes the active integration of new ideas with the mental scheme that the student has (Afaneh and Khazindar, 2007: 239).

**Objectives of Cosgrove's model:** Cosgrove's model achieves several objectives when it is used, which are:

1. Developing thinking and generating ideas for learners, especially when the students feel that their thinking about a concept or issue needs to be reviewed, and this gives them awareness of their brain abilities and an attempt to find what is correct.
2. This model works to bring about a conceptual change in the cognitive structure of the student and her ability to deal with life situations in a better way and increases the clarity of cognitive ideas.
3. The conceptual change that occurs in the structure of the brain of the learners increases their abilities to deal with situations that may arise in their daily life in a better way, and increases the clarity of ideas and cognitive structures, and this makes them more able to understand the things they face or derive new models to deal with them. (Al-Najdi and others, 2007: 465)

Teaching steps according to Cosgrove's model:

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The teaching process in the classroom is carried out in the light of the model according to the following stages:

### **Preliminary stage:**

1. The teacher presents activities such as questions in the form of a quiz or an intellectual game, so that the teacher can learn previous information for learners related to the new concept.
2. Provide a simple brief activity before the test.
3. The teacher conducts a quick review of the learners' previous experiences and this is an opportunity for the teacher to see that there are no alternative and false perceptions of the learners that may interfere with their understanding of the new concept.

### **Focus stage:**

1. In which the initial ideas of the learners are clarified with the help of the teacher and the learner. The focus phase is the appropriate time to engage the learners in activities that focus on phenomena related to concepts.
2. Helping them think about these phenomena using their own words. The role of the teacher is motivating, and also during this stage the motivation to learn is related to the subjective nature of the learner.
3. Provide interesting activities that focus on arousing the interest of the learners.

### **Challenge stage:** Learners compare their ideas with others.

1. The comparison can be done on the spot or within a cooperative learning group.
2. Encourage group members to discuss, challenge, and test each other's ideas.
3. The teacher challenges the learners' ideas by presenting difficult questions and explaining their meanings.
4. Encouraging learners to test ideas and banishing ideas that do not fit with the concept to be learned in order to make it easier for the teacher by helping them know how to test each idea.
5. When the teacher is sure that the learners are ready to understand the concept, the teacher can introduce the concept.

### **Application stage:**

1. The teacher provides learners with opportunities to see if this concept applies to a variety of life situations and situations.
2. Learners are given situations to study at least five cases in which the concept can be applied and may provide new examples indicating the concept that leads to a new round of discussion and dialogue (Raji, Yassin, 2012: 176-177)

**The second axis:** previous studies that dealt with Cosgrove's model

**Ahlam Study (2016):** This study was conducted in Iraq, Ibn Rushd College of Education - University of Baghdad. This thesis aimed at identifying the impact of Cosgrove's model and educational scaffolding on acquiring the concepts of educational psychology and metacognitive thinking among students of the College of Education, the research sample consisted of (105) students, and it included two groups, an experimental group and a control group using a random drawing method, each group numbered (35) students, the researcher studied the scientific material that took a full academic year on the first experimental group according to Cosgrove's model and the second experimental group according to the

educational scaffolding model, as for the third group, the same subject was studied in the usual way, the researcher rewarded between the groups the research in the variables (chronological age, intelligence, metacognitive thinking, concept acquisition). The researcher used the behavioral objectives in preparing and writing the teaching plans for each of the research groups. The researcher also prepared a test for acquiring concepts consisting of (90) test items distributed on objective questions of the type of multiple test, for each item there are four alternatives. The researcher used one-way analysis of variance and Sheffe's choice for dimensional comparisons. The study showed the following results.

- The students of the first experimental group who studied the subject of educational psychology according to Cosgrove's model outperformed the students of the second experimental group who studied the subject according to the educational scaffolding model in acquiring concepts and thinking metacognitive.
- The students of the two experimental groups who studied the educational psychology subject according to Cosgrove's and educational scaffolding models outperformed the students of the control group who studied the same subject in the usual way in acquiring concepts and metacognitive thinking.

