

## The Effect of Daniel's Model on The achievement of chemistry among The Fifth Scientific Grade Students

Qaes Adnan Handy<sup>1</sup>, Dr. Susan Duraid Ahmed Zanganeh<sup>2</sup>

<sup>1</sup>Ibn Al-Haytham, College of Education for Pure Sciences, University of Baghdad, qais.adnan2105m@ihcoedu.uobaghdad.edu.iq

<sup>2</sup>Ibn Al-Haytham, College of Education for Pure Sciences, University of Baghdad, susan.d.a@ihcoedu.uobaghdad.edu.iq

### *Abstract*

*The current research aims to identify the effect of Daniel's model on the fifth grade scientific students' achievement of chemistry in high government day preparatory schools. The Loyal Preparatory School for Boys was chosen by the deliberate appointment of its students to be the research sample, affiliated with the Directorate of Education in Anbar Department of Education Fallujah for the academic year (2022-2023). Two divisions of the fifth grade scientific people were randomly selected out of five divisions to represent one of the experimental group that is studying according to Daniel's model and the other is the control group that is studying according to the usual method. The equivalence of the two research groups was verified by a group of the variables, which were the chronological age in months, previous achievement o in chemistry, previous information test, Otis Lennon test for intelligence. It was found that the two groups are equivalent. The research tool was an achievement test of (40) items, (31) substantive items of the multiple-choice type and (9) items of the article. After applying the test to the two groups, it was found that there is a statistically significant difference at the level of (0.05) between the average scores of the students of the experimental group who studied according to the Daniel model and the average scores of the control group students who studied in the usual way for the experimental group, and in light of this, a set of recommendations and conclusions were developed.*

*Keywords: teaching models, Daniel model, chemistry achievement, fifth grade students.*

### **Introduction**

Educational institutions are still relying on the usual educational methods. Many studies have confirmed this problem (Al-Ibrahimi, 2020; Al-Obeidi, 2020; Saheb, Mutashar, & Ahmed, 2014). Some

teachers tend to stuff information with the minds of students ignoring that it is forgotten if that information is not closely related to their daily lives, and that the lack of availability of educational means and the lack of use of modern models and strategies decreased academic achievement in science in general and chemistry in particular. The two researchers noticed that through their experience in teaching in secondary schools, which is more ten years, there is a decrease in the level of achievement of fifth - grade scientific students in chemistry. They sought a questionnaire to survey the opinions of teachers in the extent of their satisfaction with the achievement of their students, which included three questions that were submitted to a random sample of them, chemistry for the preparatory stage, who previously studied fifth-grade scientific students of chemistry distributed among schools of the General Directorate of Anbar Education. The most prominent results of the questionnaire were:

1- 88% of teachers do not adopt modern models and strategies in teaching chemistry, as they adopt the usual method of teaching chemistry, and their role is limited to indoctrination, memorization, clarification of concepts and memorization.

100% of teachers do not have enough information on Daniel's model, although some know about modern models and strategies.

3- 81% of teachers are dissatisfied with the level of achievement of their students in chemistry due to several reasons, including the lack of tools and teaching aids, the lack of educational laboratories in their schools, the number of classes assigned to them and the shortage of class time.

Looking at the results produced by the questionnaire, the two researchers find that there is an urgent need to use modern models and strategies. Therefore, the two researchers identified the research problem with the following question: What is the effect of Daniel's model on the achievement of chemistry in fifth grade scientific students?

Significance of the research:

Since learning is no longer an option at all, but an absolute necessity, it is through it that societies can rise by activating continuous education through continuous monitoring of the global scientific, economic and societal movement (Institute of museum and library services, 2009) with the huge cognitive explosion these days. Accordingly, it requires the development of a method of learning that encourages students to take responsibility of dealing with this unlimited amount of knowledge, which is only successful with a focus on the principle of learning by doing (Saada, 2011).

Education is the tool of nations to achieve progress and prosperity and the way to improve the level of individuals. The goal of efficient learning is the expansion of experience and its extension and scrutiny and ways to enable dealing with what is going on in his environment(Saheb et al., 2014).

Since the current stage is characterized by the escalation of scientific culture, intellectual effectiveness, innovation and scientific growth was reflected in the educational system. The system imposed a new reality to acquire knowledge to synchronize development(A. N. Khalil & Ali, 2021).

Human education is also one of the most important and noble tasks for educational institutions. It in turn take planning to create a conscious and educated generation capable of keeping pace with the development in the fields of education in general and the field of education in particular(Duraid & Ahmed, 2021).

Chemistry has also contributed to the largest role in the cultural renaissance in various areas of life where the abundance of luxury such as meeting different needs enabled to convert raw materials into other forms such as dyes, medicines and perfumes. It also contributed to the medical revolution through the elimination of many diseases and the production of pesticides and synthetic fibers(Hassan & Ahmed, 2022).

The development of learning does not necessarily mean the addition of new study materials to the educational curriculum, but rather the use of modern models, strategies and methods. It uses educational technology through the consistent use of available educational resources and capabilities to provide better performance helps to achieve the desired goals of education(Tamam, 2000). Chemistry is a science based on theory and application, it must be studied and taught with the direct application of scientific facts and concepts, and the teacher must raise the ideas of his students by questions that make his students interact with the topics of the lesson(Al-Ibrahimi, 2020).

