The Effectiveness of the Roundhouse Diagram Strategy on the Achievement in Social and National Education Curriculum for the Fourth Grade in the Directorate of Education of Irbid

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Abstract

The study aimed to identify the effectiveness of the roundhouse diagram strategy on the achievement in the social and national education curriculum for the fourth grade in the directorate of education of Irbid. The quasi-experimental approach was used. The study sample consisted of (56) male and female students from the fourth grade in the schools of the directorate of education of Irbid; they were distributed into two groups: control that consisted of 14 males and 14 females and experimental which consisted of 14 males and 14 females. The researcher conducted an achievement test that consisted of (20) items whose validity and reliability were confirmed; the statistical processing and analyses were conducted. The results showed that there were statistically significant differences in the students ' scores according to the variable of the group at the level of (0.05) in favor of the experimental group and that there were statistically significant differences at the level (0.05) for the variable of gender in the post measurement in favor of the males. The study recommended including the roundhouse diagram strategy into the teaching strategies to be used during teaching students and involving teachers in training curriculums on the strategy of the roundhouse diagram.

Key words: (Roundhouse diagram, achievement, social and national education, fourth grade).

Introduction

The roundhouse strategy is one of the meta-cognition approaches proposed by Wandersee (Wandersee,1994); (Wandersee, Ward, 2002) proposed this name due to the fact that such strategy is similar to the circular forms used in the railroads to switch the train wagons where the central form represents the main idea; the main idea is divided into two parts in order to divide the main idea. The roundhouse diagram is a circular geometry with two dimensions consisting of a central circle

divided by an optional line surrounded by seven sectors, which represent the conceptual form for a part of knowledge; the seven surrounding sectors are used to fragment the difficult concepts, order the sequence of events, or learn the steps of problem solutions where the learners fill the form starting from 12 o'clock in a clockwise manner.

The roundhouse diagram strategy is defined as a learning strategy for representing the total topics, actions and activities; it focuses on drawing circular diagrams that correspond to the conceptual form of knowledge that the circle center represents the main subject to be learned and the seven external sectors represent the parts of the subject (Al-Mazrou', 2005). (Al-Kahlout, 2002) defined it as a learning strategy focusing on drawing circular diagrams corresponding to the conceptual form of a specified part of knowledge; the circle's center contains the subject to be learned, while the external halls represent the parts containing the subject; it aims to acquire the concepts and skills of visual thinking. (Muhanna, 2013) defined it as a group of learning and teaching activities that prepare a circular visual organizer which helps identify the concept through seven sectors containing the most important ideas of the concept in addition to images or symbols of these ideas helping ease their retrieval (Muhanna, 10, 2013).

Wandersee, in preparing the roundhouse diagram, adopted Ausubel's learning theory of meaningful learning, Novak's theory of human constructivism, and George Miller research on memory and visual realization research. A simple clarification of such basics is presented hereunder:

1. Ausubel's theory of meaningful learning.

Ausubel is considered one of the psychologists interested in cognitive learning; his theory is based on learning through receiving. Such theory was developed that it contained the following two types of learning:

-Learning by receiving meaning.

-Learning by discovering meaning.

Ausubel's theory is concerned with the following three important issues:

1. Methods of organizing the curriculum content.
2. Mind methods in processing new information.
3. Methods of presenting the new curriculum.

The meaningful learning model is one of the rare educational models that provide the teacher with recommendations to help him organize the new curriculum and its presentation methods (Hassan, 2006).

Teachers were frustrated when they were provided with explanations about the methods of learning by educators only because they were not provided with methods of teaching experiences and curricula organization; Ausubel's theory with its applicable models came to provide clear methods for teachers to select, organize, present and display new information (Abu Jado, 2000).

Ausubel also emphasized the possibility of improving remembrance and learning through using and preparing frameworks to organize and store information in a coherent, logical and meaningful manner; the organization and correlation of information inside the cognitive structure can lead to protecting the new idea from loss or quick forgetfulness knowing that the organized ideas are less likely to be forgotten (Al-Zayyat, 2004).

