International Journal of Innovation, Creativity and Change. www.ijicc.net
Volume 13, Issue 5, 2020

The Impact of Molecular Representation Strategy on Academic Achievement and Self-Efficacy among the 2nd Female Graders Students in Chemistry

Hiam Ghaieb Hussein [a], Israa Naji Kazim [b], [a,b] Chemistry teaching methods
Diyala University, College of Basic Education, Iraq

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 and 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 (α=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 experimental 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.

Key words: *Molecular Representation strategy, Self-efficacy.*

Introduction:

Science in general and chemistry in particular include a lot of abstract concepts that need to be clarified and facilitated, so students consider it a complex and difficult material for its abstract nature, and it is necessary to adopt modern strategies and methods that focus on linking scientific material to the student's life and make him an active participant in the educational process, especially that Most studies and research in this field showed that most chemistry teachers are still adopting traditional methods of teaching based on memorization and indoctrination, which led to a clear weakness in the achievement of second grade students in chemistry and this is confirmed by Uday studies This was done by Owaid study (2005) and

Masoudi study (2016), and through the researcher's modest experience in teaching in middle schools and discussing it to some teachers and supervisors of chemistry during the holding of seminars and training courses found there is a decrease in the scientific level of this article and this was confirmed by seeing their grades and according The General Directorate of Education in Diyala and for previous years, where there was a clear decrease in success rates, the scientific content of chemical topics at this stage has a lot of difficulty that need effective teaching strategies contribute to increase students' achievement and self-efficacy in order to employ life situations And help them to explain many chemical phenomena and self-efficacy is an important psychological variables that guide the behavior of the individual, and contribute to the achievement of personal goals (Abu Ghali, 2012), because it helps the individual to determine the amount of effort exerted in a particular activity and the amount of perseverance in the face of obstacles Difficult attitudes and the greater the sense of effectiveness, the greater the effort and perseverance (Pazares, 2005) and the low self-efficacy of students due to the frustration faced by the difficulty of the material prompted the researcher to conduct this study and the use of molecular representation strategy, a modern strategies emanating from the system Constructivist, ie, it depends on the depth in the meaning in understanding chemical phenomena, which may help increase the achievement of students and raise their self-efficacy, so the problem of the study can be identified in the presence of a decrease in the achievement of second-grade students and their self-efficacy towards chemistry. For the following questions:

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

- What was the effect of using the molecular representation strategy in the subjective effectiveness of second grade students in chemistry.

The Importance of Studying

The current era is witnessing a wide scientific and rapid development in the field of learning and teaching reflected positively on educational institutions and led to the search for teaching strategies based on the student greatly and help increase the level of educational attainment, and because science in general and chemistry in particular from one of the basic scientific branches Which contribute to the improvement and development of human life and solve problems, and lies within it many abstract concepts such as atoms and molecules that are difficult to learn, except in the light of modern strategies that contribute to the improvement of teaching methods, especially in the field of teaching chemistry, including those strategies Astra Molecular representation is one of the strategies based on the principles of structural theory and is based on three levels, namely the virtual, symbolic and molecular levels. It works to clarify the internal elements in chemical phenomena and equations and represent them

molecularly through the use of molecules and atoms and how they relate. From the apparent level to the deeper in the processes that occur at the molecular level and become figures and symbols in chemical formulas have clear meanings has (Lambo Saidi and Baloch, 2009), as many studies indicated p The effectiveness of this strategy in the understanding and interpretation of scientific phenomena such as the study of Baloch (2009) and the study of Tasker and Dalton (2006), the teaching strategy is the cornerstone that depends on the success of the educational process as it is as appropriate to the educational situation to achieve the desired educational goals and lead to solve problems The importance of this study stems from the confirmation of recent trends on the role of the learner in the educational process to be active and active, and not a future or recipient of knowledge, but is an initiative and planned and based All educational activities) writtrock, 1990, p.35 Kitami and Kitami 2000), also emphasizes education on the students' education To become self-directed learners to search for new information and master skills (Paris and Lipson, 1948), and that the learner has a role in assuming responsibility for his learning and this responsibility will contribute to increasing his ability to retrieve information stored in memory (Katami and Katami, 2000) The most effective learners in learning situations are those who focus on self-organization and adopt a perfect approach to learning (Butter and Winne, 1995), so self-efficacy is of great importance to students as it improves their confidence in their ability to pursue and excel in study, and increase their possession of skills. Personal, academic and other which increases Based on the above, and based on the importance of the intermediate stage as it represents an important transitional stage which represents the beginning of maturity, the present study derives its importance from its contribution in trying to change from the traditional teaching methods and the use of molecular representation strategy which is in line with modern trends. Many studies have confirmed that the methods of teaching chemistry in the country schools emphasize conservation, which led to a low level of achievement, while the importance is applied. The present study draws the attention of chemistry curriculum planners on the need to include modules based on the molecular representation strategy, as well as help to achieve the advantage of using this strategy in the teaching of chemistry through the results that will contribute to encourage teachers to use this strategy in Teaching and informing decision makers of the importance of self-efficacy among students in order to provide them with a suitable learning environment that fosters the development of self-efficacy among students so that they can achieve high levels of educational attainment.

