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The Impact of Molecular Representation strategy on Academic a chievement and self-efficacy among the 2nd female graders students in Chemistry

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Abstract

This aim of this study is to investigate the effect of Molecular Representation strategy on the achievement and self - efficacy of the second grade students in Chemistry. The study sample consisted of (70) students distributed in to two experimental an d control groups. The study tools consisted of achievement test self-efficacy measure and statistical. the results showed that there were statistically significant differences at the level of ($\alpha = 0.05$) between the experimental group and the control group In both the achievement test and the measure of self efficacy and for the benefit of the experiment al group, In light of the this , the researcher recommended the need to use the strategy of Molecular representation to teach chemistry because of its impact in raising the level of academic achievement in Chemistry.

Introduction:

Science in general and chemistry in particular includes many abstract concepts that need clarification and facilitation, so students consider them complex and difficult materials due to their abstract nature, and it is necessary to adopt modern strategies and methods that focus on linking the scientific material with the A student's life and making him an effective participant in the educational process, especially since Most studies and research in this field showed that most chemistry teachers still adopt traditional methods of teaching based on memorization and indoctrination, which led to a clear weakness in the achievement of second -grade intermediate students in chemistry and this is confirmed by many studies such as the study of(Awaid 2005)And the study of(Al-Masoudi 2016)And through the researcher's humble experience in teaching in

middle schools and her discussion with some chemistry teachers and supervisors during seminars and training courses, she found there was a decrease in the scientific level of this subject and this was confirmed by her review of their grades and according to the General Directorate of Education in Diyala and for previous years where it was There is a clear decrease in the success rates .The scientific content of chemical topics at this stage has a lot of difficulty that needs effective teaching strategies that contribute to increasing students' achievement and self-efficacy in order to employ life situations and help them explain many chemical phenomena .Self-efficacy is one of the important psychological variables that Directs the behavior of the individual and contributes to achieving his personal goals (AbuGhaly,2012 ,35)Because it helps the individual to determine the amount of effort he exerts in a particular activity and the amount of perseverance in the face of obstacles and difficult situations, and the greater the sense of effectiveness, the greater the effort and perseverance (Pazares, 2005,167)The decrease in self-efficacy of students due to the frustration they face from the difficulty of the material prompted the researcher to conduct this study and use the strategy of molecular representation, which is one of the modern strategies emanating from structural theory, that is, it depends on depth in meaning in understanding chemical phenomena, which may help in increasing students' achievement and raising their self-efficacy, so the study problem can be identified in the presence of a decrease in the achievement of female students of the second intermediate grade and their self -efficacy towards chemistry .The study problem can be addressed by answering the following questions:

-What is the effect of using the strategy of molecular representation on the achievement of the second intermediate grade students in the subject of chemistry?

-What is the effect of using the strategy of molecular representation on the self-efficacy of second-grade intermediate students in chemistry?

the importance of studying:

The current era is witnessing a wide and rapid scientific development in the field of learning and education, which has been positively reflected on educational institutions, leading them to search for teaching strategies that depend largely on the student and help increase his educational attainment level, given that science in general and chemistry in particular is one of the basic scientific branches which contribute to improving and developing human life and solving his problems, and there are many abstract concepts such as atoms and molecules that are difficult to learn, except in light of modern Strategies that contribute to improving teaching methods, especially in the field of chemistry teaching, and among those strategies is the strategy of molecular representation, which is one of the strategies based on the principles of structural theory are based on three levels, namely the apparent level , the symbolic level, and the molecular level, and it works to clarify the internal elements in chemical phenomena and equations and their molecular representation through the use of molecules and atoms and how they are related .Teaching with this strategy helps to bring the learner out from the apparent level to delve more into the processes that they occur at the molecular level and numbers and symbols become in formulas The chemical has clear

meanings(AmbuSaidi and Blushi,2009,512)And many studies indicated have the effectiveness of this strategy in understanding and explaining scientific phenomena such as the study of Al-Blushi (2009)And (Tasker and Dalton study 2006) The strategy of teaching is the cornerstone upon which the success of the process which t patriarchal as it as much as it is the way appropriate for the position of education achieved educational goals desired and lead to solving problems related to the application of the curriculum and low student achievement and all the way of the teacher, and stems the importance of this study confirm recent trends on the role of the learner in the learning process that is active and active, not in the future or recipient consuming knowledge, but it is the initiator of the scheme and all the educational activities(writtrock, 1990, p. 35) My Qatami and my Qatami, 2000 ,36)Education also emphasizes teaching students to become self-directed learners to search for new information and master skills(paris & Lipson, 1948,242)And for the learner to have a role in bearing the responsibility for his learning, and this responsibility falls on him, will contribute to increasing his ability to retrieve the information stored in the memory (Qatami and Qatami,2000 ,21) ,And the most effective learners in learning situations are those who focus on self-regulation and adopt the mastery approach to learning (Butter & Winne, 1995, p252) Therefore, self-efficacy is of great importance to students as it improves their confidence in their abilities to pursue and excel in studies, and increases their possession of personal, study and other skills, which increases their motivation to study and work, and based on the above and based on the importance of the intermediate stage as it represents an important transitional stage which represents the beginning Maturity The current study derives its importance from its contribution to the attempt to change the typicality of traditional teaching methods and the use of the strategy of molecular representation ,which is in line with modern trends .The theoretical importance of the current study is that it provides a model for how to teach chemistry according to this strategy, as many studies have confirmed that methods of teaching chemistry In country schools, it emphasizes conservation, which has led to a low level of achievement , while the practical importance of the current study is that it directs the attention of chemistry curriculum planners to the need to include study units based on the strategy of molecular representation , and also helps in reaching the preference for using this strategy in teaching chemistry .Through the results that will be reached, which may contribute to encouraging male and female teachers to study Serving this strategy in teaching, and informing decision-makers of the importance of self-efficacy for students in order to provide them with a suitable learning environment that promotes the development of students' self-efficacy so that they can achieve high levels of educational attainment .