The academic achievement of students is one of the goals pursued by education, so academic achievement has been given a great deal of importance by educational institutions and parents of students because it is the standard for measuring the efficiency of the educational process and the extent of its success(Hassan & Ahmed, 2022).

The usual educational methods do not achieve the desired goals, so those responsible for educational methods are interested in developing them through their research. They can develop models and strategies that enable teachers to build designs plans that raise

the level of achievement of their students(Aziz, Suzanne, & Al-Bawi, 2020).

Therefore, it has become necessary to search for new models, strategies, methods and means to meet the challenges and changes and adapt quickly to the developments of the times. It is advisable for the teacher to take into account the nature of the educational materials he intends to teach and choose a model or strategy that suits the nature of these educational materials in order to stimulate students' thinking and get them to participate in educational situations(Al-Zuwaini, 2015).

This led to scientists and researchers to provide educational models and strategies to facilitate the requirements of school learning, which leads to the inclusion of a far-reaching educational related to educational products. All was a guarantee for the emergence of new educational models and strategies in the last two decades of the twentieth century. The importance of education models in the development in the areas of life propelled the search for modern ways in the education process that help to promote the educational reality and forced many scientists and educators to actively develop teaching models that raise the educational level of students. Hence, it was necessary for educational theorists to rely on appropriate teaching models and strategies and the development of previous models.

Models of teaching modern science, methods and approaches have varied according to the changing perception of the nature of the learning and teaching process. It shifted to the constructive school that emphasizes the learner's construction of knowledge and understanding. Its use in the personal and social perspective and in new learning situations make students good with a scientific, mathematical and technological culture and responsive to issues and problems of life, and prepared to live in the twenty-first century in an industrial and technological society with its problems, challenges, expectations and revolution of cognitive, information and computer technology(Zeatown, 2007).

Many educational models and strategies have emerged that are based on the principles of structural theory, which focuses on building knowledge in the learner and uncovering the previous knowledge confronting the learner with educational situations that raise the challenge. It encourages discussion to reach results and apply them in new situations. Perhaps the most prominent of these models is the Daniel model, which some literature calls the cognitive educational model(Yassin & Raji, 2012).

From the above, we summarize the importance of the research:

- 1- The attention to teaching methods in general and methods of teaching chemistry in particular, when teaching students in all educational subjects
- 2-The research contributes to the selection of appropriate models for educational situations that depend on the active participation of students in the educational process
- 3- Activating the role of the learner in educational situations through modern models that make students active participants in the classroom and outside.
- 4- This research emphasizes raising the level of student achievement because achievement is a key goal in teaching all fields of science

#### Aim of the Research

The research seeks to identify the effect of Daniel's model on academic achievement in chemistry among fifth-grade scientific students

#### Research Hypothesis

To ascertain the goal of the research, the following null hypothesis was formulated:

- 1- There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students, and the average scores of the control group students.

#### Research Limitations :

- 1- The Human limits: Fifth Grade Scientific Students in Anbar Governorate/Fallujah District
- 2- Spatial limit: one of the government day schools and secondary schools affiliated with the General Directorate of Anbar Education/Fallujah Education Department
- 3- Time limit: The first semester of the academic year ( 2022-2023 ) .
- 4- Cognitive limit: The four chapters (first: the development of the atomic concept, the second chapter: the forces of bonding and geometric shapes of molecules, the third chapter: the periodic table and the chemistry of transitional elements and the fourth chapter: solutions ) of the chemistry book for the fifth scientific grade approved by the Ministry of Education General Directorate of Curricula for the year ( 2021), ninth edition.

#### Terminology:

##### Model Daniel's:

1- It is "a cognitive educational model in which the learner moves in acquiring the concept in nine stages, which are direct generalization, view, review, investigation / activities, clarification or expression, dialogue and discussion, invention, application, summarization and closure "(Al-Khalili, 1996, pp. 485-486).

2- "It is one of the models of constructive learning, which works to provide concepts and develop scientific knowledge to reach meaningful learning through a set of procedures and steps are direct learning, view, review ,investigation or activities ,expression and demonstration ,dialogue and discussion , invention, application, closure and summarization"(Al-Najdi, 2005, p. 139).

3- The researcher procedurally defines the Daniel model as "a set of basic procedures and steps, which the teacher implements in the classroom with flexible sequential steps, which are direct teaching, view, review, active inquiry, clarification and expression, dialogue and discussion, invention, application, summarization, and closure.

##### 4- Achievement:

"It is the result of what the student learns after a certain period of time, and can be measured by the degree obtained by the student in the achievement test to see how successful the method developed by the teacher , what the student reaches of knowledge translated into the degree"(Abu-Jadu, 2003, p. 425).

The researchers know that "students' knowledge of the subjects taught is measured by the grades that students obtain in the test counting them".

##### Teaching Models

While we help students acquire information , ideas, skills, values , ways of thinking, and ways of expressing themselves, we also teach them how to learn, and in fact may be the most important long-term outcome of learning and teaching.is to increase students' abilities to learn more easily and more effectively in the future(Laal, 2011).

##### Concept of Daniel's Model:

Daniel Neal's cognitive educational model is an educational or teaching plan. It employs the ideas presented through the learning course, concept maps and the advanced organizer in developing Daniel's model in developing the learner's ability to use the main goals of science in interpretation, judgment and prediction. It facilitates the discovery and learning of everything that is new and achieving a

functional standard of facts, information and events in the environment (Razouki, Khzami, El Khatabi, Agorram, & Selmaoui, 2017).