Objectives of the Study

The present study aims to identify:
- The effect of the molecular representation strategy on the achievement of second grade students in chemistry

- The Effect of Molecular Representation Strategy on Self-Effectiveness of Second Grade Intermediate Students in Chemistry

Study hypotheses

- There is no statistically significant difference at the level (α = 0.05) between the average scores of the experimental group studying chemistry according to the molecular representation strategy and the average score of the control group students studying the same material according to the traditional method of achievement test.

- There is no statistically significant difference at the level (α = 0.05) between the mean scores of the experimental group studying chemistry according to the molecular representation strategy and the average scores of the control group studying the same material according to the normal method on the scale of self-efficacy.
Study limits: The study was limited to:

- Second grade intermediate students in middle schools in (Baquba / Diyala province)
-The first semester of the academic year 2018-2019

- The first, second and third semesters of the chemistry chapters in the book of science, the first part of the second intermediate grade, 2017.

Study Terms and Definitions

- Molecular representation strategy defined by:

Al-Muqbali (2003): An explanation of chemical phenomena by describing how the molecules, atoms, and ions are arranged and moving.

Karjic and Selway (2001): An explanation of chemical phenomena by describing how the molecules, atoms and ions are arranged and moved

(Wu; Krajck and SoLo way, 2001)

The researcher defines it procedurally: It is a constructive educational strategy used in the interpretation of chemical phenomena by describing the order and representation of the movement of molecules and atoms using spheres and illustrations and is represented molecularly according to three levels (virtual, symbolic and molecular level) (Repair, 2016).

Collection was Defined by

Abu Dayyah (2011): The sum of the skills, knowledge, attitudes and values acquired in a period of time compared to the set of skills, knowledge, attitudes and values to be acquired (Abu Dayyah, 2011).

- Abu Zeina and Abayneh (2010): knowledge, understanding and skills acquired by the learner as a result of exposure to specific educational experiences (Abu Zeina and Abayneh, 2010)

Procedurally: the amount of result obtained by students in the experiment as measured by the total score obtained by students by answering the paragraphs of the achievement test prepared for this purpose (Abou, 2012)

Self-Efficacy has been Defined by

Al-Farehat (2017): The beliefs that the individual possesses and determines his ability to perform and guide behavior, which is reflected in his activities and how he deals with the situations he faces in life (Al-Farehat, 2017)

(Gillihan, 2002): Beliefs in an individual's ability to produce a task.
(Gillihan, 2002)

- Justice (2001): the confidence of the individual in his abilities, during new situations, or situations with many demands and unusual, or are the beliefs of the individual in his personal power with a focus on efficiency in the interpretation of behavior without sources or other reasons for optimism (Justice, 2001)

Procedurally: is the expectations of the individual in different situations and reflected on the choice of activities involved in the completion of behavior and measured self-efficacy to the degree that will be obtained by the sample of the study on the scale of self-efficacy prepared for this (Olive, 2007)

Theoretical Framework and Previous Studies

Molecular Representation Strategy

Molecular representation strategy is a modern strategy which is derived from the constructivist theory, which emphasizes the building of the learner's knowledge, and use it on the other hand, understanding is the heart of constructivism and its essence, which requires the teaching of chemistry in order to understand, and make learning meaningful, and keep it, and employ it in

situations The new learning to be a learner with a scientific culture and responsive to issues and problems effectively and ably (Zaytoun, 2007), and constructive learning depends on the idea that the learner builds his knowledge himself, so the teacher in the structural class is no longer a carrier of knowledge, but a facilitator of the learning process, and has to Knows that us Knowledge is different among educated students, due to the difference of previous knowledge, interest and degree of participation (Zaytoun, 2007). Therefore, students have difficulty in explaining what is happening in the invisible world. Therefore, understanding the molecular nature of matter and visualizing the interactions between atoms and molecules in their representation is the basis for understanding the abstract nature of chemistry and building a concept. Modern scientific strategies have emerged in teaching chemistry that emphasize building an understanding of chemistry. Molecular details are forgettable if they do not fall within a conservative system. Understanding basic principles contributes to more effective transmission of learning. Thus, the study of chemistry, including its symbols and formulas, is available. For all, the process of understanding the chemical representations by students is one of the most important goals of teaching chemistry, where understanding is the ability of students to recognize three levels or so-called ways of thinking level in chemistry, namely (Amuriyah, 2011):

- Virtual level (sensible): is all you can see with the naked eye of the surrounding phenomena through a practical experiment or watch a video or display images and depends on the interpretation of physical properties in terms of form, color, size and chemical properties

- Symbolic level: the extent to which the learner can convert his observations of the surrounding phenomena or laboratory observations into mathematical laws, illustrations, chemical formulas or chemical equations (Awid, 2005).

- Molecular level: It explains chemical phenomena using atoms and molecules to indicate the shape and movement of electrons during chemical reactions. This level is related to the nature and structure of the system and the movement of matter minutes and its relation to the change in chemical properties (Amorieh, 2011) (Aboudia, 2011).