Objectives of the study:

The current study aims to identify:

The effect of the strategy of molecular representation on the achievement of the second-grade intermediate students in the subject of chemistry

-The effect of the strategy of molecular representation on the self-efficacy of second-grade intermediate students in chemistry

The two hypotheses of the study

-There is no statistically significant difference at a significant level (0.05 =α)Between the average scores of the experimental group students who study chemistry according to the strategy of molecular representation and the average scores of the control group students who study the same subject according to the traditional method of achievement test

-There is no statistically significant difference at a significant level (0.05 =α)Between the average scores of the experimental group students who study chemistry according to the strategy of molecular representation and the average scores of the control group students who study the same material according to the usual method on the scale of self-efficacy.

Study limits: The study was limited to:

-Students of the second intermediate grade in middle schools in (Baquba / Diyala governorate)

The first semester of the academic year2018-2019

-The first, second and third chapters of chemistry classes in the Science Book, Part One, for the second intermediate grade.2017.

Study terms and their definitions- :

The strategy of molecular representation was defined by:

-(Al- muqbali ,2003,B1): an explanation of chemical phenomena: a description of how the arrangement and movement of molecules, atoms, and ions, and the input chemical phenomena are expressed using spheres and illustrations at the molecular level.Al- muqbali,2003 ,10

-(Krajck & SoLo way 2001B): An explanation of chemical phenomena b .Describing how the arrangement and movement of molecules, atoms, and ions (Wu; Krajck & SoLo way, 2001,11)

The researcher defines it procedurally: as a constructive educational strategy used in the interpretation of chemical phenomena by describing the arrangement and representation of the movement of molecules and atoms using spheres and illustrations, and they are represented molecularly on three levels (the apparent, symbolic , and molecular level

The collection was defined by:

-(Abodea2011)What is the sum of acquired skills, knowledge, attitudes and values in a set period of time Coupler skills, knowledge, attitudes and values required ACT saba (Abodea,, 2011,244)

-(Abuzina & Abenah2010):The knowledge, understanding and skills acquired by the learner as a result of exposure to specific educational experience (Abu Zina and Abenah , 2010 ,23)

Procedurally: The amount of result obtained by students in the experiment measured by the total score obtained by the students by answering the items of the achievement test prepared for this purpose

Self-efficacy is defined by:

-(Alfraihat2017)The beliefs that an individual possesses that determine his ability to perform and direct behavior, which is reflected in the activities he performs and how he deals with them in the situations he faces in life(Alfraihat, 2017 ,212)

-Gillihan, 2002 A person's beliefs in his ability to produce a specific task.

(Gillihan, 2002.33)

-Aladel, 2001 : (The individual's underlying confidence in his abilities, during new situations, or situations with many and unfamiliar demands, or are the individual's beliefs in his personal strengths with an emphasis on competence in interpreting behavior without sources or other reasons for optimistic (Aladel,2001 ,131)

Procedurally: It is the individual's expectations in different situations and is reflected in the choice of activities included in the achievement of behavior .Self-efficacy is measured by the degree to which the study sample members will obtain on the self-efficacy scale prepared for this purpose.

Theoretical framework and previous studies

Molecular representation strategy

The strategy of molecular representation is considered one of the modern strategies and it emanates from the constructivist theory, which emphasizes the learner's construction of his knowledge and its use on the other hand .Understanding is the heart and essence of constructivism, which requires teaching chemistry in order to understand, make learning meaningful, retain it, and employ it in situations New Learning so that the learner has a scientific culture and responds effectively to issues and problems (Zaiton, 2007 ,2)Building learning depends on the idea that the learner builds his own knowledge ,so the teacher in the constructive class is no longer a transmitter of knowledge, but rather a facilitator of the learning process , and he has to know that the structure of knowledge differs among students who are teachers, due to the difference in previous knowledge and interest The degree of participation(Zaiton,2007 ,24)Since the science of chemistry is centered around the molecular theory of matter, which is related to the changes, and is characterized by its abstract and difficult nature, especially in chemical reactions, formulas and concepts such as atoms and molecules and the interrelationships between them, energy and others .Therefore, students face difficulty in explaining what is happening in the invisible world and therefore the student's understanding of nature is considered molecular material and the perception of mutual interactions between atoms and molecules in their representation, represent the basis for the understanding of the abstract of chemistry and building concepts of chemical scientifically accurate, so it appeared strategies for modern teaching chemistry emphasizes on building understanding of chemistry and molecular the details are forgotten if they do not fall within the system of its reservation and understanding of the principles of fundamental principles In increasing The effectiveness of the transmission of the learning effect , and thus the study of chemistry, including its symbols and formulas, is open to all, and the process of understanding chemical representations by students is one of the most important goals of teaching chemistry, where the understanding is represente d by the ability of students to perceive three levels or so-called level methods Thinking about chemistry namely:

-the apparent level(Al- mahsos) :It is all you can watch With the naked eye from the surrounding a by conducting a practical experiment or phenomena a video or

displaying pictures and it depends on the interpretation of the physical properties in terms of shape, color, size and chemical properties

-The symbolic level: the extent to which the learner is able to convert his observations of the phenomena surrounding him or laboratory observations into mathematical laws, illustrations, chemical formulas, or chemical equations.