Learning focuses on the learning outcomes of students by presenting basic information to students, stimulating their interest and motivation to learn, mastering work, confirming facts, applying rules, searching for information, using and installing devices, drawing conclusions and deducing the reasons for the results to appear in that way(Zaire, 2017).

#### Stages of the Daniel Model

##### 1- Direct education:

At this stage, the teacher gives a general introduction to the objectives and content of the lesson and the purpose of this stage is to focus the attention of students on what is required to be accomplished in the lesson

##### (i) Audits:

At this stage, previous lessons related to the new lesson are discussed in order to prepare the minds of students for the current lesson

##### 3. Review:

At this stage, a general and preliminary review of the new information or the problem presented for study is conducted. The students' ideas are stimulated, brainstormed, clarified, explained and done everything necessary to harmonize the cognitive charts(AI-Jundi, 2017).

##### 4. Inquiry / Activities:

It requires students to use a variety of sources of information and ideas to increase their understanding of a problem, topic or issue of importance. Therefore the student investigates, explores, researches and seeks knowledge. This is enhanced by participation with a community of students , as each learns from the other in social interaction(Kuklthan, 2007).

##### 5. Clarification and Expression:

Communication channels are established between students by expressing their findings by creating tables, drawings, concept maps and boards that express their findings. The teacher distributes worksheets to students when conducting the experiment. The teacher asks each group of students to conduct the experiment through a computer and then records their findings in preparation for the next stage.

#### 6. Dialogue and discussion:

At this stage, the teacher discusses with the students the answers they came up with, asking a group of questions (What did you find?) and ( What did you do? ) (Duration this happened) (What is your proof of this answer? )

#### 7. Invention:

The direct teaching is done again by the teacher at this stage where new concepts are taught and explanations are given, and the process of reading the book material is also done and at this stage the cognitive structure is reshaped to ensure meaningful learning for the student

#### Implementation

At this stage, students apply what they have learned in an educational situation to new situations in their daily lives.

#### 9. Summarization and closure

At this stage, the teacher and his students draw what they have learned from their lesson(Yassin & Raji, 2012).

#### Achievement

Academic achievement is one of the most important aspects in the life of the learner and has a great role in his future career. Therefore, reaching a high level of achievement is one of the priorities of students and their parents because the means by which the student moves from one grade to another is the basis on which to divide students into academic and professional branches, as well as the measure adopted by various institutions in the countries of the world to accept a job. Achievement in its broad framework includes the acquisition of cognitive structures, thinking processes and psychomotor skills, which are very influential factors in the formation of the student's personality(Al-Salkhi, 2013).

### **Research Methodology and Procedures**

Experimental research: It is based on the use of scientific experience in the study of the phenomenon and its variables. It aims to determine the effect of each variable in it and determining its relationship with other variables in order to control the conditions of conducting a specific experiment within specific hypotheses. In experimental research, the researcher relies on identifying the resulting variables or measuring the extent of the effect of these variables affecting the phenomenon and determining the effect of each of them. The importance of this research lies in the basis for judging the extent of the benefit in using a variable in the events of a phenomenon or fact,



so experimental research is one of the most accurate scientific research(Dashli, 2016).

Experimental design: The experimental design of the post-test was adopted for the two equal groups (experimental and control), because it suits the nature of the research, which includes one independent variable (Daniel model) and one dependent variable (chemistry achievement) and as shown in Table (1)

Table (1) Experimental design table for the two groups

No.	Group	The independent variable	The dependent variable
1	experimental group	Daniel's Model	1. Chemistry achievement test
2	Control group	Teaching in the regular way	

Research community: The research community are all individuals who are in the research community(Obeidat, Hamadneh, Alkasassbeh, Almseidin, & AlZubi, 2019). The research community includes students of the fifth grade scientific in the public preparatory secondary schools of the Directorate of Anbar Education/Fallujah District for the academic year (2022-2023).

The research sample: The two researchers visited a number of preparatory secondary schools affiliated with the Directorate of Anbar Education, the Department of Education of Fallujah, and the Loyal Preparatory School affiliated with the Fallujah District was chosen intentionally to apply the experiment. Two divisions were chosen in a random way to represent the two research groups (experimental and control). Division (A) represented the experimental group, which will be taught in the experimental way, and the Division (B) the control group, which will be taught in the normal way. The number of the students of the two divisions (62) were the (31) experimental students and the (31) control group

#### Alignment procedures

The two researchers were keen to control what would affect the dependent variable (The achievement of chemistry) and thus affect the credibility of the research results. Therefore, before starting the experiment, the researcher takes the following steps and to verify the internal safety, the following factors were addressed as follows:

First: The internal validity of the experimental design:

The control of variables is an important measure in experimental research in order to provide the internal validity of the experimental design. The researcher can attribute the effect of the dependent variable to the independent variable in the research and not to

another variable(Melhem & Isa, 2013). In order to verify internal safety, the following factors were addressed as follows:

1- Equivalence of the research sample group (experimental and control):

The two research groups are rewarded by several variables to prove that the change in the dependent variable is due to the independent variable and not to another variable(Ahmed, 2020).