The strategy of molecular representation is defined as the use of phenomena and molecules and their interrelationships in the interpretation of phenomena (Al-Balooshi, 2003). This strategy has several names, including molecular representation, molecular model, and particle representation. So this strategy is used to explain chemical phenomena and visualize the visual world through anthropomorphisms and illustrations and by describing how the atoms and molecules are arranged (Islah, 2016).

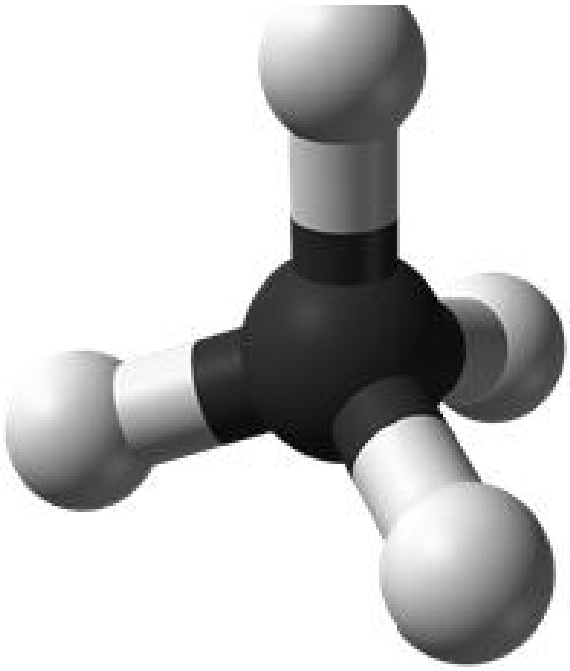
It should be borne in mind that the opportunity for students to learn tangible is limited, and the greatest reliance is on abstract education, and therefore the student does not find the opportunity to match the imagination of the world of atoms and molecules with something tangible in front of him, hence the importance of designing sensible or semi-tangible experiences that approximate the abstract molecular nature of chemistry (Farhat, 2017). These experiences are two-dimensional or three-dimensional drawings, and molecular models of chemical compounds (Ambo Saidi and Balooshi, 2009).

Methods of Molecular Representation Strategy

There are several methods identified by Ambo Saidi and Al Balooshi (2009), including:

Three-dimensional representations: This is the use of stereoscopic models or modeling clay or computer programs that allow the teacher and the student the opportunity to imagine atoms or molecules and design 3D models (Medoun et al., 2014).

Figure 1.



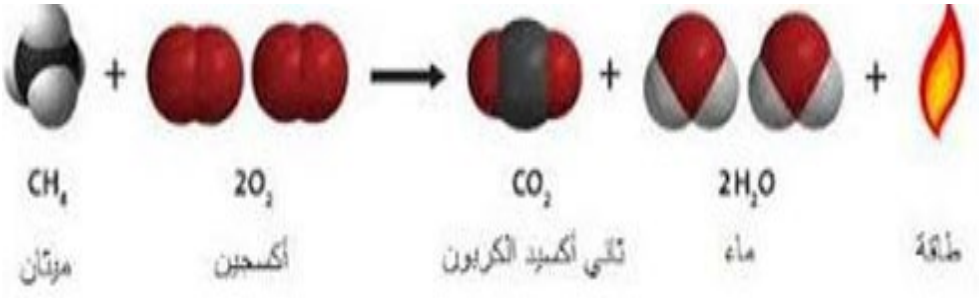
- Two-dimensional representations: The teacher or student in this way to represent molecules or atoms using circles and drawings with the addition of some colors indicating the different types of atoms, and there are two types of two-dimensional representations

1- Combination between the apparent and molecular levels. This type is done when using the image taken or drawn for the chemical phenomenon.It has to clarify the molecular components of the elements involved in this phenomenon and the direct link between the phenomenon, and what happens at the molecular level leading to an accurate explanation of the causes of the phenomenon and the ability to imagine (AL-BaLushi, 2003); (AL-BaLushi, 2009).

Figure 2. Silver Atoms Gold Atoms Gold Atoms

2 - the integration of the symbolic and molecular levels and in this way add some molecular clarifications of the equations are in this way add some molecular illustrations of symbolic equations such as clarifying the movement of movements and exchanges that occur at the molecular level during the occurrence of chemical reaction, and understand the numbers in it as the number of molecules is before The number of atoms is written after the symbol, and it helps to balance the equation and detect errors in how the atoms are bound together within a single molecular formula (Wittrock, 1990).