1. Novak's structural theory (structural modeling approach)

Novak is considered one of the structural school scientists who contributed theories to the educational design; along with Gowin, he presented concept concepts called (VEE diagram concept maps). The human constructivism is considered a logical development of the principles of the cognitive thinking because constructivists focus on the education based on meaning; the student uses his knowledge to build his new knowledge; therefore, students should be encouraged to build their own acquaintances with the help of teachers who should make their ideas clear; students should also be encouraged to carry out activities so that meaningful learning takes place (Saraya, 2007).

2. George Miller's research

the roundhouse's seven external sectors were consistent with the outcomes of Miller on the short-term memory; in 1956, he wrote his famous article entitled *" The Magical Number Seven, Plus or Minus Two: Some Limits on Our Capacity for Processing Information"* in which he concluded that most people can remember seven things; in case there was an effective data collection, the learner can find relationships between ideas and increase learning since the process of organizing information and creating relations among the groups of information can increase recall; chunking increases recall (Al-Mazrou', 2005).

(Ambusaidi and Al Balushi, 2011) mentioned some forms for the roundhouse diagram that can be summarized in the following points:

- Training learners to summarize the multiple information to become easily to read and recall.
- Developing the linguistic intelligence through discussions during design in addition to the spatial visual intelligence; the form organizes the information in a visual image that can be seen and easily recalled in addition to the logical intelligence through the brainstorming followed during dividing concepts into seven sectors.
- Developing the learners' ability to draw since the roundhouse diagram depends on drawing, which enhances the relationship between science and art.

Through reviewing the theoretical frameworks of this strategy and the objectives it seeks to, we can identify the importance of this strategy in the following points:

- using the strategy creates a rich educational environment.

-Breaking the routine and monotony of classes.

- having fun during designing and filling the diagram.
- processing information by organizing and arranging it which leads to transforming it from the short-term memory to long-term memory.
- Discovering the incorrect concepts among learners specially at linking the concept with the symbol it represents.

The learner prepares the roundhouse diagram through following the steps of preparing the diagram where the learner, according to (War and Wandersee, 2001), will:

1. identify his purpose of forming the roundhouse diagram.
2. Identify the main concept which is written inside the circle axis.
3. Divide the main concept into seven ideas that may increase or decrease by two ideas; here, the learner transforms the complex concepts into a reasonable amount of information.
4. Draw a simple picture or symbol for each idea to promote the concept in each sector.
5. Start filling the roundhouse diagram with ideas and icons beginning with the sector pointing to the clock (12) and moving clockwise.
6. If there is a difficult sector of the roundhouse diagram or one which needs expansion, the learner can enlarge it as is the case in the diagram.
7. Use a form for controlling the roundhouse diagram so that the learner can direct himself.

As a follow-up, learners can write a description of the charts in a short essay in their notebooks or they can exchange their charts; the learner can also tell a story through looking at the graphs, which helps integrate the language arts and promote his learning.

The roundhouse diagram is a flexible strategy that the teacher can apply by following steps that suit him and the conditions of the teaching process since there is no ideal method for applying the strategy. We will try to summarize the steps proposed by (Ambusaidi and Al-Baluchi (2011, 491):

-The teacher presents the lesson in one of the teaching methods such as practical presentation, survey or appropriate explanation.

-The teacher forms cooperative learning groups and determines whether they are homogeneous or heterogeneous according to his or her viewpoint and nature of objectives.

-The teacher along with the students set the ideas to be written in the roundhouse diagram.

-Students write the objectives of preparing the roundhouse diagram at the bottom of the paper on which the roundhouse diagram is written.

- Students divide the main concept into several related topics.

-Students write the information about each sector and the symbols signaling it from the sector closest to the number (12) per hour in a clockwise manner.

-Each group displays the diagram it designed to the members of the class along with the comments of both the teacher and colleagues .
-The teacher may ask to publish the diagram in one of the papers or school journals, make a poster placed in one of the corners of the class or compose a story using the information contained in the diagram.
To apply the diagram inside classes, it is required to have:
-White papers and coloring pencils or transparencies.
-Tools or materials for the method used in teaching such as the practical presentation or survey.
-Chipboard.
-the upper data show so that students can display the forms they made (Ambusaidi and Al-Baluchi, 2011).
Computer programs can be used during teaching the roundhouse diagram strategy through preparing the electronic forms of the roundhouse diagrams; computer images and symbols can be used and included in the form sectors and Word or Power point can be also used to present the forms and models of the roundhouse. There are many benefits for integrating technology with the roundhouse strategy, (Muhanna, 2013) stated the following features:

1. It is good for teachers who cannot draw through replacing drawing by electronic images.
2. It enhances students ' skills in using the computer programs and research skills on images and short films.
3. It presents the forms prepared by the computer to all the class.
4. Adding colors, images and sound add vitality to the roundhouse diagram.