### Chapter Three: Research Methodology and Procedures

1- **Research Methodology:** The researcher used the experimental research method, because it is more consistent with the nature of his research, which (Qandilji) defined as a deliberate and controlled change of the specific conditions of a specific reality or phenomenon, which is the subject of the study, and then observing the effects of this change In that reality or phenomenon (Qandilji, 2019: 148)

#### 2- Research Procedures

##### A- Experimental design of the research

The experimental design is the method of distributing the sample members to the experimental cases and conditions according to the type of research question to be selected (Syed, 2019: 46). Choosing a consistent experimental design, then, guarantees scientific accuracy and access to reliable results in answering the questions posed by this problem (Raouf and Al-Masry, 2001: 152). The researcher chose the experimental design (the two equivalent groups) with partial control for the experimental and control groups with the post-test, and due to the fact that the current research contains the independent variable (Cosgrove) and a dependent variable which is achievement, as shown in the following table (1):

The group	Equivalent	Independent variable	Dependent variable
Experimental	- previous collection - intelligence - previous information	Cosgrove's model	- achievement - generative thinking
control		Usual method	

### **Second: the research community and its sample**

- A- **Research community:** The researcher identified the current research community all the students of the fifth scientific (biological) grade, who are studying at Aisha Preparatory School for Girls, who were intentionally chosen from one of the government day schools affiliated to the General Directorate of Education in Baghdad - Karkh II for the academic year (2020-2021). It reached (36) students.
- B- **Research Sample:** The researcher was chosen by simple random assignment into two divisions (A-B), by lottery method, which numbered (36) students, and Division (A) was chosen to represent the experimental group with (18) students who will be taught according to Cosgrove's model, and Division (B) The control group is represented by (18) students, who will be taught according to the usual method.

### **Third: Equivalence of the two research groups**

Despite the homogeneity of the research sample in the two research groups with cultural, social and economic variables because they are from one homogeneous environment, so the researcher was keen, before starting the experiment, to make sure that some variables directly related to the experiment were controlled, and to ensure the internal safety of the experiment, the statistical equivalence was carried out with the following variables (test achievement, intelligence test, previous information test)

**Fourth: Adjusting the extraneous variables:** What is meant by the extraneous variables are those variables that can affect the dependent variable and are not under the researcher's control in the study design, and such variables, even if they are unknown, the researcher must take them into consideration when discussing and interpreting the results, and they cannot affect the validity of the experiment, the degree of reliability of its results, and the possibility of generalizing its results to the community from which the sample was taken. (Al-Rubaie et al., 2018: 89)

- The impact of experimental procedures

1- Study subject 2- Confidentiality of the experiment 3- Subject school 4- Place of the experiment 5- Duration of the experiment 6- Distribution of classes.

- Experimental conditions and associated accidents
- Experimental extinction
- Measuring tools

### **Fifth: Research requirements**

1- Defining the scientific material 2- Formulating behavioral objectives 3- Preparing teaching plans

### **Sixth: Research tool**

The current research requires two tools to measure the impact of the research variables (an achievement test), and these tools were prepared as follows:

- **Achievement Test:** Achievement tests are one of the most important assessment tools used by teachers, and in light of their results, appropriate decisions are taken, ie, the learners are evaluated and then evaluated. (Abdul-Raouf and Issa, 2017: 118) In order to achieve the goal of the first research,

the researcher measured the achievement of the fifth grade students in science in biology, the researcher worked on preparing a test that is characterized by honesty and reliability and contains the specific topics, a test consisting of (40) objective items was prepared from a multiple-choice test with four alternatives in light of the first four chapters of the book to be taught for the fifth academic year (2020-2021). The researcher followed the following steps in preparing the achievement test:

- **Preparing the specification table (test map):**

The specification table is defined as a detailed outline that shows the content of the study material in the form of main headings with determining the level of focus, the percentage of goals and the number of questions assigned to each part (Mujahid, 2021:304). The specification table is one of the main and important procedures in preparing the achievement tests, so the researcher prepared a test map that included the number of content pages for the subjects of the first semester of biology for the fifth grade scientific and the behavioral objectives of the six levels of the cognitive domain of Bloom's classification, and accordingly, the table of specifications was prepared according to the following steps:

- Determining the relative weights of the content of each of the first four chapters of the biology book for the fifth grade science, depending on the number of pages of each chapter according to the following relationship:

$$\text{Weight of content for each chapter} = \frac{\text{Number of chapter pages}}{\text{Total number of chapter pages}} \times 100\%$$

- Determine the relative weights of the behavioral goals at each level and for each of the four seasons according to the following relationship:

$$\text{Target weight per level} = \frac{\text{The number of behavioral goals at one level}}{\text{The sum total of the behavioral goals}} \times 100$$

- Determine the number of questions for one content using the following equation:

Number of questions in each cell = total number of questions x percentage of content x percentage of goals at each level (Al-Najjar, 2010: 86-87), and then the researcher distributed the achievement test items and arranged between the classes of the subject and the levels of the cognitive domain in an objective and more accurate distribution and arrangement the percentage of each of the memory was 0.31%, the comprehension was 0.28%, the application of 0.09%, the analysis of 0.10, the composition of 0.36, and the evaluation of 0.15.