Figure 3. Illustrating the use of anthropomorphisms to illustrate the merging of the symbolic, molecular levels



Verbal representations: The description of scientific phenomena outwardly in chemistry without delving into the molecular levels remains the student at the virtual level and thus lead to misconceptions, so the written language that describes the phenomenon can be converted to a language that uses molecular terms such as atoms and molecules (Ambo Saidi and Baloch, 2009)

The Philosophical and Psychological Foundations of Molecular Representation Strategy

Abstract concepts in chemistry according to Ospel theory of secondary concepts are concepts that do not have concrete examples such as atoms and molecules and the number of moles and others, and this is because students lack the tools to transport them to imagine the world of atoms, molecules and others, or they do not know how to employ them In understanding the nature of the phenomenon, if they have the right tools to study the phenomenon and are able to build relationships between these tools, the natural result is that their understanding corresponds to the scientific interpretation of the phenomenon, and if they do not have the ability to link between the tools and use them The result is that they have the wrong understanding. For example, many students believe that atoms are soft in the liquid state and solid in the solid state. They know that matter is made up of molecules and atoms, but they have failed to construct a scientifically acceptable understanding using their previous information If they have inappropriate tools to study the phenomenon, they may try to use these tools to synthesize their understanding of the phenomenon and as inappropriate tools, so students fall into a more misunderstanding of the scientific phenomenon, and the view that new knowledge is formed using the scientific method and then added To know the range of experiences in the mind is an inaccurate view because the student's mind is not an open file for the teacher to enter everything he wants and therefore must be cautious when providing these tools for students, and the developmental stage according to Piaget's classification of cognitive development, which corresponds to the strategy of molecular representation is the formal procedural stage Students develop the ability to think abstractly, which is consistent with the abstract concepts contained in the science of chemistry related to molecules, atoms, and others, but the thinking abilities of students with abstract concepts at the middle school age can not be easily absorbed and understood However, there is a learning environment that brings these abstract concepts closer to their minds by using various teaching methods such as stereotypes, animations and computer programs (Lee, et.al, 1993).

The strategy of molecular representation aims to

1. Developing the ability to imagine and form mental images of chemical compounds and reactions. This strategy works with the visual capabilities that it provides to expand the imaginary perceptions of students and build a clear mental image of chemical compounds and

processes that are not seen by the naked eye. Protons and electrons can be developed by three-dimensional or two-dimensional representations

2 - Link between the three levels of chemistry (virtual, symbolic and molecular) The three levels of thinking in chemistry makes the student easily move between these levels so that it is difficult to convert his laboratory observations to molecular representations, as confirmed by the study Tasker and Dalton (2006). (Lambo Saidi and Al Balooshi, 2009)

3. Improve students' understanding of chemical concepts:

It simplifies how chemical reactions occur, such as the exchange of atoms and atomic groups for the formation of compounds, and the teaching of equations, their weight, and related concepts such as equivalence and number of moles.

4. Correcting chemical misconceptions:

There are many chemical misconceptions in which students fall into the world of atoms and molecules and representations at the molecular level correct them through their molecular representation (Ambo Saidi and Al Balushi, 2009).

The strategy of molecular representation has several advantages, including:

1. Develops the ability of learners to imagine the interactions between atoms and molecules in building accurate and scientifically sound chemical concepts
2 - Enhances the enthusiasm of the learners because of the practical applications and the possibility of representation of the molecular representation.
3 - lead to change the ideas of learners, which increases their motivation to learn
4. Increase 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, molecular).
6 - Addressing learning experiences, which eliminates many of the misunderstandings generated by learners in the subject (Rajab, 2012)

This strategy has a number of drawbacks, including:
- Need time for practical and verbal activities and the transfer of students to and from the laboratory.
- Cost is relatively high, requiring the availability of chemicals and laboratory tools not available in most of our schools.
- Need a great effort by the teacher in the preparation of materials and tools and arrange laboratories. (Aslih, 2016) The role of the teacher and the strategy of molecular representation

of the material is to identify the objectives and formulate them and prepare for the activity to be implemented as well as identify and explain the steps of conducting the experiment and strategy clearly and specifically, and follow-up and supervise students during the implementation of the activity in terms of their representation of phenomena using atoms or molecules and discuss students To learn the extent of understanding the subject and evaluate them to avoid future weaknesses. It can be minimized in the learning of scientific phenomena in their molecular level by several methods, including:

- The teacher uses binary illustrations using the usual blackboard or transparencies
- Training students to interpret and convert natural phenomena and their apparent level to the molecular level using drawings
- The teacher uses physical models, such as the use of balls and balloons and others
- Training students on the practice of linking the phenomenon to its three levels when interpreting the phenomenon using drawings through worksheets or classroom activities (Rajab, 2012)
- The teacher uses 3D graphics using computer simulation.