-The molecular level: It explains the chemical phenomena by using atoms and molecules to indicate the shape and movement of electrons during the occurrence of chemical reactions, ie this level is related to the nature and structure of the system and the movement of the minutes of matter and its relationship to the change in chemical properties- (Al-Amoriya, 2011 ,18)

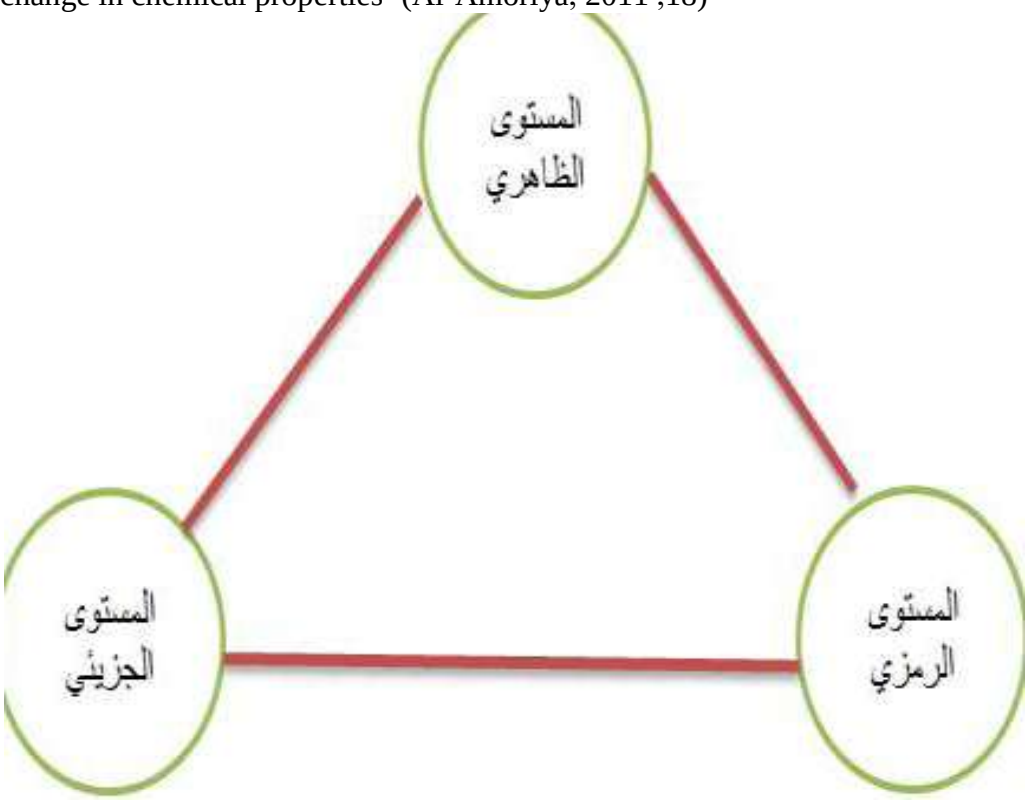

Figure showing levels of thinking in chemistry

The strategy of molecular representation is defined as the use of phenomena and molecules and the interrelationships between them in explaining phenomena (Alblushi, 2003 ,6)And this strategy has several names, including molecular representation, molecular model, and particle representation . Therefore, this strategy is used in explaining chemical phenomena and imagining the visible world through models and illustrations and to describe how the atoms and molecules are arranged (Aslaeh,2016,18)

It must be taken into consideration that students have limited opportunities for tangible learning, and the greatest reliance is on abstract education, and therefore not The student finds the opportunity to match what he imagines of the world of atoms and molecules with something perceptible in nature in front of him, and from here appears the importance of designing tangible or semi-tangible experiences that approximate the abstract molecular of chemistry, and among

These experiences are two- or three-dimensional drawings, and molecular models of chemical compounds (Ambusaidi & Alblushi, 2009 ,510)

Methods of strategy for molecular representation of matter:

There are several methods identified by(Ambu Saeedi and Al Balushi) 2009of which:

Three-dimensional representations: In this method, three-dimensional models are used, clays, or computer programs that allow the teacher and the student the opportunity to

visualize atoms or molecules and design three-dimensional models

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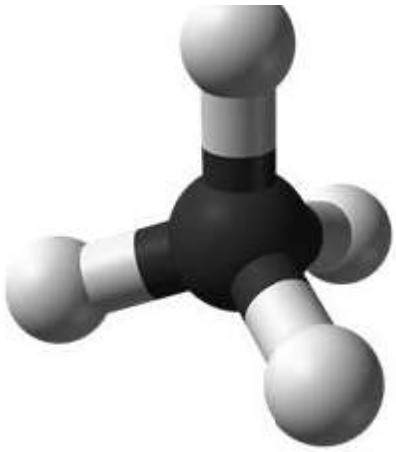


Two-dimensional representations: In this method, the teacher or student represents molecules or atoms using circles and drawings with the addition of some colors indicating the different types of atoms, and there are two types of two-dimensional representations

1 -The merging between the apparent and molecular levels, this type is done when using the captured or drawn image of the chemical phenomenon, and it is upon it to clarify the molecular components of the elements involved in this phenomenon and the direct connection between the phenomenon , and what happens at the molecular level, leading to an accurate explanation of the reasons for the occurrence of the phenomenon and the ability to imagine it.