Previous Studies

Many studies examined the roundhouse strategy such as (Jalab and Al-AJarash, 2016), which aims to find out the impact of using the roundhouse diagram strategy in the achievement of basic Arabic history among the second grade students in the intermediate stage. The research was limited to the second grade students in the intermediate stage in Babil province, Iraq who were taught the topics of the basic Arabic history textbook of the first and second semesters. The researchers prepared an objective test consisting of (40) multiple choice items as a tool for research after validating its reliability and validity. The researcher used a group of statistical means such as (Pearson correlation coefficient, Chi square, T-test, and coefficient of difficulty, easiness and excellence). The research concluded that the experimental group, which used the roundhouse strategy in studying the Islamic Arabic history textbook surpassed the control group which was taught through the regular method.
(Al-Samirai', 2013) conducted a study that aimed to identify the effectiveness of the roundhouse diagram in the achievement of history textbook among the second female students in the intermediate stage of the schools of the directorate of education of

Baghdada/ second Al-Rasafa. Two sections were randomly chosen one representing the experimental group that consisted of (30) female students and the other is control consisting of (30) female students making the study sample consisting of (60) student. The validity and reliability were confirmed and the statistical processes were also conducted. The results of the study concluded that the female students of the experimental group who were taught through the roundhouse diagram in history exceeded the other female students in the control group who were taught through the regular method. In light of the results of the current research, the researcher concluded many points, including: 1) Using the roundhouse diagram strategy made the students more active during the lesson; the positive role of the student in thinking about herself gives her greater opportunities in focusing and remembering what she learned and understood. 2) Teaching according to the roundhouse diagram requires more time, effort and skill from teachers than the case in using the regular method.

(Mustafa, 2013) aimed to identify the impact of using the roundhouse diagram in the achievement and retention of the history textbook among the first grade students in the intermediate stage. To verify the research hypotheses, the researcher randomly chose his research population, which consisted of 29 schools by 15 middle schools and 14 secondary schools. The study sample was chosen from Al-Rafideen middle school that one section represented the experimental group which consisted of 33 male students, and the other section represented the control group which consisted of 35 male students; after excluding four students who failed, the final number of the research sample was 64 students. To statistically process the data, the researcher used the following statistical methods: T-test of two independent samples; Chi Square; Pearson correlation coefficient; and Spearman brown correlation coefficient; After analyzing the results, the researcher concluded: the students of the experimental group who studied history through the roundhouse diagram exceeded the students of the control group who studied history through the regular method in the achievement test and in keeping the information of the history textbook.

(Hussein, 2013) aimed at identifying the impact of the roundhouse diagram strategy in the achievement of the geography textbook among the first grade female students in the intermediate stage. To achieve the objective of the research, the researcher adopted the experimental method procedures via one of the experimental designs with partial control used for both the experimental and control groups that used the post-test. The researcher intentionally selected "thoughts secondary" school for girls of the directorate of education of Al-Rasafa/ Baghdad. To apply the experiment, section (B) was randomly selected to represent the experimental group and section (A) represented the control group; there were (61) female students in the study sample by 30 female students in the experimental group and 31 female students in the control group. An achievement test consisting of 40 multiple choice items. The test was checked in terms of validity, reliability, coefficient of items' difficulty and the effectiveness of the incorrect alternatives. The study results concluded a statistically

significant difference at the level of 0.05 between the mean scores of the female students of the experimental group which studied the geography textbook through the roundhouse strategy and the mean scores of the female students of the control group which adopted the regular method in studying the same textbook in achievement in favor of the experimental group in addition to a statistically significant difference at 0.05 between the mean scores of the female students of the experimental group which studied geography through the roundhouse strategy and the mean scores of the female students of the control group which studied the same textbook through the regular method in regards to retention in favor of the experimental group.