Steps of Molecular Representation Strategy

- Students are divided into groups of 4-6 members each.
- The teacher explains the activity that the students will do
- The teacher distributes activity worksheets for each group
- The working paper deals with the steps of the application of the activity in accordance with teaching techniques prepared in advance
- Students use teaching techniques to illustrate the three levels (virtual, symbolic and molecular) of the subject and using both or some of the following multimedia (artificial clay, animation and simulation using PowerPoint, 3D computer software, multiple representations)
- Students deduce concepts related to the subject of the lesson

Self-Efficacy

Self-efficacy is one of the concepts of modern psychology as referred to by Pandora in the theory of cognitive social learning.Pandora has proposed the concept of self-efficacy, which represents the expectations of the individual and his beliefs that enable him to carry out any particular action successfully, individuals who have more self-efficacy do better on Many types of tasks compared to those with less self-efficacy (Beck, 2004)

Self-efficacy is one of the important psychological variables that guide the behavior of the individual and contribute to the achievement of personal goals (Abu-Ghaly, 2012) .How to think and believe the individual influences his behavior, as these beliefs constitute the main

key to the driving forces of this behavior has, as it works to explain his achievements Based on the abilities he believes he possesses, making him do his best to succeed (Bandura, 1997) Pandora emphasizes the principle of reciprocal determinism in social learning, emphasizing the interrelationships between behavioral factors, the environment and factors influencing the behavior of individuals, where self-efficacy plays Dr When students have an idea of themselves as intelligent and acceptable, they tend to act on this idea and the process is reciprocal since the behavior of the individual influences the way and how he perceives himself, so individuals' perceptions of their own effectiveness affect their lives. In their choices, they are successful if they have high efficacy, and depressed if they have low efficacy (Bandura, 1997). And the amount of prayer In the face of difficult situations, the greater the sense of efficiency, the greater the effort, perseverance and solidity, individuals with high self-efficacy deal with difficult problems and activities with more sense of calmness and sobriety (Pajares, 2005). It does not mean self-efficacy, including beliefs about what he can do and represents the epistemological axis of operations (Bandura, 2007) .If an individual has a belief in his or her ability to perform a task, it will increase his focus, effort and involvement in this. Mission, while he The individual had the skill and knowledge to complete the task, this does not necessarily mean its ability to completion (Zimmerman and Cleary, 2006)

The importance of self-efficacy stems from its impact on multiple manifestations of individual behavior through

-Achtaar activities: that thinks he will succeed in solving it, and avoids which he believes will fail to solve

-Altalm and achievement: Individuals with a high sense of self-effectiveness tend to learning and achievement more than their counterparts with a low sense

Individuals with a high sense of self-efficacy tend to make greater efforts when they try to accomplish certain tasks and are more persistent when faced with impediments to their progress and success. Individuals with a low sense of self-efficacy make less effort to perform tasks and quickly stop working. When faced with obstacles to the achievement of the task

Self-efficacy is influenced by several factors, including personal effects, environmental influences, and behavioral influences (Zimmerman, 1989). Pandora believes that self-efficacy has three dimensions:

-Alvaalah: which means the level of motivation of the individual performance in the areas of different positions, and that level varies depending on the nature or the difficulty of the situation

-Alamomcih: the transmission of the expectations of effectiveness to similar situations, often, individuals generalize their sense of effectiveness in a similar position to which they are exposed to situations

- Strength where the sense of personal effectiveness is about high perseverance and high ability to choose activities that perform successfully (Bandura, 1997)
previous studies :

- Studies on the strategy of molecular representation

- The study of Rajab (2012) revealed the effectiveness of the particle representation strategy of the material in the development of chemical concepts and visual thinking skills in science among the ninth grade students in Gaza, where the sample of the study included (70) students from the ninth grade distributed in two control and experimental groups. The study indicated 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 for the benefit of the experimental group.

- ALBLushi (2009) study aimed to detect the mental image at the molecular level of the material for science teachers, where the sample of the study included (22) science teachers, the results indicated the lack of a homogeneous mental model of the atom to explore chemical phenomena and this explains that many learners may be difficult They have to study abstract chemistry and explain chemical phenomena

- Tasker and DaLton (2006) conducted a study aimed at how to visualize the molecular world using drawings and moving molecules through a program called Vischem based on animation drawings of chemical representations at the symbolic and molecular levels. The results indicated the effectiveness of the program in assessing the students' deep understanding in terms of molecular level structure and processes.

-Ardac and Akaygnn study (2005) aimed to introduce the effectiveness of teaching method based on the representation of molecules in multimedia in the students' understanding of chemical changes. The experimental method was used. The sample of the study consisted of 49 students from the eighth grade divided into two control and experimental groups. The study indicated that the experimental group and the effectiveness of the multimedia program were superior to students' understanding of chemical changes and their solution.

Al-Muqbali (2003) conducted a study in the Sultanate of Oman aimed at knowing the effectiveness of teaching using molecular representation in the study of chemistry on the interpretation of the second secondary scientific students of chemical phenomena and

modifying their conceptual errors. The sample of the study consisted of (120) students distributed to two experimental and control groups. The results of the study showed a statistically significant difference in favor of the experimental group.

In reviewing previous studies, we observed a variety of objectives, study sample and tools. Al Balooshi's study (2009) aimed to study mental images at the molecular level of material for science teachers, while Rajab's study (2012) aimed at developing concepts and visual thinking skills for the preparatory stage. The concept test, and the study of Al-Muqbali (2003) dealt with the use of molecular representation in the interpretation of chemical phenomena of the secondary stage and modify their conceptual errors by preparing the concept test. Undergraduate study, Adrac and Kaygun (2005) addressed visually enhanced teaching based on molecular representation and the sample of the study is the preparatory stage. The present study differed with the previous studies in terms of objective, sample and study tools. It dealt with the achievement and self-efficacy of second-grade students in chemistry. An achievement test and a measure of self-efficacy were prepared as study tools.

