

The Effect of Using Jigsaw Strategy in Teaching Science on the Acquisition of Scientific Concepts Among the Fourth Graders of Bani Kinana Directorate of Education

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Abstract

The study aimed to identify the effect of using Jigsaw strategy in teaching science on the acquisition of scientific concepts among the fourth graders of Bani Kinana Directorate of Education compared to the traditional way. The study sample consisted of 70 male and female students, divided into two groups: experimental and control where the students of the experimental group studied through the Jigsaw strategy and the students of the control group studied the same units in the traditional way. An achievement test was developed in the mentioned units of science to measure the extent of the acquisition of scientific concepts, which had sufficient validity and reliability. The test was applied on the study sample and the appropriate statistical analyses were conducted. The results indicated that there were statistically significant differences at the significance level (0.05) for the variable of the group in the post measurement as the value of (F) was (18.366) by a statistical significance of (0.000), and the differences were in favor of the experimental group and that there were no statistically significant differences at the level of (0.05) for the variable of gender. The researcher recommended the adoption of the teaching method by using the Jigsaw strategy in teaching science because of its effect on the acquisition of scientific concepts.

Keywords: (Jigsaw strategy, scientific concepts, fourth grade).

1. Introduction

Cooperative learning is one of the modern trends in the field of teaching aiming to link learning by doing action and participation of the students; so this method received considerable attention since the eighties of the last century for being used as an alternative to the traditional method which leads to competition among learners rather than the spirit of cooperation. Despite the multiplicity of scientific studies which showed the importance of using cooperative learning instead of the traditional competitive learning, especially in the United States, the Arab education system still suffers from shortcomings in the teaching methods that are able to keep pace with the era of advanced technology being dependent on the traditional method in teaching and evaluation, which lies on teaching students to memorize the school course and measuring its ability to conservation, recovery and repeating of the curriculum, which ends with the exam rather than the students' understanding and application of the material (Al-Deeb, 2004).

Despite the features of the cooperative learning, educators and psychologists working in "Austin" schools, Texas invented a developed method for the cooperative learning that was called (Jigsaw) since it resembles the game (Jigsaw) in order to develop relations among students who are English, Spanish and Negroes to minimize the severity of ethnic tensions (Al-Qasirin, 1998). The results of applying this method has indicated that the English students were well educated in the Jigsaw classes; at the end of the class, friendliness and harmony were formed among the members of the group and other students in the classroom in a greater degree than it was at the beginning of the study. In short, this method presented positive results in achievement and trends and encouraged students for cooperation and teamwork as well as the fact that it damaged any personal obstacles among students (Al-Hela, 2005).

Al-Zuhairi (2013) indicated that the (Jigsaw) strategy consists of a group of learners who are, within the mechanism of this strategy, called experts where each expert of each learning group meeting together in one group to study a certain subject then goes back to their groups to teach its members what they had learned; accordingly, this strategy is sometimes called the broken images, where each learner in the group takes a part of the content, studies and discusses it inside the group. Afterwards, the parts of the content are organized and ordered to have one full image.

The first one who used Jigsaw strategy is Areston in 1978 where he divided learners into groups where each group has six members; the study topic was divided into five main parts one of which is distributed to each learner; two learners participate in the last part afterwards the learners from different groups who took the same part meet with a group of experts to discuss the scientific material and give their comments on the subject; then, each learner returns to his original group to teach his group the part he mastered and he also learns from others what they have learnt. Slavin developed this strategy in 1980 where he divided learners into groups that each group contains four or five individuals; each individual has his own part to study it with a group of experts so he

can become an expert in this part being responsible for teaching it to others; this is called inter-reliability which makes the team members rely on each other during performance (Al-Zuhairi, 2013).