Silver atoms gold atoms gold atoms

Zinc atoms l

2 -The merging between the symbolic and molecular levels ,and in this way some molecular explanations are added to the equations, and in this method some molecular explanations are added to the symbolic equations, such as

clarifying the movement of the movements and exchanges that occur at The molecular level during the occurrence of a chemical reaction, and understanding the numbers in it as a number Molecules are before the symbol and the number of atoms is written after the symbol .It also helps to balance the equation and reveal the errors in how the atoms are bound to each other within the single molecular formula.

(A figure showing the use of figures to illustrate the merging between the two symbolic levels , Molecular)

-Verbal representations: that describing scientific phenomena outwardly in chemistry without going deep into the molecular levels, the student remains at the apparent level and thus leads to misconceptions, so the written language that describes the phenomenon can be converted into a language that uses molecular terms such as atoms and molecules(Ambusaidi & Alblushi, 2009 ,,516-518)

The philosophical and psychological foundations of the molecular representation strategy

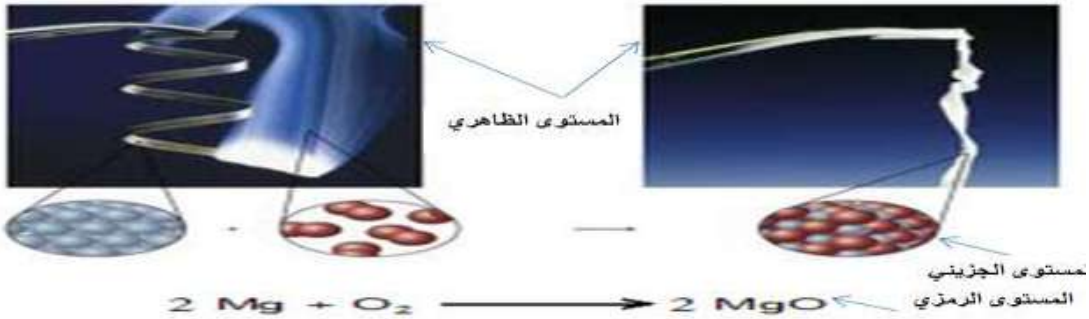
The abstract concepts in chemistry, according to the theory of Ozebel, are considered secondary concepts, which are concepts that do not have concrete examples such as atoms, molecules, the number of moles, etc. ,And largely due to the lack of students for no tools necessary to take them to imagine the world of atoms and molecules and other, or they They possess it, but they do not know how to use it in understanding the nature of the phenomenon .In the event that they possess the appropriate tools to study the phenomenon and were able to build relationships between these tools, the natural result is that their understanding matches the scientific explanation of the phenomenon, and if they do not possess the ability to link between the tools and use them scientifically, the result is For example ,many students think that atoms are soft in the liquid state and solid in the solid state .They know that matter consists of particles and atoms, but they failed to construct a scientifically acceptable understanding using their previous information(Ambu Saidi and Al Blushi, 2009,508) However, in the event that they possess inappropriate tools for studying the phenomenon, they may try to use these tools to construct their understanding of the phenomenon and because it is not suitable tools .Therefore, students fall into further wrong understanding of the scientific phenomenon, and that the view is that new knowledge is formed using the scientific method, then this knowledge is added to a group .Experiences in Balzhn look is not accurate because the mind of the student is not a file open for the teacher does not income all what he wants and where it should be cautious when providing these tools for students ,The developmental stage, according to Piaget's classification of cognitive development, which is compatible with the strategy of molecular representation, is the formal procedural stage , in which students develop the ability to think abstract form, which is consistent with the abstract concepts included in chemistry related to molecules, atoms, etc., but

students' thinking abilities with concepts The abstract in middle school age cannot easily comprehend and understand it, except by providing an educational environment that brings these abstract concepts closer to their minds by using various teaching methods such as stereoscopic models, animation and computer programs (Lee, et.al , 1993 ,. 249-270)

The molecular representation strategy aims to- :

1-Developing the ability to visualize and form mental images of compounds and chemical reactions, as this strategy works with the visual capabilities it provides to expand students' imaginative perceptions and build a clear mental picture of chemical compounds and processes that are not seen with the naked eye because the formation of mental images is the basis for understanding chemistry with its content of atoms and protons Electrons can be developed through three-dimensional or two-dimensional representations of all kinds

2-Linking between the three levels of chemistry (virtual and symbolic and molecular (that the three levels of thinking in chemistry makes the student moves easily between these levels so that Egged difficulty converting his orders to the laboratory and molecular representations of this study was confirmed by(Tasker and Dalton, 2006) . (A Mbu Saidi and Al-Balushi ,2009 ,511-516)



(A figure showing the connection between the virtual, molecular and symbolic level)(3)

To improve students' understanding of chemical concepts:

Where to simplify how the chemical reactions such as the exchange of atoms and atomic groups to form compounds occur in teaching equations and the method of weighing and related concepts Kaltkava and the number of shopping malls, and this is confirmed by many studies as a study Almuqbali (2003) And Rajab Study(2012)

4 -Correct The Wrong Chemical Concepts:

There are many chemical misconceptions that students located in the world of atoms and molecules and work representations at the molecular level on T Sahihaa through its representation molecularly (AmboSaidi& Blushi,2009 ,515-516)

The molecular representation strategy has several advantages, including:

1 -Developing the ability of learners to imagine the interactions between atoms and molecules in building accurate and scientifically sound chemical concepts

2-The enthusiasm of the learners is strengthened because of the practical applications and the possibility of being partially represented.