- Studies on self-efficacy

The study of Midoun and Abi Mawloud (2014) aimed to reveal the level of both self-efficacy and academic compatibility among a sample of middle school students, and the sample of the study consisted of (798) students who were randomly tested, and the results showed that the level of self-efficacy and academic compatibility. High in the experimental group, and that there are fundamental differences between pupils and pupils in the academic consensus for the benefit of pupils.

- The 2003 study (Wilke) aimed to investigate the impact of employing active learning strategies in academic achievement and motivation and self-efficacy of the students of the University of Angelo in the United States of America in physiology, and was prepared a test achievement and measure of motivation, the results showed the superiority of the experimental group in both achievement test The motivation scale, they had positive attitudes towards active learning.

- Through a review of studies on self-efficacy is the study Midoun and Abi Mouloud (2014), which aimed to know the level of self-efficacy and academic compatibility of the intermediate stage, while Wilke study (2003) examined the impact of active learning strategies in the achievement, motivation and self-efficacy of the undergraduate

- The present study has dealt with the effectiveness of the molecular representation strategy in the achievement and self-efficacy of second-grade students in chemistry.

The previous studies were used to write the theoretical framework of the strategy and the preparation of study plans as well as the preparation of the measure of self-efficacy and statistical methods.

Study Procedures

The researcher chose the experimental method for the purpose of achieving the study objective.

Striped (1)

Dependent variable	Independent variable	Group
-Academic achievement test - measure of self - efficacy	Molecular Representation strategy	experimental
	Ordinary method	control

Study community and sample

The study population includes the middle day schools for girls in the city of Baquba, Diyala Governorate for the academic year (2018-2019), and the medium (delight for girls) was chosen intentionally to apply the study experience to provide all the possibilities that help to conduct the experiment. After the exclusion of the repetitive female students, there were 70 students divided into two experimental and control groups.

Equality of female students in both study groups:

The researcher made sure that the two study groups were statistically equal in some of the variables related to the study.

Table 1: Represents the equivalence of the two study groups in previous achievement, chronological age and intelligence

Statistical significance	t-caluclated	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	
	0.56	2	6.9	30.94	35	experimental	intelligence
		2	6.7	30	35	Control	
	0.42	2	8.84	174.17	35	experimental	Time age month
		2	8.6	173.3	35	Control	

Study Requirements

- Determination of scientific material: The scientific material is determined by the first and second semesters of the chemistry chapters of the book of science scheduled for the academic year (2017-2016) and take these classes (6) weeks (2) lessons per week

-Development of behavioral goals: A number of behavioral goals were formulated distributed at the three lower levels of Bloom's classification of cognitive domain (remember, absorb, apply) In the light of the views of a group of experts Appendix (1) has been added and modified some of the goals and thus became the number of adopted goals is (120) Behavioral goal
- Preparation of teaching plans (12) of the necessary teaching plans were prepared for each group to cover the study material in the three chapters and according to the behavioral objectives set previously, and the plans were presented to a group of experts in the curricula and teaching methods, and some of them were adjusted and 80% Consensus to be finalized Annex (2)

-Adata study

The study requires an achievement test in chemistry and a measure of self-efficacy
- Constructing the Achievement Test: The researcher prepared a test consisting of (30) test items of multiple choice type with four alternatives. The questions and paragraphs were

distributed according to the behavioral objectives at their three levels, and one score was set for the correct answer for each of the test items and zero for the wrong and abandoned answer.

-The authenticity of the test has been confirmed through

- virtual honesty: the researcher presented the test paragraphs to a group of experts in the field of curricula, teaching methods and chemistry, in order to identify their views on the validity of paragraphs and sound drafting was adopted (80%) of the consensus of the arbitrators in the validity of the paragraph as a minimum to accept the paragraph within the test Thus, the number of paragraphs of the test (30) test paragraph, and thus achieve virtual honesty.

- Content validity: The researcher has prepared a table of specifications (test map), which is one of the indicators of the truthfulness of the content and deals with the test paragraphs and their contents in terms of their order, number and representation aspects and dimensions to be studied well, according to the relative weight of each part, that is, a table linking the objectives and shows the relative weight For each of the different parts and the extent to which the behavioral purposes of the material, and thus verified the content of the material.

Table 2: Specification Table

total	Percentage of behavioral goal level			Academic content			chapter1635
	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		total

- Statistical analysis of the test items: The survey was applied to a sample of (60) female students (secondary hopes for girls) and was conducted statistical analysis of the test items to calculate the coefficient of difficulty, ease and discriminatory power of the paragraphs and the effectiveness of the wrong alternatives. The stability coefficient is 79, 0 and is a good stability coefficient.