The complementary strategy is developed by (Aronson, Etal., 1978), where he divided the class into small cooperative groups consisting of 5-6 members cooperating among each other. This strategy is divided into two types (Aziz, 2010):

A. Jigsaw 1

It is based on the division of students into a group of members that each member of a group learns a part of the course to be taught to all the students of the group; each member is responsible for teaching the material he receives from the teacher to the rest of the members; students are set to individual tests while the whole group evaluates the cooperative job.

B. Jigsaw2

This strategy is established by (Slavin, 1978), which is a modification of (Jigsaw I) where all students read the course but focusing on different topics; students focusing on the same topic, study their topics then teach them to the members of their groups; the members of the team pass quizzes in each course been focused on and the degree obtained to the students is given to the team.

A lot of research and applied studies refer to merging the two strategies as one strategy under the title (Jigsaw), which refers to the growing interest in the importance of the cooperative work, and its effect on understanding and perceiving knowledge, the availability of a sense of love and positive attitudes towards academic subjects, which increases the positive dependence among individuals and encourage the individual responsibility, directing the social skills, and finally communication and working effectively within the group (Aziz, 2010).

1.1. Previous studies

Al-Qaisi (2015) aimed to identify the effect of Jigsaw strategy compared to the traditional way in the achievement of physics and scientific processes for the students of the first middle grade in Fatima Zahra school for girls of Al-Anbar General Directorate of Education from the first four chapters of Physics of the first semester of the year 2014; the study sample consisted of (62) female students by (32) students for section A and (31) students for section B in addition to those who failed the course and who were statistically excluded to ensure equivalence due to their additional experiences. To confirm the equivalence of the search groups, they were examined according to the following variables: chronological age in months, achievement in the sixth-grade science, and previous information. The study showed that using Jigsaw strategy in teaching physics led to the superiority of the experimental group on the control group in achievement and scientific operations.

(Al-Obeidi, 2013) aimed to identify the effectiveness of the Jigsaw strategy of the cooperative learning in the achievement of the female fourth graders in history compared to the traditional way. The study sample consisted of two groups: pilot and control in Diyala; the pilot group consisted of (42) female students that were taught according to Jigsaw strategy and the control group that consisted of (43) female students taught via the traditional method. The researcher prepared an achievement test in history consisting of 50 test multiple choice items and the researcher confirmed the validity, reliability and objectivity of the test. After analyzing data through using the T-test of two independent samples, the researcher concluded the presence of statistically significant difference in favor of the experimental group which studied history via Jigsaw.

(Deep, 2011) aimed at providing the students of the educational rehabilitation diploma at the Faculty of Education at the University of Damascus the contemporary concept and strategies of the individualization of education through Jigsaw of cooperative learning. To achieve the objectives of the research, the researcher prepared an educational unit according to the systems, which consisted of four parts: the concept of individualized instruction, individual's described education system, the personal education system and the audio guidance system. The proposed educational unit was applied on a sample of 54 male and female students from various specialties of educational rehabilitation diploma students at the Faculty of Education at the University of Damascus. The students' acquisition of each part of the four parts of the unit was tested through the pretest / posttest whose validity and reliability were examined. The study concluded the presence of statistically significant differences at the level (0.05) between the mean degrees of the students in the pre-test and their mean degrees in the posttest in all the proposed parts of the unit (the concept of individualized instruction, individual's described education system, the personal education system and the audio guidance system); this difference is in favor of their mean degrees in the posttest; that is a difference resulted from the large, effective and significant size via Jigsaw of the cooperative learning on the students' achievement where the size effect values (ETA square) ranged (0.95 - 0.97) in all the parts of the educational unit.