The two researchers were keen to ensure the equivalence of the two groups through a set of variables as shown in Table (2)

Table (2) Parity variables for the two groups

Variables	Group	No of Sample	Arithmetic Average	Variance	T value	
					Calculated	tabular
Chronological age in months	experimental group	31	198.709	11.209	275	2
	Control group	31	198.548	13.719		
Exam Intelligence.	experimental group	31	39.225	130.896	0.327	2
	Control group	31	38.290	122.810		
Background check	experimental group	31	6.580	4.648	0.244	2
	Control group	31	6.451	3.988		
Previous academic achievement in chemistry	Experimental group	31	65.781	94.109	0.119	2
	Control group	31	65.580	89.567		

The duration of the experiment application: The duration of the experiment was equal for both research groups (experimental and control), where teaching began on Wednesday, 12/10/2022 and ended on Tuesday, 10/1/2023.

Experimental extinction (leaving during the experiment): It is what the students of the research sample are exposed to during the period of application of the experiment, such as the leakage of a number of students, leaving them or interrupting them from work, which leads to an effect on the dependent variables and thus leads to varying results(Khalil, 2009). There has been no dropout or interruption of students that attracts attention or the transfer of students between the grade or to another school, with the exception of cases of individual absence, often in small proportions between the two groups.

- Processes related to the maturity of the sample students: means biological, psychological or mental changes that may occur to the students who undergo the experiment during the period of its application(A.-A. R. Mahmoud, 2007).

The experiment started on (Wednesday) 12/10/2022 and ended on (Tuesday) 10/1/2023. So that the effect of these factors was not due to the short duration of the experiment and because the students of the group (experimental and control) were at an almost age level. The occurrence of any growth related to one of the biological, psychological or mental growth aspects is almost equal in all students. In this case, the two groups of students are equal in terms of variables related to maturity.

External validity of the experimental design:

External safety does not only take into account in experimental design, as the two researchers should take into account external safety, which relates to the extent to which the materials of the experiment and the students represent their community. It is the extent to which the results of the experiment can be designed(Al-Azzawi, 2008).

In order to ensure the external safety of the experimental design, the two researchers carried out the following procedures:

A-Interaction of experimental situations:

The group's students (experimental and control) were not subjected to more than one experiment during the duration of the experiment.

B- Confidentiality of the research experience:

The two researchers kept confidentiality of the experiment in agreement with the school administration. The students of the experimental group and the control are under the experiment in order to ensure the continuation of the experiment correctly and control this factor and the continuation of student activity.

C- The conditions of the experiment and the accompanying accidents:

During the duration of the experiment, the group's students (experimental and control) were not exposed to any significant incidents that would cause obstruction of the experiment and was affected by the dependent variable (The achievement of chemistry) next to the independent variable (Daniel's model).

D- The interaction of the selection with the experiment: The researcher to reduce the effect of this variable in the selection of the two researchers to the student, (Division A, B) randomly to be Division (A). The experimental group studied according to Daniel's model, while Division (B) was the control group studied in the usual way.

E- Research tool:

The achievement test prepared by the two researchers was adopted, and the tool was applied to the experimental and control group after the end of the trial period, where an achievement test was built that corresponds to the content of the study material and behavioral purposes in light of following the following steps and the researcher followed the following steps in preparing the test:

A- Determining the objectives of the test: Determining the objectives of the test in an accurate procedural form is useful in preparing the teacher and directing him to the goals he wishes to measure by testing and measuring the extent of students' familiarity with the facts, concepts and principles and measuring the students' ability to solve the problems and the material he will cover by preparing a list of topics included in the test.

B- Determining the scientific material: The scientific material that was studied for the group ( experimental and control), which includes a section of the first chapter, the second chapter three chapter and the fourth chapter of the chemistry book scheduled for the fifth scientific grade, has been identified.

C- Formulation of behavioral purposes: The identification of behavioral purposes is important. It represents the activities carried out by students to reach the required outputs in the educational process. It also contributes to the selection of teaching methods, means and techniques appropriate to the educational content (Attia, 2008). The behavioral purposes were formulated according to Bloom's classification within the cognitive field at its six levels ( remember, understand, apply, analyze, synthesize, evaluate ) and determine their levels ,after presenting them to a number of arbitrators, as their number in the final picture reached (300) behavioral purposes

D-Preparing the specification table: To ensure that the items of the achievement test include the cognitive levels and the academic content, and to find the cognitive weight, the two researchers relied

on the behavioral purposes and the number of classes to find the relative weight of the subject. Accordingly, the number of items that measure the objectives of the parts of the content of the material was determined. Thus, the coverage of the test was achieved, as well as the relative weight of the subject, and the weight of the cognitive level was also determined, so the number of questions of (40) items became important for each chapter as in Table (3)

Table (3) Specifications for the achievement test

Level / Content				Bloom Levels						Total
Chapter	Number of courses	Time min.	Relative importance	memory 28%	Comprehension 25%	App 21%	Analysis 13%	Installation 9%	Evaluation 3%	
First Semester	10	450	25%	3	3	2	1	1	0	10
Chapter Two	9	405	22.5%	3	2	2	1	1	0	9
Third Chapter	12	540	30%	3	3	3	2	1	0	12
Chapter Four	9	405	22.5%	3	2	2	1	1	0	9
<b>Total</b>	<b>40</b>	<b>1800</b>	<b>100%</b>	<b>12</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>4</b>	<b>0</b>	<b>40</b>

T- Drafting test items: 40 items of the achievement test were drafted in the subject of chemistry, 31 of which are substantive items. Each has four alternatives, one of the items is correct and the rest is wrong. The wrong alternatives are characterized by homogeneity, so the percentage of recourse to guessing is reduced. The topics included 9 articles.