(Abdo, 2013) This study aimed at investigating the impact of using the Roundhouse Diagram Strategy on immediate and post ponded scientific achievement and attitudes of (10th) grade students in physics (Energy in our life) in governmental schools in Nablus governorate. To answer the questions of the study and test its hypotheses, the researcher conducted this study on the subjects of the study which consisted of (141) males and females in public school in Nablus. The students of the study were distributed into four sections. Two sections, one for males and one for females, were chosen randomly and these two sections represented the experimental section. The study findings were: There were significant statistical differences between the achievement and attitudes in the students' means towards learning physics and towards the physics teacher in the experimental and control groups in favor of experimental groups. There were no significant statistical differences between achievement, and attitudes of the students' means towards the physics and towards physics teacher, due to time. There were significant statistical differences between the achievement, and attitudes of the students' means towards physics and towards the physics teacher due to gender, in favor females. In accordance with the findings of this study, it was recommended to encourage teachers' adoption for the Roundhouse Diagram Strategy method for its effectiveness. It is always recommended for researchers to conduct further studies concerning the Roundhouse Diagram Strategy teaching method.

(Al-Kahlut, 2012) aimed to identify the effectiveness of using the roundhouse strategy in developing the visual concepts and thinking skills in geography among the female students of the eleventh grade in Gaza; the researcher used the descriptive method and the quasi-experimental method. The study was applied to a sample of (76) female students of the eleventh grade in the directorate of education of eastern Gaza and distributed into two sections: one is control that consisted of (38) females and the other is experimental consisting of (38) female students. To achieve the objectives of the study, the researcher prepared three tools: content analysis tool, a test of geographical concepts, and a test of thinking skills, whose reliability and validity were checked; data were also collected through using the statistical processors. The results of the study concluded that there were statistically significant differences in the test of geography concepts in favor of the experimental group and

that there were statistically significant differences in the post-test of visual thinking skills in favor of the experimental group .

Comment on Previous Studies

In the light of the researcher's review of previous studies that are related to the roundhouse diagram strategy, she benefited from preparing the theoretical framework important axes directly related to the study problem, forming a deeper understanding to the study problem and different concepts and dimensions , choosing the study variables, methodology and tools, and identifying the proper statistical methods. Furthermore, there are similarities between this study and previous studies, such as the study method, tool and variables, and also there is a focus on the importance of the roundhouse diagram to achieve the objectives. This study is consistent with (Al-Samurai'i, 2013) and (Mustafa, 2013) in targeting the measurement of the degree of the effectiveness of the roundhouse diagram in the achievement of the social and national education textbook.

Study Problem

Teaching the social and national education at the basic stage has been dependent on the regular method asserting the theoretical aspects without students' real contribution in educational aspects; teachers' method of instruction and students' rote learning led to weak educational achievement in this curriculum among students (Jalab and Al-AJrash, 2016). Most teachers of social and national education do not use modern teaching methods, such as the roundhouse diagram due to their inexperience or lack of information on this regard. The researcher also noted that there were few studies on using this strategy. Accordingly, the main objective of the study is identifying the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum for the fourth grade in the directorate of education of Irbid. The problem of this study is to answer the following questions:

1. What is the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum for the fourth grade in the directorate of education of Irbid?
2. Are there statistically significant differences in the achievement of social education curriculum for the fourth grade in the directorate of education of Irbid attributed to students' gender (males and females)?

Study Importance

The importance of the study lies in helping in:

- preparing a teacher's guide and students' handbook that may benefit teachers in training students to use the roundhouse diagram strategy which has a positive impact on the educational process.

-Encouraging those in charge of preparing and developing the social and national education curricula to avoid stereotypes and keep abreast of development.
-Opening new horizons in employing the roundhouse diagram strategy in teaching the social and national education in the development of all the cognitive, emotional and skillful aspects.
-The study might represent an objective response to the call of the international trends and the conferences' recommendations of keeping abreast to the modern methods in teaching.

Study Objectives

1. Validating the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum of the fourth grade in the directorate of education of Irbid?
2. Are there statistically significant differences in the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum of the fourth grade in the directorate of education of Irbid attributed to the students' gender (males and females)?