(Al-Darraj, 2011) aimed to identify the effect of Jigsaw and conceptual maps on the achievement of Child Psychology course among the female students of the Teachers' Training Institute. A partial control experimental design and the post-test were selected as a design of the study and the Teachers' Training institute in Baghdad's Rusafare presented the intentional sample of the study; 3 sections in the third grade were randomly

selected and the study sample consisted of 90 female students by 30 students in the first experimental group representing section 2, which studied the Jigsaw strategy, the second experimental group consisted of 30 students representing section 1 which studied through the conceptual maps, and the control group consisted of 30 students representing section 3, which studied through the traditional way (lecture); equivalence among groups was conducted in the variables of (chronological age, intelligence, the previous cumulative average and the educational achievement of the parents). A test was prepared for the final achievement through applying the post achievement test. The study concluded the excellence of the first experimental group that studied via the Jigsaw strategy over the second experimental group that studied through the conceptual maps, the excellence of the students of the first experimental group that studied via the Jigsaw strategy over the control group, which studied via the traditional way, and finally the excellence of the students of the second experimental group that studied through the conceptual maps over the control group, which studied via the traditional way.

(Aziz, 2010) aimed to identify the effect of using the jigsaw strategy of cooperative learning on the achievement of the first-grade students of teacher training institutes in mathematics. The study was conducted on a sample of first graders in the teacher training institutes amounting to (49) students representing two divisions of the first graders of the academic year 2009/2010. The researcher used the experimental design of two equal groups where the sample was chosen through the random way and distributed it to two groups: the first is the experimental which studied mathematics using the jigsaw of cooperative learning and the second is the control group, who learns through the traditional way. Equivalence was conducted between the two groups according to the variables of the chronological age of the student, his grades for all courses and his degree in mathematics in the third grade and finally the educational level of parents. Afterwards, the researcher prepared the lesson plans for the topics of the first and second semesters of the mathematics of the first grade of the teacher training institutes, as well as an achievement test in the first and second semesters of the same mathematics, whose reliability coefficients were calculated. Then, he studied the two groups for six weeks then conducted the achievement test to the students of the sample; the results indicated that there are statistically significant differences between the mean achievement of students studying mathematics using the jigsaw cooperative learning and the mean students' achievement studying mathematics through the traditional way in favor of the experimental group.

(Abu Shouk, 2010) aimed to reach for the design of a proposed program that uses the cooperative learning method (Jigsaw) in teaching chemistry of the second grade and the effect of this program on the academic achievement and retention among students through education compared to the effect of the traditional methods that the original society of the study consisted of all the second secondary graders of the White Nile state. The researcher used the multi-stage cluster method for the selection of the study sample that consisted of forty-eight students, which were later distributed into an experimental group of twenty-four students and a control group of twenty-four students; a development standard was designed for the program consisting of four axes: objectives, content, teaching methods and evaluation and it was judged by a committee of scientists and a guide that was designed to the cooperative teacher explaining the method of using jigsaw cooperative learning method to the experimental group. The teacher/trainer taught the experimental group the developed unit of halogens through the jigsaw and also taught the control group the same unit developed in the traditional way. The researcher prepared a pre and post achievement test on all the members of the sample after the end of the experiment that lasted six weeks. The study results showed the existence of significant differences between the experimental group and the control group in the academic achievement in favor of the experimental group and the presence of statistically significant differences between the experimental group and the control group in keeping learning in favor of the experimental group due to the effectiveness of the proposed program, which uses the jigsaw of the cooperative approach of learning.

(Al-Hila, 2007) aimed to investigate the effect of cooperative learning based on expert groups (Jigsaw2) and the gender of students on the immediate and delayed achievement for the students of the faculties of Educational Sciences in the course of education design compared to the normal cooperative learning. The study sample consisted of 62 male and female students by (22) male students and (40) female students from the students of the Faculty of educational Sciences of the international relief Agency in their fourth year enrolled in education design course for the second semester 2002/2003. The members of the study sample were randomly chosen into two groups: experimental and control; the members of the experimental group studied the course through the cooperative learning based on expert groups (Jigsaw2) while the members of the control group studied through the normal cooperative learning. An achievement test in its final image was prepared consisting of a hundred multiple-choice items, whose validity and reliability were verified and whose reliability coefficient was (90%).