- After the completion of finding the validity and reliability of the test and statistical analysis of its paragraphs, the test is ready and its final form consists of (30) paragraph annex (3)
Second: the measure of self-efficacy

After reviewing the previous studies and taking advantage of the measures of self-efficacy, the researcher formulated the paragraphs of the scale and may be from (27) paragraph and also chose (3) alternatives for each paragraph and these alternatives weights ranging (3-2-1) which is fully agree and get (3) Somewhat Agree and you get (2) I disagree and you get (1)
In order to ensure the validity of the scale, it was presented to a group of experts with specialization. The required amendments were made and the paragraphs that did not get the required agreement percentage of 80% of the experts' opinions were deleted. For the scale

As has been confirmed the stability of the meter in a way where the re-test was applied on the same scale exploratory sample it was re-applied two weeks after the same sample in the first application and after calculating the correlation coefficient found that the reliability coefficient is 81 ,. This indicates that it has a high degree of stability, and thus has been verified the validity and stability of the scale and has become in its final form of (24) paragraph annex (4)

- The study groups were started by the school of chemistry after providing the necessary teaching plans and clarifying the objective of the study and follow-up continuously to see the application of the experiment, which started on (7/10/2018) until (18/11/2018), and the achievement test was applied The measure of self-efficacy after the completion of the application of the experiment and one day on (20/11/2018) on the study sample was statistically processed and analyzed the results down to the objectives of the study.
Statistical Methods: The researcher used the Statistical Program Ready for Social Sciences (SPSS)

View and Interpret Results

View Results

In order to verify the validity of the first zero hypothesis, the mean and standard deviation of the scores of the experimental group and the total control were obtained in the achievement test, using the T-test for two independent samples. The calculated T value was found as shown in Table (3).

Table 3: shows the arithmetic mean, standard deviation and the calculated and tabulated T value of the two study groups in the achievement test

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

The above table shows that the calculated T value (8.85) is greater than the T value (2) at α = 0.05 and the degree of freedom (68). = α) between the average scores of the experimental group studied using the molecular representation strategy and the average scores of the control group students 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

Self-efficacy

In order to verify the second null hypothesis, the arithmetic mean and the standard deviation of the experimental and control scores were found in the self-efficacy scale, using the T-test of two independent samples.

Table 4: shows the arithmetic mean, standard deviation and the calculated and tabulated T value of the two study groups in the self-efficacy scale

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

Table (4) shows that the computed T value (7,143) is greater than the tabular value (2) at the level of significance (α = 0.05) and the degree of freedom (68), and therefore rejects the second zero hypothesis, which states that "there is no statistically significant difference At the significance level (α = 0.05) between the mean scores of the experimental group studied using the molecular representation strategy and the average scores of the control group studied in the usual way in the scale of self-efficacy, which means that the experimental group exceeds the control group in the scale of self-efficacy

- Interpretation of results - The results of the study showed that the group studied according to the strategy of molecular representation than the control group studied according to the usual method of academic achievement and this is consistent with previous studies such as Rajab study (2012) and this is because the molecular representation strategy is a fun way to learn chemistry because Two-dimensional presentations, embodiments, color drawings, and image presentations helped the students to imagine things that could not be seen with the naked eye, such as atoms, electrons and molecules, and to represent them in a molecular manner, which contained the information to be acquired. Recognizing the information not available in the textbook and thus makes the learning process attractive and interesting and interesting, and the strategy emphasized the active role of students during learning, and that the strategy contains ways to attract attention and stimulate the motivation towards learning helped to develop mental abilities through their activities Practical and mental, which is through the 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 students freedom to move easily between levels of thinking Ath (virtual symbolic and molecular) and thus improve their academic achievement in chemistry in general, and this is in line with the result of the study of Rajab (2012)

- The results of the study also showed that the experimental group surpassed the control group in the measure of self-efficacy. This is due to the fact that the molecular representation strategy has worked to enhance the confidence of the students themselves and their abilities on the one hand, as well as enhancing the confidence between them and the material school on the other hand because the strategy gave the students the opportunity to choose and work for themselves. Thinking and expressing their experiences increased their interest in carrying out the duties while spending extra effort and time in accomplishing them. The strategy also provided fun and suspense through pictures and colored drawings of abstract objects, which led to the involvement in learning and reflected on the sense of M Pfaalathm self-promotion and this is in line with the result of the study of Meudon and my father born (2014).

Recommendations

In light of the results of the present study, the researcher recommends the following:

1 - Guiding those who teach science in general and chemistry in particular using the strategy of molecular representation in teaching in the intermediate stage because of its impact in improving the achievement and self-efficacy of students.
2 - Holding training workshops for chemistry teachers in order to enable them to activate the strategy of molecular representation and design their lessons according to them and help them to design educational activities for students to enable them to move between the three levels (virtual, symbolic and molecular)

3-The need to provide educational and educational programs that raise the level of self-efficacy of students in the intermediate stage, and can be done through curricula
4. Interest of the authors and developers of the curriculum and teaching methods using the molecular representation strategy in the chemistry curriculum for the intermediate stage.

Proposals

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

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

2. Conducting a similar study to identify the impact of the molecular representation strategy on other dependent variables such as the development of types of thinking, scientific enlightenment, trends and multiple intelligences.