Study Limitations

This study consisted of the following limitations:

1. This study was limited to the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum of the fourth grade in the directorate of education of Irbid.
2. This study was limited to a sample of male and female fourth grade students in Al-Halhuli basic school for boys and Al-Qadissiyah basic school for girls in the directorate of education of Irbid which are both registered in the second semester of the academic year 2017/2018.
3. The study schools were selected from a group of schools since they agreed on applying the study procedures and providing the appropriate assistance.
4. The measurement of the achievement of scientific concepts was determined using a test prepared for the purposes of the present study.

Procedural Definitions

-**Roundhouse strategy**: A learning strategy to represent all the geography topics contained in the third module of the geography textbook (Earth's surface and composition factors); it focuses on drawing circular diagrams corresponding to the conceptual structure of a certain part of knowledge; the circle center represents the geographical topic to be learned, and the external sectors (5-9) represent the parts of the topic aiming to provide female students with the geographic concepts and the visual thinking skills.

-**Achievement**: students' learning result directly after studying the teaching material. It is measured by the total marks the students get in the test prepared for this purpose.
-**Social and national education**: subjects presented to students in an integrated and comprehensive method, such as: history, geography, and national education; it focuses on the learner and how to contribute to achieving his effective growth making him a good citizen able to serve his country and aware of the changes and developments in various fields (Suleiman and Nafe', 2001).
-**Procedural definition**: the material prescribed by the Ministry of Education in Jordan for the basic fourth grade and it is considered as one of the educational tools and the main source of the social education textbook in the Jordanian schools.
-**Fourth grade**: One of the basic educational stage classes in the Hashemite Kingdom of Jordan with students of 10-12 years of age receiving their education in the first semester of 2017/2018.

Study Methodology

The researcher adopted the quasi-experimental approach which studies the differences between two samples in reality without controlling other variables to identify the impact of the effectiveness of the roundhouse diagram strategy in the achievement of social education curriculum of the fourth grade in the directorate of education of Irbid.

Study population and Sample

The study population consisted of the fourth graders in the directorate of education of Irbid. The study sample consisted of (56) male and female students who were randomly selected and later divided into two groups; control (14) males and (14) females and experimental: 14 males and 14 females. The students of the experimental group studied the social and national education textbook through the roundhouse diagram while the students of the control group studied it through the regular method. Table 1 shows the distribution of the members of the study sample according to its variables:

Table 1. Distribution of the members of the study sample according to the variables of (gender and group)

variables	level	frequency	Percent
Gender	male	28	50%
	female	28	50%
	Total	56	100%
group	Experimental	28	50%
	Control	28	50%
	Total	56	100%

Study Tools:

First: Educational material

The study unit was selected from the social education curriculum of the fourth grade in the directorate of education of Irbid. The researcher analyzed the lessons, and identified the educational objectives expected to be achieved. After reviewing the previous literature and previous studies concerning the roundhouse diagram strategy, the researcher identified the ideas contained in these lessons, and prepared the required activities and lessons. To confirm the validity and suitability of the activities' design and the validity of the information contained, the researcher presented them to a group of (8) trustees with experience in the educational sciences and teaching methods whose observations and suggestions have been taken and the necessary amendments have been made.

Second: Achievement test

To achieve the objectives of the study, the researcher prepared a test for the social education of the fourth grade, which is taught in the directorate of education of Irbid; the test was prepared using the social education curriculum in addition to the teacher's guide. The researcher also analyzed the content of the material and prepared a specification table for the unit's scientific concepts. In light of this, the items of the scientific concepts test were prepared that it consisted of (20) multiple-choice items. The test was prepared according to the following steps:

1- Determining the purpose of the test, Which is measuring the achievement of the fourth graders in the social education material.
2- Analyzing the content of the teaching material from the content of the social education curriculum for the fourth grade and distributing it into main topics and sub-topics .
3- Preparing a specifications' table for the test to identify the number of items required to each objective and topic.
4- Writing the items of the achievement test according to the specifications' table and identifying the degrees of the items, the total grade, and test time and directing it in its preliminary case.

Test Validity

The initial case of the test was presented to a group of trustees with experience in the field of measurement, evaluation and teaching methods to get to know their viewpoints on the language of the items, the suitability of the test items to the test's target, and the suitability of the items to the levels of the targets; the trustees' opinions and suggestions were taken into account and the necessary amendments and deletions were done that the researcher adopted (85%) of the trustees for the suitability of the item.