3 -Lead to changing the ideas of learners, which increases their motivation to learn

4 -It increases students' ability to self-learn, investigate and solve problems

5 -through this strategy, the learner can move between the three levels of thinking in chemistry (virtual, symbolic, and molecular)

6-Addressing learning experiences, which eliminates many of the misunderstandings generated by the learners in the educational subject (Rajab,2012 ,29)

This strategy has a number of drawbacks, including- :

You need time for practical and verbal activities, and for students to travel to and from the laboratory.

Its cost is relatively high, as it requires the availability of chemicals and laboratory tools that are not available in most of our schools.

It requires a great effort on the part of the teacher in preparing the materials and tools and arranging the laboratories (Asleah, 2016 ,32)The role of the teacher and the strategy of the molecular representation of the material is to define and formulate the goals and prepare for the activity to be implemented, as well as define and explain the steps for conducting the experiment and strategy in a clear and specific manner, and follow-up and supervise students during the implementation of the activity in terms of their representation of phenomena using atoms or molecules and discussion with students to know the extent of understanding the topic and their evaluation to avoid Weaknesses in the future As for the Learner, he will have a positive role in this strategy, as he is a participant and interacting ,without reviews and results during the conduct of the experiment and an explanation of the relationships based on the results reached and thus applies and generalizes them in other new situations .The difficulties in learning scientific phenomena at their molecular level can be minimized by several methods of which :

The teacher uses binary illustrations using regular blackboards or transparencies

Training students to interpret and convert naturala and their apparent level to the molecular level, using graphics

The teacher uses physical models, such as using balls, balloons, etc.

Training students to practice linking the phenomenon to its three levels when interpreting the phenomenon by using drawings through worksheets or classroom activities (Rajab ,2012 ,29)

The teacher uses three-dimensional graphics using computer simulations.

Molecular Representation Strategy Steps

Students are divided into groups , the number of which varies between (4-6)

The teacher explains what activity the students will do

The teacher distributes the activity worksheets to each group

-The worksheet deals with the steps of implementing the activity according to the teaching techniques prepared in advance

-The teacher uses students teaching techniques to illustrate the three levels (virtual and symbolic and molecular) of the subject and using both or some of the following multimedia (mud industrial, mobile fees of simulation using Alpurboan t , software computer three - dimensional, multiple representations(

Students derive concepts related to the topic of the lesson

Self-efficacy:

Considered self-efficacy of the concepts of psychology modern as referred to by Bandura in cognitive social learning theory, has suggested a Pandora's concept of self - efficacy ,which represents the expectations of the individual and beliefs that enable him to carry out any act successfully special ,Individuals who have a degree AK righteousness of self - efficacy are Ba 's disease Better on many types of tasks compared to those with less self-efficacy (Beck, 2004 , 232)

Self-efficacy is one of the important psychological variables that direct an individual's behavior and contribute to the achievement of his personal goals(Abughali, 2012, 32) The way an individual thinks and believes affects his behavior, as these beliefs constitute the main key to the driving forces for this behavior in him, as he works to explain his accomplishments based on the capabilities he believes he possesses, which makes him do his best to achieve success (Bandura, 1997,45) Bandura emphasizes the principle of reciprocal determinism in social learning , stressing the interrelationships between behavioral factors, the environment and the factors affecting the behavior of individuals, where subjective activity plays a major role in directing and defining behavior .When a student has an idea of himself that he is intelligent and acceptable, he tends to act constructively .This idea and process are reciprocal, as the behavior practiced by the individual affects the way and how he perceives himself, so individuals' perceptions of their self-efficacy affect their daily life and their choices, so they will be successful if they have high activity , and are depressed if they have low activity (Bandura, 1997, p. 141-215)Highlights the impact of self - efficacy by helping the individual to determine how much effort you Sabzlh in a particular activity and the amount of perseverance in the face of obstacles, and the amount of hardness in front of difficult situations, the greater the sense of Eva cent effort, perseverance and hardness increased ,Individuals with self - efficiency high deal Wen with problems and activities The difficult one with more emotion ,calm and sobriety (Pajares , 2005,7)Self-efficacy is described as a motivational state in which an individual's self -esteem is measured for carrying out certain actions to achieve his goals , and it does not mean self-efficacy with what the individual has, but rather with his beliefs about what he can do and represent the cognitive axis of the processes(Bandura, 2007 , 47)If the individual has a belief in his ability to perform a task, this will increase his focus, effort and involvement in this task, while if a thousand respondents had the skill and knowledge to complete the task, this does not necessarily mean his ability to complete it (Zimmerman & Cleary, 2006,175)

The importance of self-agency stems from its effect on multiple aspects of an individual's behavior through

Choosing activities that he thinks he will succeed in solving, and avoids those he thinks he will fail to solve

Learning and achievement: Individuals with a high sense of self-efficacy tend to learn and achieve more than their low-sense counterparts.