The results showed the presence of statistically significant differences in the direct and delayed achievement among the students of the two groups of study that are attributed to the teaching method in favor of the students of the experimental group who have studied via the cooperative learning based on the expert groups, and to the gender of the students in favor of females. The results of the analysis did not reveal any statistically significant difference due to the interaction between the learning method and the students' gender.

1.2. Commenting on Previous Studies

Through a review of the previous studies, it was obvious that there are studies dealing with jigsaw strategy as (Al- Qaisi, 2015) and (Al- Obeidi, 2012); it is noted that all these studies have used the test as a tool for the detection of variables. We also noticed that they were conducted by several countries that in Sudan, (Abou Shouk, 2010) was conducted and in Syria, (Deep, 2011) was conducted. The previous studies were benefited from through being familiarized with the theoretical literature and benefit from them in the theoretical literature and identifying the findings of the studies and transferring them to teachers in the field in order to apply them.

2. Study Problem and Questions

Given the diversity and multiplicity of teaching skills of all subjects and the difficulty of the performance from one skill to another, more appropriate and better strategies are sought in the modern field of teaching and education so as to accelerate the learning process of such skills in line with the rapid developments. Through the experience of the researcher in the field of teaching course, it was evident that there is a clear contrast in learning the teaching of courses, which is due, according to the researcher, to the educational curricula's lack of any new inventions and retaining the traditional means and methods with no more focusing on the situational embarrassment owned by the student which may hinder and slow the learning process, accordingly, the researcher shed light on this problem through the use of a new strategy which is jigsaw as an attempt to find a new way or mechanism to get to achieve the objectives of the learning process, which is the correct learning at a good level for all students. This study will try to answer the following questions:

- What is the effect of using jigsaw in teaching science on the acquisition of scientific concepts among the fourth-grade students in Bani Kinana Directorate of Education?
- are there statistically significant difference in the effect of using Jigsaw strategy in teaching science on the acquisition of scientific concepts among the students of the fourth-grade students in Bani Kinana Directorate of Education due to the gender of the students (male, female)?

3. Study Objectives:

This study was to investigate the effect of using Jigsaw strategy in teaching science on the acquisition of scientific concepts at the fourth-grade primary students in Bani Kinana directorate of education and examine the presence of a difference in the acquisition of scientific concepts among them according to gender (male, female).

4. Study Importance

The importance of Jigsaw stems from the facts that: the jigsaw strategy encourages creativity through work, research, participation and thinking, encourages dialogue among students themselves and between students and the teacher, and encourages the exchange of ideas and information; it is one of the active learning forms that is based on the social construction philosophy, calls for the fact that teaching and learning are in a social orbit, works on setting control inside the semester since students are busy working all time and decreases the load for the slow students.

5. Study Limitations:

- **Temporal limitations:** This study was applied in the first semester of the academic year 2016-2017.
- **Spatial limitations:** This study was applied in the schools of Bani Kinana Directorate of Education in the Hashemite Kingdom of Jordan.
- **Objective limitations:** This study was limited to studying the effect of using Jigsaw strategy in teaching science on the acquisition of scientific concepts.

Procedural Definitions

- **Jigsaw strategy of Cooperative learning:** This method lies in organizing students to work in small groups consisting of 5-6 members, and each student is given information that is not given to another in the group making him an expert in the part of the subject after receiving tasks; afterwards, the students are prepared to teach their own subject after being mastered by the students of the groups; then, they are selected and granted degrees or other rewards.
- **Fourth grade:** all the students enrolling to study for the first semester of 2016/2017.
- **Scientific Concepts:** a set of ideas that have been circulated in certain events, observations or situations that are formed to each individual; they consist of a meaning and understanding of associated words, phrases or operations.

6. Study Methodology

The researcher relied on the semi-experimental method, which relies on studying the differences between the two samples in reality without controlling other variables to identify the effect of using Jigsaw strategy in teaching science on the acquisition of scientific concepts among the fourth graders in Bani Kinana Directorate of

Education.