G- Answer instructions: The instructions for answering the test are aimed at explaining the test in the simplest possible way. Therefore, the instructions were formulated in a clear, easy, appropriate and understandable manner for the preparatory stage, in order to facilitate the process of conducting the test. Clear and understandable instructions help in raising the coefficients of validity, stability and objectivity of the test (Samara, 1989). A page was drafted at the beginning of the achievement test containing instructions on how to answer the achievement test so that the student can easily answer the items without ambiguity. It included a number of items of the test, and the aim of the distribution of grades and gave an illustration of how to answer the substantive items without leaving any question.

R- Instructions for evaluating the achievement test: The development of the model answer to each question is the first step in the scoring

process and increases the stability of the test, and helps the teacher to identify the ambiguity in the items, if any, and the typical answer is the test by which students' answers are measured (Al-Saadi, 2004). The two researchers allocated that one score to answer the correct item, zero for the wrong answer, and zero for the item in which more than one alternative was chosen. So the total were (31) substantive items and the (18) article items were two degrees for the article item.

P- The validity of the test: Validity is one of the important characteristics in the field of educational standards and tests, and the honesty of the test is represented by the degree to which the test measures the attribute that was developed to measure it well. The validity of the test is related to what it measures (Abu-Allam, 2011). To verify the validity of the test, the two researchers relied on two types:

- face validity: This validity is called the validity of the arbitrators. The validity of the test can be reached based on what the arbitrators agreed upon, because this kind of validity measures what was set for it and does not measure anything else in lieu of or in addition to it (Al-Zamili, 2009, p. 240). In order to verify the apparent validity, the items of the achievement test with behavioral purposes (in their initial form) were presented to a group of arbitrators, specialists in the field of methods of teaching chemistry, educational psychology, measurement and evaluation, and chemistry, in order to indicate and know their views and observations about the validity of the test items in measuring what they were designed for. It tests the accuracy of their linguistic and scientific formulation, the appropriateness of the test for students at that stage, and the extent to which the test represents the topics of the book for behavioral purposes. The proposed amendments were made according to the opinions and observations of the arbitrators. Thus, the test items are valid if they are accepted by (80%) or more of the opinions of the arbitrators who were used through the use of the Cooper equation.

- Content validity: The two researchers analyzed the study material to its elements and determined the behavioral purposes and set a specification table. They build an achievement test that is appropriate to the specification table and consistent with the specified behavioral purposes. It ensures the extent to which the test items represent the content and behavioral purposes presented to a number of arbitrators and specialists in education and teaching methods Chemistry Science to express their views on the suitability of the test items for the study material. More than 80% of the opinions of the arbitrators adopted a test to accept the item from its rejection through the use of the Cooper equation, and the arbitrators agreed on all test items after making some simple amendment to them. Thus the two researchers were able to verify the validity of the content of the test items.

Q- The first exploratory application : The purpose of the first exploratory application is to determine the time that the student needs to answer and to ensure the clarity of the test items and instructions(Al-Zuhairi, 2017). In order to determine the time necessary for students to answer the test items and in order to ensure the clarity of the items of the achievement test and its instructions , the test was applied to a reconnaissance sample of (50) Fifth scientific Grade Students of the secondary schools of the Directorate of Education of Anbar / Fallujah. The two researchers observed during the conduct of this exploratory application the clarity of the items through the lack of students' inquiries about how to answer with the recording of the time. It took students to answer the test items as the time required to answer the test items was calculated by taking the first fourteen students who handed over their papers and the last fourteen students handed over their papers to calculate their average, as it ranged between 30-40 minutes. The average of the time taken to respond to the students (35 minutes) is an appropriate time to perform the test.

$$\text{Average time taken} = \frac{\text{First student time} + \text{second} + \text{third} \dots \text{etc}}{\text{Total students}}$$

K- The second exploratory application (statistical analysis of the test items ): The goal of the analysis of the test items is to keep the appropriate and good items in the scale and that the method of the two extremist groups in response is an appropriate procedure for the analysis of items(Ebel & Frisbie, 1972). The selection of high-quality items to measure the educational and psychological features accurately by some of the conditions that are achieved by logical methods and the judgments of experts is a necessary measure in the construction of standards. No matter how accurate these methods are, they do not substitute for field experimentation of the scale and analysis of its items using the appropriate statistical methods(A. S. E.-D. Mahmoud, 2006). In order to conduct the statistical analysis, the researchers relied on determining the size of the sample of the statistical analysis on the Steven Thompson equation, which takes into account the first saturation limit. It is the limit at which the size of the sample does not increase as the size of the community increases significantly taking into account the percentage of error in the sample and the standard degree at the level of confidence (95%)(Bashmani, 2014). The researchers relied on the application of the Stephen Thompson equation to extract the sample size through the use of Microsoft Excel program. The result of the equation was that the statistical sample has a sample size of (300) students, and to randomly select the sample size of the statistical analysis, schools were chosen first randomly, and then 50 students were randomly selected from a

group. The achievement test was applied on (Monad) corresponding to (26/12/2022).