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

4 - Preparation of a proposed program to train teachers in service on the use of this strategy in teaching and its impact on their performance in teaching and student achievement

REFERENCES

Abou, G.A. (2012). Self-efficacy and its relationship to the pressures of life of married students at Al-Aqsa University. Journal of the Islamic University of Educational and Psychological Studies, 1(20): 619-654.

Aboudia, A. A. (2011). Contemporary methods in teaching social studies. Amman: Al-Masirah Publishing House, 4(67): 151 – 167.

Abu, Z., Farid, K. & Abayneh, A. Y. (2010). Curricula for teaching mathematics for the first grades. 1st floor, Amman Al - Masirah Publishing & Distribution House, 5(27): 225-236.

Adrac, D. & Aka, Y.S. (2005). Using static and dynamic visuals to represent chemical change at molecular level. International Journal of Science Education, 2(11): 1269.

AL-BaLushi, S.M. (2003). Erpering Omani pre-service science teachers imagination ate the microscope level in chemistry and their use of paractiulate nature of matterin their explanation dissertation abstracts international, 1(67): 264-211.

AL-BaLushi, S.M. (2009). Factors influencing pre-service science teachers Imagination ate the microscope Level in chemistry. International of Science and Mathematics Education, 7(6): 1089-110.

Amuriyah, F. (2011). Teaching chemistry, challenges and solutions. Education Letter, 2(31): 119-122.

Awid, F.A.H. (2005). The effectiveness of concept maps in acquisition of chemical concepts among second grade intermediate students. Unpublished Master Thesis, Diyala University, College of Basic Education.

Bandura, A. (2007). Muchado over afaulty conception of Perceived self effieacy groundety experimentation. Journal of Social and Clinical Psychology, 6(26): 641-658.

Butter, R. & Winne P. (1995) .Feed back and self regulation learning: A theoretical synthesis. Revsew of Educational Research, 3(65): 245-281.

Farhat, A. A. (2017). Social intelligence and its relation to self-effectiveness among students of Ajloun University College, Jordan: Taibah University Journal for Educational Sciences, 12(2): 207-225.

Justice, A.M. (2001). Analysis of the relationship between the components and the ability to solve social problems and both self-efficacy and risk orientation, Ain Shams University, Part I, No., Cairo: Journal of the Faculty of Education, 6(25): 121-178.

Katami, Y. & Katami, N. (2000). The psychology of classroom learning. Amman: Dar Al-Shorouk for Publishing and Distribution.

Masoudi, S. A. A. H. (2016). Educational design in accordance with brain-based learning and its impact on the achievement of chemistry and mental capacity in second grade intermediate students. Unpublished Ph.D. Thesis, University of Baghdad, College of Education for Pure Sciences, 4(70): 127 – 138.

Medoun, M., Abi, M. & Abdel, F. (2014). Self-efficacy and its relation to academic compatibility among a sample of pupils of intermediate education, 8(17): 105-118.

Muqbali, F. (2003). The effectiveness of using molecular representation in scientific interpretation of chemical phenomena and modification of conceptual mistakes among second grade students in Al-Omani secondary school. Unpublished Master Thesis, Sultan Qaboos University, 2(36): 156 – 162.

Olive, A. (2007). Structural theory and strategies for teaching science. 1st Floor, Amman: Dar Al-Shorouk for Publishing and Distribution, 3(47): 252 – 268.

Pajares, F. (2005). Over view of social cognitive theary and self –efficacy. Educational and Psycholgical Measurement, 3(68): 434-463.

Paris, S., Cross, D. & Lipson, M. (2017). Informed strategies for learning: Aprogram to improve childrens, wading awareness and comprehension. Journal of Educational Psycholgy, 1(76): 1239-1252.

Rajab, A. (2012). The effectiveness of the particle representation strategy in developing chemical concepts and visual thinking skills in science among ninth grade students in Gaza. Unpublished Master Thesis, Islamic University, Gaza, 9(82): 192 – 202.

Repair, H. B. (2016). The effect of using molecular representation strategy in developing skills of writing equations and visual thinking with chemistry for grade 11 students, Unpublished Master Thesis, Islamic University, Gaza, 7(42): 132 – 136.

Tasker, & Dalton, R. (2006). Research in to practice, visualizations of the Molecular world using animation. Chemistry Education Research and Practice, 7(2): 141-159.

Wilke, R. (2003). The effect of active learning on student characteristics in human physiology cours for none majors. Avances in Physiology Education, 3(27): 207-223.

Wittrock, M.C. (1990). Generative process of comprehension. Educational Psychologist, 4(24): 345-376.

Wu, H., Krajcik, J. & Soloway, E. (2001). Promoting conceptual understanding of chemical representation student use of visualizations tool in the class room. Journal of Research in Science Teaching, Wyoming, 7(35): 821- 839.

Zimmerman, B. & Cleary, T. (2006). Adulescents development of personal agency .In Pajares, Fandurdan, T. (Eds), Self-efficacy.Beliefs of Adolescents.Green wich, CT: Information Age Publishing, 5(27): 225 – 234.