Exerted effort and persistence: Individuals with a high sense of self-efficacy tend to make greater efforts when trying to accomplish certain tasks and are more persistent when facing what hinders their progress and success, while individuals with a low sense of self-efficacy spend less effort in performing the tasks and quickly stop continuing to work .When you encounter obstacles stand in the way of achieving the task

Self-efficacy is affected by several factors, including (personal influences, environmental influences, and behavioral influences(Zimmerman, 1989, p.1-25)Bandura believes that self-efficacy has three dimensions- :

Effectiveness: which means the level of an individual's motivation to perform in different areas and situations , and that level varies according to the nature or difficulty of the situation.

-Generality: it is the transfer of expectations of agency to similar situations .Individuals often generalize their sense of agency in situations similar to the situation they are exposed to.

-Strength, where the strength of a feeling of personal effectiveness is considered a high perseverance and a high capacity that enables the selection of activities that are performed successfully (Bandura, 1997, p. 44-45)

previous studies:

Studies dealing with the strategy of molecular representation

The Rajab Study aimed at(2012)Disclosure of the effectiveness of representation strategy Dakkaiqa of the substance in the development of chemical concepts Om Herat visual thinking in science students at the ninth grade core in Gaza , which included a sample study 70A student of the ninth basic grade was distributed into two control and experimental groups, and the study tool consisted in testing chemical concepts and testing visual thinking skills , and the indicated results that there are statistically significant differences between the mean scores of the control and experimental group students in the post-test of concepts and visual thinking skills in favor of the experimental group.

As a study aimed at (2009 ALBLushi) To reveal the mental image at the molecular level of the material for science teachers, as the study sample included (22) From science teachers, and the results indicated the lack of a homogeneous mental model of the atom to explore chemical phenomena, and this explains that many learners may find it difficult to study abstract chemistry and explain chemical phenomena.

-As conducted(Tasker & DaLton2006) A study aimed at how to visualize the molecular world using graphics and moving particles through a program called it Vischem Based on animated drawings of chemical representations at the symbolic and molecular levels, the researchers used the experimental approach, and the study sample included( ) 48)An undergraduate student, and the results indicated the effectiveness of the program in evaluating the students' deep understanding in terms of the structure and processes of the molecular level.

As a study aimed at(2005Ardac & Akaygun)To define the effectiveness of the teaching method based on the representation of molecules in multimedia in students' understanding of chemical changes .The experimental method was used .The study sample consisted of(49) Students from the eighth grade divided

into two groups, a control and experimental study consisted tool tests the achievement, and the results indicated to the superiority of the experimental group and the effectiveness of a multimedia program on the understanding of the students of chemical and resolution changes.

As conducted by Al-Muqbali(2003)A study in the Sultanate of Oman aimed at the effectiveness of teaching using molecular representation in the study of knowing chemistry on the interpretation of the second scientific secondary students of chemical phenomena and amending their conceptual errors . The study sample consisted of) 120Students divided into experimental and control group two groups, the study consisted tool to test chemical concepts and testing of Laos and n , and the results indicated that there are differences statistically significant in favor of the experimental group.

Through the review of previous studies, we noticed that there is a diversity in the objectives, the sample of the study, and the tools.2009)To study mental images at the molecular level of the subject for science teachers, as for the study of Rajab(2012)It aimed to develop the concepts and visual thinking skills for the middle school and used the conceptual examination, as for the study of al-Muqbali(2003)It dealt with the use of molecular representation in explaining the chemical phenomena of the secondary stage and amending their conceptual errors by preparing the concept test. Tasker & DaLton It dealt with how to visualize the molecular world using animation for undergraduate studies ,either Adrac & Kaygun (2005) It dealt with the visually enhanced teaching based on molecular representation, and the preparatory sample of the study was the stage . The current study differed with previous studies in terms of the goal, the sample, and the study tools .It dealt with the achievement and self-efficacy of intermediate second-grade students in the subject of chemistry .An achievement test and a measure of self-efficacy were prepared as tools for the study.

Studies on self-efficacy

Where I aimed to study Midoun and Abi Mouloud(2014)To reveal the level of both self-efficacy and academic compatibility of a sample of intermediate school students, and the study sample consisted of(798)Male and female students were tested randomly, and the results showed that the level of self-efficacy and academic compatibility is high in the experimental group, and that there are fundamental differences between students and students in the academic compatibility and in favor of the students .

-Aimed to study (2003) Wilke To investigate the impact of employing active learning strategies on academic achievement and the motivation and self-efficacy of students of Angelo University in Texas in the American state in physiology ,and an achievement test and a measure of motivation were prepared, and the results showed the superiority of the experimental group in both the achievement test and the motivation scale, and they had trends Positive and active learning.

-And by reviewing the studies that dealt with self-efficacy, it is the study of Midoun and Abi Mouloud) 2014Which aim to find out the level of self-efficacy and academic compatibility for middle school students, either studying

Wilke(2003)It examined the impact of active learning strategies on achievement, motivation, and self-efficacy of the university level

Either study Current I have dealt with potency The strategy of molecular representation in the achievement and self-efficacy of the second intermediate grade students in chemistry.

The previous studies have been benefited from in writing the theoretical framework of the strategy and preparing study plans, as well as preparing a measure of self-efficacy and in statistical methods.