For the purpose of conducting the statistical analysis of the achievement test items, the following procedures are required:

1- evaluating the achievement test forms for the statistical analysis sample.

2- The ranking of the total grades obtained by the sample members in descending order from the highest grade to the lowest grade.

3- Selecting 27% of the forms with the highest scores, and 27% of the forms with the lowest scores. This percentage is the best compared to the two peripheral groups in the response. Kelly suggested that the number of members of each of the two extremist groups in the total score when calculating the discriminatory power of the items was (27%) of the members of the research sample(Odeh, 1998).

In the light of this ratio, the number of forms in the upper group was 81, and the number of forms in the lower group was 81. The answers were analyzed statistically and the factors of difficulty, discrimination and the effectiveness of the wrong alternatives were calculated, as follows:

A- The difficulty coefficient of the item: The purpose of calculating the difficulty coefficient of the item is to give the researcher an indication of the extent of this difficulty to make its difficulty suitable for the situation to be measured. The items which are very difficult or very easy must be modified or deleted, because this makes the test less stable(Al-Zobaie & Al-Ghannam, 1981).

The test is good when each of its items is not at a high level of ease, so that all learners can answer it or it is very difficult so that not everyone can answer it(Brady, 2012).

Since the test includes two types of questions (objective), and essay questions, the difficulty coefficient was calculated for each type of questions (objective and essay), according to its own equation, the results were as follows:

The substantive items ranged between 0.41- 0.59, and the difficulty coefficient (for the article items) ranged between 0.43- 0.58. The items are good if the difficulty coefficients range between 0.20- 0.80 with an average of (0.5).

B- The coefficient of distinction of the item: It is the extent of the item's ability to distinguish between excellent learners in the adjective measured by the test, and weak learners in that adjective.



The coefficient of discrimination of the achievement test items for the items (substantive and essay) was calculated according to the special equation for the items. The value of the coefficient of discrimination for the items (substantive) ranged between 0.47- 0.53, while the value of the coefficient of discrimination for the items (essay) ranged between 0.51- 0.67.

C- Effectiveness of the wrong alternatives: The multiple choice questions contain a set of possible answers, but there is one alternative that represents the correct answer. So the effective alternatives are supposed to attract the largest possible number of examiners from the lower group and the lowest possible number from the upper group (Abu-Fouda & Younis, 2012). The achievement test includes (31) multiple choice items (4 alternatives) out of (40) items. The answers to the multiple choice items were arranged individually, and divided into two groups (upper and lower), and after applying the equation of effectiveness of alternatives. The values ranged between (0.06- 0.31 -), and it was found that the wrong alternatives attracted a number of members of the lower group more than the upper group, and thus the wrong alternatives were kept unchanged.

N - The stability of the achievement test: The stability of the achievement test, which consists of (40) items, was calculated, and because the test consists of substantive items and essays, the best way to extract stability is the Cronbachs-Alpa equation. The scores of the statistical analysis sample of (300) students were subjected to the Alpha-Cronbach equation, and the stability coefficient reached (0.87), which is a good stability coefficient. The test is characterized by the stability if its value (0.67) or more ((Al-Nabhan, 2019). Thus, the finalized achievement test is ready to be applied to the research sample.

J - Achievement test in its final form: The achievement test in its final form consists of (40) items, of which (31) substantive items. The score of each item was 1- 0, and (9) items. With the scores of each item (0- 2), the highest score for the achievement test was (49) scores, and the lowest score for the test was 0.

## **Results and Discussion**

Upon the experiment according to the steps, after comparing the average scores of the group's students (experimental and control) in each of the chemistry achievement test and comparing the statistical significance of the difference between them to verify the zero research hypothesis, the following was inferred:

1- Verifying the first hypothesis, which states the following:

"There is no statistically significant difference at the significance level (0.05) between the average scores of the experimental group students who study according to Daniel's model, and the average scores of the control group students who study according to the usual method of obtaining chemistry among fifth grade students."

For the purpose of verifying the zero hypothesis, the achievement test scores were analyzed in the chemistry of the experimental and control groups. The T-test was adopted for two independent equal samples to show the differences between the average scores of the students of the experimental and control groups in the achievement test in chemistry. The results were

The experimental group outperformed the control group in the achievement test in chemistry, where the arithmetic mean of the scores of the experimental group students was (42.419) with a standard deviation of (5.315). Also, the arithmetic mean of the scores of the control group students was (27.838) with a standard deviation of (6.698), and when applying the T-test to two independent samples equal to the experimental and control groups, the results indicated that there was a statistically significant difference between the average scores of the experimental group students and the average scores of the control group students. For the benefit of the experimental group, the calculated T-value was (9.493) was greater than the table T-value (2), at a level of significance (0.05), with a degree of freedom (60), which indicates the superiority of the experimental group students who are studying according to Daniel's model over the control group who are studying according to the usual method in the achievement test in chemistry. Therefore, the zero hypothesis was rejected and the alternative hypothesis was accepted.

Measuring the size of the effect of Daniel's model in the academic achievement of chemistry showed:

To determine the size of the effect of the independent variable (Daniel's model) in the experimental group, the arithmetic means and standard deviations of the responses of the experimental and control groups in the test for academic achievement in chemistry were calculated, as shown in Table (4).