7. Study Population and Sample

The study population consisted of all the fourth grade students in Bani Kinana Directorate of Education. The study sample consisted of 70 male and female students who were selected intentionally from four classes in Yubla elementary school for boys, Harta elementary school for boys, Harta elementary school for girls and Yubla elementary school for girls; the random selection of the members of the study sample was conducted consisting of two groups: control group (17) male students and (18) female students and an experimental group of (17) male students and 18 female students; the students of the experimental group studied the scientific concepts through the cognitive maps, while the students of the control group studied through the traditional method. Table 1 shows how the members of the study sample were distributed according to its variables:

Table 1. Distribution of respondents according to the variables (gender, school)

Variables	Level	Frequency	percentage
Gender	Male	34	48.57
	Female	36	51.43
	Total	70	100.00
School	Yubla Elementary School for Boys	17	24.29
	Harta Elementary School for Boys	17	24.29
	Harta Elementary School for Girls	18	25.71
	Yubla Elementary School for Girls	18	25.71
	Total	70	100.00

8. Study Tools:

First, the Educational Material by Using Jigsaw strategy

The unit of study was selected from the science book of the fourth grade of Bani Kinana Directorate of Education; the researcher analyzed the lessons and determined the educational goals expected to be achieved. After a review of literature and the previous studies on Jigsaw strategy, the researcher determined the scientific concepts contained in these lessons and then designed the required teaching methods by using Jigsaw strategy. To confirm the validity of such methods, their design and information, it was presented to a group of 8 specialized arbitrators in educational science and methods of teaching science; their comments and suggestions were taken into account and amended as required.

8.1. Second: Testing Concepts

- In order to achieve the objectives of the study, the researcher prepared a test of concepts of the fourth grade science taught in the Hashemite Kingdom of Jordan where the test was designed with the help of the school book of science in addition to the teacher's guide; also, the content of the subject matter was analyzed and a specifications' table was prepared due to the scientific concepts of this unit. In light of this, the items of the concepts' test were prepared consisting of (20) multiple choice items. The test was prepared according to the following steps:
- Determining the purpose of the test, a measurement of the achievement of the fourth graders in the scientific concepts contained in science.
- Identifying the general objectives of the unit and the behavioral objectives according to Bloom's Classification (remembering, understanding, application, analysis, forming and evaluation).
- The content of the teaching material was analyzed from the content of the fourth grade science and divided into major and minor topics.
- Preparing a specifications' table to determine the number of items needed for each level of the object and the subject.
- Writing the items of the achievement test in accordance with the specification table, determining the grades on the items and the total grade and determining the test time and forming it in its initial image.

8.2. Test Validity and Reliability

The test in its initial image was displayed to a group of experienced arbitrators in the field of measurement and evaluation and the methods of teaching science, in order to express their opinion on the linguistic formation of items, the appropriateness of the test items to the goal of test, and the appropriateness of the items to the levels of goals; their views and suggestions were taken into account and deletions and amendments were made as required; the researcher depended on (84%) as an agreement percent on the validity of the item by the arbitrators. To identify the consistency extent between the test items and the test as a whole, the test will be applied on an exploratory sample of 20 male and female students from outside the study sample, where the correlation

coefficients will be calculated between each item and the test as a whole using Pearson correlation coefficient, which should be positive, not less than 0.30 and statistically significant so that the test can enjoy a validity degree.

To confirm the significances of the structural validity of the test, it has been applied on an exploratory sample of 25 male and female students outside the study sample and the community itself to ascertain the extent of harmony between the test items and the test as a whole; Table 2 illustrates this.