To identify the homogeneity between the test items and the test as a whole, the researcher would apply it on an exploratory sample of (15) male and female students

from outside the study sample; the correlation coefficients between each item and the test as a whole will be calculated through using the Pearson correlation coefficient, which should be positive, less than 0.30 and statistically significant that the test would enjoy a certain degree of validity.

To confirm the validity of the constructive validity of the test and confirm the consistency between the test items and the test as a whole, the researcher applied the test on an exploratory sample of (15) male and female students outside the study sample and from the population itself. Table (2) illustrates this.

Table (2): Structural validity coefficients (Correlation between each item and the test as a whole)

No.	Correlation between each item and the test as a whole	No.	Correlation between each item and the test as a whole
1	.815	10	.667
2	.694	11	.982
3	.982	12	.610
4	.786	13	.694
5	.694	14	.476
6	.428	15	.641
7	.434	16	.982
8	.400	17	.720
9	.982	18	.608
19	.641	20	.786

Table (2) shows that all the correlation coefficients between the test items and the test as a whole ranged from (0.400-0.982), which is an indication on the presence of a correlation between the items and the test as a whole; such correlation coefficients are significant and acceptable for the purposes of this study .

The researcher also applied the reliability steps to a sample of (15) male and female students from outside the study sample by finding the Chronbach's alpha of the questionnaire, which amounted to (0.759) that is considered high signaling the reliability of the study tool.

Test Scoring

The final form of the test consisted of (20) multiple choice items where each item has four alternatives: three wrong alternatives, and one valid alternative; the correct answer to the item is given one degree, and zero if the student gives a wrong answer making the total degree of the test (20).

Study Procedures

The study was conducted according to the following procedures:

1. Preparing an achievement test suiting the required material and the educational objectives in the textbook.
2. Obtaining a letter from the Directorate of Education of Irbid to the principals of the schools examined in the study, coordinating with the administration of both schools to conduct the study, implement the lessons through the roundhouse diagram strategy for the experimental group and implement the lessons through the regular method to the control group and coordinating with the teachers of the third grade of the two schools to conduct the study.
3. Identifying the study population and members; the study members were divided into two groups: experimental group consisting of (14) male students and (14) female students, who were taught through the integrated built-in learning, and a control group, which consisted of (14) male students and (14) female students, who were taught through the regular approach.
4. The (think, duplicate and participate) strategy was applied to the study sample for two months by two classes per week with a total of (16) classes, each of which lasts for (45) minutes.
5. The equivalence of the teachers of both the experimental and the control groups was taken into account in terms of experience, competence and ability of teaching.
6. The post test of the study was applied and the test time was set to (45) minutes to measure the development of the students of the experimental group directly after applying the educational positions of the curriculum.

Study Variables:

-independent variables: they consist of two variables: group (control and experimental), and gender (males and females)

-Dependent variables: academic achievement.

Statistical Processing

The following statistical methods were used using the SPSS:

1- (two-way ANOVA) test to verify the equivalence of the control and experimental groups.

2- means and standard deviations of the pre and post-measures according to the group and gender variables.

3- (ANCOVA) to detect the differences between the experimental and control groups in the post measure.

Equivalence between the two groups

To verify the equivalence of the two groups, the (two-way ANOVA) was applied to detect the differences between the two experimental and control groups in the pre-measure.

Table 3. (two-way ANOVA) Test results to detect differences according to the variables of group and gender in the pre-measure

Source of variance	Sum of squares (SS)	degrees of freedom (DF)	Mean squares (MS)	(F) value	statistical significance
Group	36.161	1	36.161	3.771	.057
Gender	1.446	1	1.446	.151	.699
Error	508.232	53	9.589		
Corrected Total	545.839	55			

Table (3) shows that there are no statistically significant differences at the level (0.05) for the group variable in the pre-measure where the (F) value was (3.771) by a statistical significance of (0.057), and no statistically significant differences at the level (0.05) for the variable of gender on the post-measure where the (F) value was (1.446) by a statistical significance of (0.699); thus, there is an equivalence between the two groups in the pre-measure.

Discussion of the Study Results

The results of the study are presented below and discussed according to its hypotheses:

Zero hypothesis: There are statistically significant differences in the effectiveness of the roundhouse diagram strategy in the achievement of social education among the fourth grade students in the directorate of education of Irbid, attributed to gender (males and females) and the group.