Study procedures :

The researcher chose the experimental approach for the purpose of achieving the goal of the study, and the experimental design with molecular control was chosen with two experimental and control groups, with a dimensional choice to measure achievement and self-efficacy as shown in the following chart Planner (1)

Dependent variable	**Independent variable**	**Group**
-Academic achievement test - Measure Of a self-Efficacy	**Molecular Representation strategy**	**Experimental**
	Ordinary method	**The Control**

Study community and sample:

The study population includes middle schools for girls in the city of Baqubah, Diyala Governorate Center, for the academic year) 2018-2019 ,(And the medium(Al-Masarah for Girls) was chosen intentionally to implement the study experience in order to provide all the capabilities that help in conducting the experiment .The study sample consisted of two divisions out of three for the second intermediate level, and after excluding students who had failed, their number reached) 70A student divided into two groups, experimental and control.

Equal female students of the two study groups:

The researcher was keen on the statistically parity of the two study groups in some of the variables of the study and among these variables (chronological age calculated in months, intelligence, and previous achievement of the science subject and as shown in Table (1)

Table (1) represents the parity of the two study groups in past achievement, chronological age and intelligence

Statistical significance	t-calculate	T-tabular	Standard deviation	Average account	the number	Group	Variables
Is statistically significant	0.63	2	6.67	68	35	experimental	Prior achievement in science
		2	7	66.9	35	control	

Is statistically significant	0.56	2	6.9	30.94	35	experimental	intelligence
		2	6.7	30	35	control	
Is statistically significant	0.42	2	8.84	174.17	35	experimental	Time age month
		2	8.6	173.3	35	The Control	

Study supplies:

-Determining the scientific subject: The scientific subject is specified in the second and third chapters of chemistry from the science book scheduled for the academic year (2017,2016)It takes teaching these classes(6)Weeks by(2)A weekly share

Formulating behavioral goals: A number of behavioral goals have been formulated distributed across the lower three levels of Bloom's cognitive domain)remember , comprehend , implement) and in light of the opinions of a group of experts (appendix (1)Some goals have been added and modified, and thus the number of approved goals is(120)A behavioral goal

-The teaching plans were prepared (12)Of the teaching plans needed for each group to cover the course material decided in the three semesters and according to the previously defined behavioral goals. The plans were presented to a group of experts in curricula and teaching methods , and modifications were made to some of them and a percentage was determined(80%) For a consensus agreement to be in the final form an annex(2)

Research tools:

The study requires an achievement test in chemistry and a measure of self-efficacy .The following is an explanation of what the researcher did

Building the achievement test: The researcher prepared a test consisting of (30)A test paragraph of the multiple -choice type with four alternatives, and the questions and their paragraphs were distributed according to the behavioral goals of their three levels, and one score was placed for the correct answer for each of the test paragraphs and zero for the wrong and abandoned answer.

-The validity of the test was confirmed through

1 -Apparent truthfulness: The researcher presented the test items to a group of experts in the field of curricula, teaching methods and chemistry, with the aim of getting acquainted with their views on the validity of the paragraphs and the safety of their formulation (%80)From the consensus of opinions from the arbitrators regarding the validity of the paragraph as a minimum for accepting the paragraph within the test, and thus the number of test paragraphs has become(30)A test paragraph, thereby achieving apparent validity.

-Validity of the content: The researcher prepared a table of specifications (the test map), which is one of the indicators of the validity of the content and deals with the test items and their contents in terms of their arrangement, number and representation of the aspects and dimensions to be studied well, according to the relative weight of each part, ie it is a table that links the objectives to the content and shows the relative weight for each of the different parts and the extent to which the behavioral objectives of The material are achieved , thus achieving the validity of the content .Table(2)

(Table) 2Table of specifications

Total	Percentage of behavioral goal level			Academic content			chapters
	Application	comprehension	Knowelge	The relative importance of content	Number of class	Chapter title	
12	2	4	6	41.67%	5	Elements and chemical bonding	Chapter one
8	1	3	4	25%	3	Chemical compounds	Chapter two
10	1	4	5	33.33%	4	Formula and chemical reaction	Chapter three
30	4	11	15	100%	12		T Otal

-Statistical analysis of the test items: The exploratory application was carried out on a sample consisting of) 60Student) of students (high hopes for girls (were conducted statistical analysis of the paragraphs of the test to calculate the coefficient of difficulty and the ease and power of the discriminatory clauses and effective alternatives are wrong, as to make sure the stability of the test using a formula Alvakronbach , it has reached the reliability coefficient79 0is a good reliability coefficient.

-After completing the validity and reliability of the test and the statistical analysis of its paragraphs, the test is ready and in its final form it consists of (30)Appendix Paragraph(33)

Second: Self-Effectiveness Scale

After the researcher reviewed the previous studies and benefited from the self-efficacy measures , the researcher formulated the scale paragraphs, which may be from(27)Paragraph as chosen(3)Substitutes for each paragraph, and these alternatives have weights ranging from(3-2-1)She totally agrees and you get(3)Somewhat agree and you get(2)I do not agree and you get(1)

To ensure the validity of the scale, it was presented to a group of specialized experts, and the required amendments were made and the paragraphs that did not get the required agreement percentage were deleted, namely (%80)From the opinions of the experts, so the scale is from) 24Paragraph, thereby achieving the apparent validity of the scale

The stability of the scale was also confirmed by a re-test method, as the scale was applied to the same exploratory sample, and it was re -applied after two weeks on the same sample in the first application and after calculating the correlation coefficient, it was found that the reliability coefficient is81 .,This indicates that it has a high degree of stability, and thus the validity and stability of the scale was confirmed and became in its final form a component of(24)Appendix Paragraph(4-

- The two study groups were taught by the School of Chemistry after providing it with the necessary instructional plans and clarifying the purpose of the study and following it up continuously in order to see the application of the experiment as it started on(7 /10 /2018) Up to(18 / 11 / 2018) , And the achievement test and the self-efficacy measure were applied after completing the application of the experiment and for one day on the date (20 /11 / 2018) On the study sample, and it was processed statistically and analyzed the results in order to reach the goal of the study.