Table (2): structural Validity factors (correlation between each item and the test as a whole)

No.	Item correlation with the test as a whole	No.	Item correlation with the test as a whole
1	0.61 **	13	0.51 *
2	0.58 **	14	0.67 **
3	0.57 **	15	0.65 **
5	0.45 *	16	0.57 **
7	0.55 **	17	0.60 **
8	0.48 *	18	0.63 **
9	0.62 **	19	0.52 **
11	0.57 **	20	0.59 **
12	0.61 **		

** Correlation coefficients are significant at the level of ($\alpha \leq 0.01$)

* Correlation coefficients are significant at the level of ($\alpha \leq 0.05$)

Table 2 shows that all the correlation coefficients between the test items and the test as a whole ranged between (0.45-0.67), which indicates the presence of a correlation between the items and the test as a whole, which are significant and acceptable for the purposes of applying this study.

The researcher applied the reliability steps on a sample of (20) male and female students from outside the study sample in two ways, namely: the reliability of the internal consistency using Kuder–Richardson Formula (20) KR (20), (KR20) coefficient, and the (test-re- test). (KR 20 was (0.82) and the test-re-test reliability coefficient was (0.87), which are acceptable for the purposes of applying the study.

8.3. Test Correction

The test in its final case consists of (20) multiple choice items where each item has four alternatives: three wrong alternatives and right alternative; the right answer for each item is given one degree, and zero if the student answered wrongly; accordingly, the total degree of the test is (20).

8.4. Study Application Procedures

In order to achieve the objectives of the study, the researcher followed the following steps:

- Reviewing the theoretical literature and the previous studies and identifying the study problem and questions.
- Identifying the study community and sample.
- Building the educational material for Jigsaw strategy and confirming its validity.
- Developing an achievement test to measure the acquisition of scientific concepts among the fourth graders in Bani Kinana Directorate of Education and confirming its validity and reliability.
- applying the study where the members of the control group were appointed followed by those of the experimental group randomly; afterwards, the equivalence of the two groups was confirmed through a pre-test; the researcher supervised the science teachers in the sample schools, trained and directed them to apply the study where the scientific topics were taught to the male and female students of the experimental group through the cognitive maps, while the male and female students of the control group were taught traditionally through the textbook of science that has been taught in the school year 2016/2017.
- After the end of the application process, a post test was conducted for the experimental and control groups; afterwards, the test was corrected, grades were collected, statistical analyses were conducted to answer the test questions, come up with results, suggest recommendations.

8.5. Statistical Processing

The following statistical methods were used through the (SPSS): where the (TWO-WAY ANOVA) was used to verify the equivalence of the control and experimental groups in addition to the arithmetic means, standard deviations of the two tests: pretest and post-test according to the variables of group and gender, and also the (ANCOVA) to figure out the differences between the experimental and control groups in the post-test.

8.6. Equivalence between the two groups

To ensure the equivalence of the two groups on the pre-test, the (TWO-WAY ANOVA) was applied to detect the differences between the control and experimental groups in the post-test.

Table 3. (TWO-WAY ANOVA) Results to detect the differences according to the variables of group and gender in the post-test

Source of variation	Sum of squares	Degrees of freedom	Average squares	(F) Value	Statistical significance
group	1.157	1	1.157	0.095	.759
Gender	10.225	1	10.225	0.841	.362
error	802.203	66	12:15		
Total corrected	817.843	68			

table (3) shows the absence of significant differences at the significance level (0.05) for the variable of the group on the post-test as the value of (F) was (0.095) by a statistical significance of (0.759), and the absence of significant differences at the significance level (0.05) for the variable of gender on the post-test as the value of (F) was (0.841) by a statistical significance of (.362); accordingly, there is an equivalence between the two groups regarding the post-test.

9. Study Results and Discussion

The following is a presentation of the results and discussion of the study according to its hypotheses:

Hypothesis I: there is an effect for using Jigsaw strategy in teaching science on the acquisition of scientific concepts among the fourth graders of Bani Kinana Directorate of Education.

Hypothesis II: There are no differences for using Jigsaw strategy in teaching science on the acquisition of scientific concepts among the fourth graders of Bani Kinana Directorate of Education.