Alternate hypothesis: There are no statistically significant differences in the effectiveness of the roundhouse diagram strategy in the achievement of social education among the fourth grade in the directorate of education of Irbid due to gender (males and females) and the group.

To test these hypotheses, the means of the pre and post measures were extracted according to the variables of group and gender in addition to the adjusted means and the (ANCOVA) to detect differences between the experimental and the control groups in the post-measure with the pre-measure as a covariate variable. The results are shown below.

Table 4. means and standard deviations for the pre- and post- measures and the adjusted means according to the variables of group and gender

Group	gender	Pre-measure		Post-measure		Adjusted mean
		mean	standard deviation	mean	standard deviation	
Control	males	10.57	2.62	17.21	.58	13.89
	Females	11.64	2.31	14.50	1.70	13.07
	Total	11.11	2.48	15.86	1.86	13.49
Experimental	males	9.71	4.45	19.71	.47	14.71
	Females	9.29	2.55	17.86	1.35	13.58
	Total	9.50	3.56	18.79	1.37	14.15

- * mean of 20 degrees.

Table (3) shows that there are visual differences between the prep-measure and post measure of the control and experimental groups where the mean for the males and females in the pretest of the control group was 10.57 and 11.64 respectively, and the means of the same gender in the experimental group amounted to 9.71 and 9.29 respectively.

The means for the males and females in the post-test of the control group were 17.21 and 14.50 for the control group, and 19.71 for the males and 17.86 for the females of the experimental group.

In order to detect the statistical significance of these differences, (ANCOVA) was applied, and the effect size was extracted through the (Eta Squre). Table (5) shows it.

Table (5): The results of the (ANCOVA) to detect differences between the experimental and control groups in the post-measure along with the pre-measure and the effect size (ETA)

Source of variance	Sum of squares (SS)	degrees of freedom (DF)	Mean squares (MS)	(F) value	statistical significance	effect size (ETA)
Group	54.212	1	54.212	50.647	.000	0.759
Gender	36.197	1	36.197	33.817	.000	0.555
pretest	26.044	11	2.368	2.212	.032	0.439
Error	44.956	42	1.070			
Corrected Total	264.214	55				

Table (5) shows that:

-There are statistically significant differences at the significance level (0.05) for the variable of group in the post-test where the (F) value was (54.212) by a statistical significance (0.000); the differences were in favor of the experimental group where the adjusted mean was (14.15), while the mean of the control group was (13.49), and the effect size (Eta Square) was (75.9%). The superiority of the roundhouse diagram strategy was attributed to the fact that it makes students the center of the educational process giving them freedom to express their opinions without fear or hesitation, which has an impact on their achievement. The roundhouse diagram strategy is one of the modern methods in teaching which increases the teacher's freedom during the lesson and creates positive attitudes for following up the lesson and respecting the other opinion. Providing many and various thoughts helped create a pleasant atmosphere among students that they loved and excelled in the curriculum. The topics studied during the experiment might be suitable to the roundhouse diagram strategy which led to an increase in students' achievement in such subjects. This study was consistent with (Jalab and Al-AJarash, 2016 and Al-Samurai', 2013), which showed the superiority of the group that studied through the roundhouse diagram strategy; it was inconsistent with none.

There were statistically significant differences at the level of significance (0.05) for the variable of gender in the post-measure where the (F) value was (36.197) by a statistical significance (0.000); the differences were in favor of the males since the mean was (14.71), while the mean of the females was (13.58) in the experimental group; however, for the control group, the mean of the females was (13.07) and (13.89) for the males. The Eta Square was (55.5%). This result can be attributed to the males' greater ability to remember and keep information for a longer period of time, males' attention in dealing with the educational attitudes compared to the females and the males' accuracy, follow-up and good conduct in addition to the competiveness between males and females which led to males' higher level and increased motivation towards learning. The result of this question is inconsistent with (Al-Kajlut, 2012) and (Hussein, 2013), which can be due to the difference in the environment between the students of the two studies and their age levels.

Recommendations

-Conducting studies similar to the current study to identify the impact of the roundhouse diagram on dependent variables other than achievement and attitude, such as: critical, creative thinking and the trend towards the curriculum.

-The need that the Ministry of Education focus on modern methods of teaching and include them within the training programs of teachers during service, especially the roundhouse strategy.

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