- **Writing the achievement test items**

The tests varied in the educational field, and they became important tools for measuring the impact of the collection of the research sample. It is one of the most important assessment tools used by teachers, which in light of its results take appropriate decisions, ie evaluating students and then evaluating them. Therefore, I formulated a multiple-choice achievement test with four alternatives, one of which represents the correct answer. Where objective tests are characterized as questions that

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are not affected by the subjectivity of the corrector and the conditions of correction, meaning if two or more correctors independently correct them, the student's grade will not change. (Nassar, 2010: 234) Therefore, the researcher formulated (40) items of the type of multiple choice with the four alternatives, one of them represents the correct answer.

- **Drafting test instructions that include:**
  - A- Answer instructions
  - B- Correction instructions
- **Procedures for applying the experiment**

The researcher started the actual application of the experiment on Sunday 11/29/2020, where she taught by himself to the experimental and control groups, if the experimental group studied according to Cosgrove's model, while the control group studied in the usual way, the experiment ended on Tuesday 16/2/2021, and that It is the day of applying the achievement test to the two research groups (experimental and control), and the answers were corrected after that according to the pre-prepared correction instructions.

### Chapter Four: Presentation and interpretation of the results

#### 1- **Presentation of results:** Presentation of the results related to the achievement of the null hypothesis

There are no statistically significant differences at the level of significance (0.05) between the average scores of the experimental group students who studied according to Cosgrove's model and the average scores of the control group students who studied according to the usual method in the

Group	Number of students	Arithmetic average	Variation	Degree of freedom	T-test		Statistical significance (0.05) at
					Calculated	Tabular	
Experimental	18	27,55	13,67	34	3,98	2	Statistical function
Control	18	23,33	7,67				

achievement test in post-biology. The researcher extracted the arithmetic mean And variance, Appendix (16), and then the (t-Test) equation was applied to two independent samples of equal number, the results for the two research groups (experimental and control) were obtained as follows in Table (2)



It appeared that the arithmetic mean of the scores of the experimental group amounted to (27,55) and the variance amounted to (13.67), while the arithmetic mean of the scores of the control group was (23.33) with a variance of (7.67) and using the t-test, for two independent equal samples, it was found that the calculated T-value amounted to (0.82) which is greater than the tabular value of (2) at a significance level of (0.05) and with a degree of freedom (34). According to these results, the null hypothesis is rejected, meaning there is a significant difference Statistically at the level of significance (0.05) between the average scores of the experimental group students who study biology according to Cosgrove's model and the average scores of the control group students who study the same subject in the usual way in the biology achievement test, so this difference is in favor of the experimental group students.

The researcher relied on the Eta square equation to calculate the size of the impact of the independent variable (Cosgrove model) on the dependent variable (achievement) after applying the special equation, it was found that the impact size of the experimental group that studied according to Cosgrove's model (achievement test) is (0,32), so it has a very significant effect in increasing the achievement of the experimental group students in biology compared to the students of the experimental group.

## **2- Interpreting the results**

After the results of the experiment appeared and showed the superiority of the students of the experimental group over the students of the control group in the post achievement test for biology, and this is attributed to several reasons, according to the researcher's opinion, which are:

- Cosgrove's model that the researcher used with the students of the experimental group provided the students with opportunities to practice alternative methods of traditional school learning, which provided opportunities for the majority of the students to improve their scientific level and their thinking.
- Cosgrove's model helped to create longing and motivation among students who listen to everything new and lead to better results, because it allows students to reconstruct the material and treat ideas, arrange and organize them in a special way, and that leads to better understanding.

Teaching using Cosgrove's model contributes to keeping the information in the memory of female students for a longer period, because female students have reached the formation of its cognitive structure by itself, and this consequently weakens the forgetting factor because the results of what a student gains from information and experience as a result of effort and diligence.

## **3- Conclusions**

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The results of the research showed a positive effect in the use of Cosgrove's model, which contributed to raising the achievement of fifth-grade students with the impact size (0.32), that Cosgrove's model gives the students the ability to highlight the main ideas, organize them and sequence ideas.

### 4- Recommendations

The study proved the impact of Cosgrove's model in raising the level of academic achievement of female students in biology, so the researcher recommends in her current study to use it in teaching other subjects such as physics, mathematics and other academic courses, and directing the attention of those in charge of biology textbooks to writing in detail about Cosgrove's model, because The lack of sources that mention this model, the lack of studies that dealt with it, and the interest in involving students in learning and giving them the freedom to express their opinions and viewpoints and not imposing restrictions that hinder their learning.

### 5- Suggestions

Conducting a study dealing with the impact of using Cosgrove's model with other educational models in teaching scientific concepts

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