Table (4) Post-test statistics The achievement of chemistry The Fifth Scientific Grade Students

Testing Group	No.	Post-assessment	
		Arithmetic Average	Standard Deviation
Experimental group	31	42.419	5.315
Control group	31	27.838	6.698

To verify the significance of the differences between the averages, a single variance analysis was used. The results were as in Table (5).

Table (5) Analysis of the single variance of the two groups for the post-testing of the chemistry achievement scores

Sources of variation	Squares Sum	Degree of freedom	SUM OF SQUARES MEAN	F Avona	Level of Significance
Between Groups	3295.226	1	3295.226	90.126	Significant at 0.05
Within Groups	2193.742	60	36.562		
Total	<b>14230.725</b>	<b>61</b>			

Table (5) shows that there are statistically significant differences at the significance level (0.05) of the chemistry achievement test between the experimental and control groups. The calculated value of (90.126) was greater than the table value of (4) at a degree of freedom (1-61). To find out the size of the effect of the independent variable on the dependent variable, the standard values set by Cohens (1988) are compared with the value of the ETA box (0.600). When comparing the value with the standard values of the ETA box set by Cohens (1988), the size of the effect of the independent variable, which is Daniel's model in the dependent variable (achievement in chemistry) was medium, and the effect ratio was 60%. This indicates that the effect of the independent variable (Daniel's model) on the dependent variable is the achievement of Fifth scientific Grade Students and in favor of (the experimental group).

Second /Interpretation of Results:

Interpretation of the results of the achievement test for chemistry:

The results showed a statistically significant difference between the experimental group students who studied according to Daniel's model and the control group who studied according to the usual method in the achievement test. The researchers explain this in light of Daniel's model and as follows:

1- Daniel's model is one of the cognitive educational models in the field of teaching, so it helped students to organize their goals and perception, thus increasing their ability to remember and organize information

2- The role of the student in the Daniel model is the focus of the educational process and he practices activities, events and self-learning under the supervision of the teacher.

3- Daniel's model introduces Material B in a new way and allows the student to investigate the information, understand the relationship between the concepts and discuss the conclusions when asking a question or idea.

4- Daniel's model cultivates student attitudes such as perseverance in finding solutions to questions and curiosity.

### **Conclusions:**

Teaching excelled according to Daniel's model, which helped increase the achievement of chemistry among fifth scientific grade students, more than teaching in the usual way.

### **Recommendations:**

1- Encouraging teachers in general, and in particular chemistry teachers, to introduce Daniel's model in teaching because of his role in developing students' skills, as well as taking responsibility for learning.

2- Preparing development programs for teachers before and during the job service for how to implement Daniel's model in teaching subjects in general and chemistry in particular.

3- Emphasizing the use of modern models and strategies in the teaching of chemistry and all sciences.

### **Suggestions:**

In order to complete the two researchers' procedures, the researcher proposed the following studies:

1. Conducting a similar study, which includes a comparison between Daniel's model and another structural model at different stages of study.

2. Conducting a study similar to the current study in other dependent variables

3. Conducting a study similar to the current study at another stage of study in chemistry or other subjects

## Bibliography

- Abu-Allam, R. M. (2011). *Research Methods in Psychological and Educational Sciences: Quantitative Research Methods*. Cairo: Universities Publishing House.
- Abu-Fouda, B. K., & Younis, N. A. B. (2012). *Achievement Test*, 1st Edition (1 ed.). Amman, Jordan Dar Al-Masirah Publishing House.
- Abu-Jadu, S. M. A. (2003). *Educational Psychology* (3 ed.). Amman.: Al Masirah House for Publishing, Distribution and Printing,.
- Ahmed, S. D. (2020). The Effect of Fishbone Strategy in the Achievement of Chemistry and Visual Thinking Among the Seven Grade Students. *Utopía y Praxis Latino Americana*, 25.
- Al-Azzawi, R. P. C. (2008). *Measurement and Evaluation in the Teaching Process*. Amman, Jordan: Dar Dijla for Printing.
- Al-Ibrahimi, Z. A.-A. (2020). The effect of the strategy of Pecs (P.E.C.S) in the collection of chemistry and holistic thinking among fifth grade scientific students. (Master's). University of Baghdad, Iraq.
- Al-Jundi, F. M. (2017). The effect of Daniel's model on the cognitive motivation of middle third grade students. *Journal of Educational and Psychological Research*(55).
- Al-Khalili, K. Y. (1996). *Teaching Science in the Stages of Public Education* (1 ed.). Dubai, UAE Dar Al-Qalam for Publishing and Distribution
- Al-Nabhan, M. (2019). *Intelligence Tests*. Baghdad: Nippor Publishing.
- Al-Najdi, A. (2005). *Teaching Contemporary Sciences and Recent Trends in Science Education in the Light of International Standards and the Development of Constructivist Thinking and Theory*. Cairo, Egypt: Dar Al-Fikr Al-Arabi.
- Al-Obeidi, E. S. A. (2020). The effect of the strategy of filling the jar in the acquisition of chemistry and divergent thinking among middle first grade students. (master's unpublished). University of Baghdad. , aculty of Education for Pure Sciences – Ibn Al-Haytham.
- Al-Saadi, S. A. Q. (2004). *Teaching and training skills: Al-Warraq Foundation for Publishing and Distribution*.
- Al-Salkhi, M. J. (2013). *Academic Achievement and Modeling of the Factors Affecting It* (1 ed.). Amman Dar Al-Radwan
- Al-Zamili, A. A. J. (2009). *Concepts and Applications in Educational Evaluation and Measurement*. Kuwait: Al-Falah Library.
- Al-Zobaie, A.-J. I., & Al-Ghannam, M. A. (1981). *Research Methods in Education: University of Baghdad Press*.
- Al-Zuhairi, H. A.-K. M. (2017). *Educational Research Methods* (1 ed.). Amman, Dubai: Debono Center for Teaching Thinking,.
- Al-Zuwaini, I. S. M. (2015). *Old Teaching Methods – Haditha* (1 ed.). Amman, Jordan House for Publishing and Distribution.
- Attia, M. A. (2008). *Meta-Knowledge Strategies in Reading Comprehension* (1 ed.). Amman, Jordan Dar Al-Monjouh Publishing and Distribution.
- Aziz, M. S., Suzanne, D. A., & Al-Bawi, M. I. (2020). (2020) : The Effect of the Active Thinking Model on the Achievement of the Second Intermediate