-Statistical methods: The researcher used the ready-made statistical program for the social sciences(SPSS)

View and interpret results

Display results

-In order to verify the validity of the first null hypothesis, the arithmetic mean and standard deviation of the scores of both the experimental group and the control group were found in the achievement test, using the test T-test(For two independent samples, the calculated T value was found as shown in the table (3)

Table(3)Shows the mean Arithmetic And deviation The standard value of the T Yeh calculated tabulated For my study group at the test Achievement

Significance at level)0.05(	t-tabular	t-caluclated	Standard deviation	Average account	Number	Group
Statistically function	2	8.85	4,5	27	35	Experimental
			4.8	17	35	Control

It can be seen from the above table that the calculated T value) , 85, 8)Greater than the T -value ,which is(2)At a significance level(0.05 =A (and the degree of freedom of) 68 ,(And thus rejects the first null hypothesis ,which states : "There is no difference at the level of significance".0.05 =α (between the average scores of the experimental group students that were studied using the strategy of molecular representation and the average scores of the control

group students who studied in the usual way in the achievement test .This indicates the superiority of the experimental group over the control group in the achievement test.

B-Self-agency

In order to verify the second null hypothesis, the arithmetic mean and standard deviation of the scores of both the experimental group and the control group were found in the self-efficacy scale, using the T -test) T-test)For two independent samples, the calculated T value was found, and as in the table (4(

Table(4)Shows The Average Arithmetic And deviation The standard and the calculated and tabular T -value For my study group In the Self-Effectiveness Scale

Significance at level 0.05	t-tabular	t-caluclated	S tandard deviation	Average account	Number	Group
Statistically function	2	7.143	3.87	49	35	Experimental
			4.17	42	35	Control

Can be seen from the table(4) The value of T favoritism(7, 143)Greater than the tabular value(2)At a significance level(0.05 =α) and degree of freedom(68)And therefore rejects the second null hypothesis, which states that " there is no statistically significant difference at a significant level(0.05 =α)between the mean scores of the experimental group students who studied using the molecular representation strategy and the average scores of the control group that were studied in the usual way in the self-efficacy scale, which means the superiority of the experimental group over the control group in the self-efficacy scale

-Interpretation of results - The results of the study showed the superiority of the group that was studied according to the strategy of molecular representation over the control group that was studied according to the usual method of academic achievement and this is consistent with previous studies such as the Rajab study(2012)This is due to the fact that the strategy of molecular representation is a fun way to learn chemistry because it two-dimensional presentations, models, colored drawings and the display of images that helped students to imagine things that are not seen with the naked eye , such as atoms, electrons and molecules, and represent them in a molecular representation that carries inside the information they want to acquire, which gives students the opportunity Identifying the information that is not available in the textbook and thus makes the learning process attractive, interesting and interesting, and the strategy emphasized the active role of students during learning, and that the strategy contained methods to attract attention and raise motivation learning helped to develop mental abilities through their practice of practical activities towards the mentality, which is done

through drawing and representation of chemical phenomena, which led to an understanding of the abstract nature of chemistry by clarifying the movement of movements and exchanges, and the strategy gave the students the freedom to move easily between the three levels of thinking (apparent, symbolic and molecular) and thus improve their academic achievement in chemistry in general and this is consistent With the result of Rajab's study (2012)

-Okzlk study results showed the experimental group on the group exceeds the control in a measure of self - efficacy is attributed to the molecular representation strategy has worked to strengthen students confidence in themselves and their abilities on the one hand as well as the strengthening of trust between them and school material on the other hand for the strategy given the opportunity to Sister J R For students to work on their own ,think and express their experiences, which increased their interest in carrying out duties while spending extra effort and time in completing them . The strategy also provided fun and suspense through pictures and colored drawings of abstract things , which led to engaging in learning and was reflected in their sense of self-efficacy and its enhancement, and this is consistent with the result of the study of Midoun and Abi Mouloud (2014)

Recommendations :In light of the results of the current study, the researcher recommends the following:

1 -Directing those in charge of teaching sciences in general and chemistry in particular to use the strategy of molecular representation in teaching in the middle school because of its effect on improving students' achievement and self-efficacy.

2 -Holding training workshops for chemistry teachers with the aim of enabling them to activate the strategy of molecular representation and design their lessons according to it and help them design educational activities for students that enable them to move between the three levels (virtual, symbolic and molecular)

3 -The necessity to provide educational and educational programs that raise the level of self-efficacy of female students in the middle stage, and this can be done through the curricula

4 -The interest of the authors and developers of curricula and teaching methods using the strategy of molecular representation in the intermediate school chemistry curriculum.

The proposals:

To complement the current study, the researcher proposes the following:

1-Study the effectiveness of using the strategy of molecular representation in teaching chemistry and for the different stages in achievement and self-efficacy.

2-Conducting a similar study to identify the effect of the molecular representation strategy on other dependent variables such as developing thinking of all kinds ,scientific enlightenment, trends and multiple intelligences

3-Conducting a similar study to identify the effectiveness of the molecular representation strategy in other study subjects.

4 -Preparing a proposed program for in-service training of teachers on the use of this strategy in teaching and its impact on their performance in teaching and the achievement of their students

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