To test these hypotheses, the arithmetic means of both the pre-test and post-test were extracted according to the variables of the group and gender, the amended means and the (ANCOVA) for detecting the differences between the experimental and control groups in the post-test with the presence of the pre-test as a companion variable. Here are the results.

Table 4. Arithmetic Means and Standard Deviations of the Pre-test and the Post-test and the Amended Arithmetic Means According to the Variables of the Group and Gender

group	Gender	Pre-test		Posttest		Amended Arithmetic Means
		Arithmetic Means *	standard deviation	Arithmetic Means	standard deviation	
Control	Males	8.12	3.94	14:00	3.57	14:02
	Females	8.39	3.52	14:00	3.41	13.98
	Total	8.26	3.67	8.13	3.44	13.99
Experimental	Males	7.35	2.76	16.94	2.33	16.94
	Females	8.61	3.62	17:00	2.09	17:00
	Total	8.00	3.24	15:49	3.22	16.98

* Arithmetic mean of 20 degrees.

Table (3) shows the existence of morphological differences between the pretest and the post test of the experimental and control groups. To detect the statistical significance of such differences, the (ANCOVA) was applied and the effect size was calculated through (Eta Square); Table (5) shows that.

Table (5): Results of (ANCOVA) for the Detection of Differences between the Experimental and Control Groups in the Post-test with the Presence of the Pre-test and the Effect Size (Eta)

Source of variation	Sum of squares	Degrees of freedom	Average squares	(F) Value	Statistical significance	Size Effect (Eta)
group	155.873	1	155.873	18.366	0.000	.218
Gender	0.004	1	0.004	0.001	.982	0.00 0
Pre-test	2.810	1	2.810	.331	0.567	0.005
error	560.146	66	8.48			
Total corrected	717.486	68				

table (5) shows:

there are statistically significant differences at the level of (0.05) for the variable of the group in the post measurement as the value of (F) was (18.366) by a statistical significance of (0.000), and the differences were in favor of the experimental group, where the amended arithmetic mean was (16.98), while the amended arithmetic mean of the control group was (13.99); the effect size (Eta Square) was (22%), which is due to the use of (Jigsaw) strategy in teaching science among the students of the experimental group, the role of (Jigsaw) strategy in developing the thinking skills among the students of the experimental group, and helping students connect the meanings of scientific concepts with the cognitive content; this is reflected positively on their understanding and

acquisition of these concepts and acquiring them. furthermore, (Jigsaw) strategy encourages the active learning of the student, arranging the structure of ideas in a structured format for helping the learner grasp relations between concepts, facilitating understanding them, understanding new pieces of information and remembering the previous information. As for the students of the control group, they were taught through the traditional way, which focuses on the memorization of scientific concepts without being understood. In addition, through (Jigsaw) strategy, the right and left halves of the brain were used to combining cognitive information, images and shapes. This result is consistent with Al- Qaisi (2015) and Al-Darraji (2012), which proved the existence of an effect of using (Jigsaw) strategy.

The results showed that there were no statistically significant differences at the level of (0.05) for the variable of gender as the value of (F) was (0.001) by a statistical significance of (.982), and that there were no statistically significant differences at the level of (0.05) for the pre-test where the value of (F) was (0.331) by a statistical significance of (0.567); this is due to the fact that the members of the study sample were subjected to the same teaching environment and the same educational opportunities, they were taught by male and female teachers with similar academic qualifications, the teaching method increased the motivation of students and their preparations for learning, the curriculum for both male and female students had the same activities and finally teaching was applied in similar procedures to move away from prejudice. This study was consistent with Al-Hela (2010), which showed no differences in favor of gender.

10. Recommendations

- Adopting a teaching method by using (Jigsaw) in teaching science due to its effect on the acquisition of scientific concepts.
- holding training courses for the science teachers on the effective and proper use of the Jigsaw strategy on teaching science.
- conducting further studies and research on using the Jigsaw strategy in teaching other materials, such as social studies and the Arabic language, and studying students' attitudes towards using them.

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