- Grade Students of Science and Their Visual Thinking. *Journal of the Psychological Research Center*, 31(01).
- Bashmani, S. (2014). A comparative analysis of the formulas used to calculate the random sample size. *Tishreen University Journal for Research and Scientific Studies-Economic and Legal Sciences Series*, 36, 85-100.
- Brady, E. (2012). Epic—a library for generating compilers. Paper presented at the Trends in Functional Programming: 12th International Symposium, TFP 2011, Madrid, Spain, May 16-18, 2011, Revised Selected Papers 12.
- Dashli, K. (2016). *Scientific Research Methodology*. University of Hama, Palestine: University Books and Publications Directorate.
- Duraid, A. S., & Ahmed, F. K. (2021). Analysis of the Chemistry book for the third grade medium on the skills of the 21st century. *Turkish journal of computer and mathematics education*, 12.
- Ebel, R. L., & Frisbie, D. A. (1972). *Essentials of educational measurement*.
- Hassan, K. H., & Ahmed, S. d. (2022). The effect of the hands-on the achievement of Chemistry in first intermediate grade students *International journal of childhood special education*, 13.
- Institute of museum and library services. (2009). *museums, libraries and 21 st century skills* Retrieved from [www.ims.21centuryskills.org](http://www.ims.21centuryskills.org)
- Khalil. (2009). *An introduction to research methods in education and psychology* (2 ed.). Amman, Jordan, Ltd.,: Al-Masra House for Publishing and Distribution,.
- Khalil, A. N., & Ali, A. H. (2021). A secret magazine from the Faculty of Education - Samarra University. *Journal of Surra Man Raa*, 17(66).
- Kuklthan. (2007). *Guided inquiry, Learning in the 21st century*. . Westport, CT & London: Libraries Unlimited
- Laal, M. (2011). Barriers to lifelong learning. *Procedia-Social and Behavioral Sciences*, 28, 612-615.
- Mahmoud, A.-A. R. (2007). *Research Methods in Psychological and Educational Sciences* (6 ed.). Cairo: Universities Publishing House.
- Mahmoud, A. S. E.-D. (2006). *Educational and Psychological Measurement and Evaluation: Basics and Contemporary Directions*. Cairo, Egypt Dar Al-Fikr Al-Arabi.
- Melhem, T. Y., & Isa, Z. M. (2013). Enhancing critical thinking skills among students with learning difficulties. *International Journal of Academic Research in Progressive Education and Development*, 2(4), 151-169.
- Obeidat, I., Hamadneh, N., Alkasassbeh, M., Almseidin, M., & AlZubi, M. (2019). Intensive pre-processing of kdd cup 99 for network intrusion classification using machine learning techniques.
- Odeh, A. S. (1998). *Measurement and Evaluation in the Teaching Process* (2 ed.). Irbid, Jordan: Dar Al-Amal Press,.
- Razouki, A., Khzami, S.-e., El Khatabi, I., Agorram, B., & Selmaoui, S. (2017). How MOOCs Are Perceived by Moroccan Students and Teachers? *European Scientific Journal*, 13(22), 82-92.
- Saada, G. A. (2011). *Active Learning between Theory and Practice* (1 ed.). Amman, Jordan Dar Al-Shorouk for Publishing and Distribution.
- Saheb, A., Mutashar, M., & Ahmed, S. D. (2014). Positive thinking and its relationship to academic self-motivation and the trend towards the

teaching profession among students of colleges of education. *Journal of Educational and Psychological Research*(41).

Samara, R. (1989). *Teaching English as a second language*. University of North Carolina at Chapel Hill,

Tamam, A.-J. T. I. (2000). *New horizons in the development of education curricula in light of the challenges of the twenty-first century*. Minya, Egypt Dar Al-Huda Publishing and Distribution,.

Yassin, W. A. K., & Raji, Z. H. (2012). *Structural Introduction Models and Strategies in Teaching Scientific Concepts* (1 ed.). Baghdad Noor Al-Hassan Library for Printing and Publishing.

Zaire, S. A. (2017). *Contemporary Educational Encyclopedia*, 1st Edition , Part II. Amman, Jordan: Safaa Publishing and Distribution House.

Zeatown, A. M. (2007). *Structural Theory and Strategies for Teaching Science* (1 ed.). Amman, Jordan Dar Al-Shorouk.