The Impact of the Effectiveness of the Fishbowl Strategy on the Development of Science concepts in Science among the Sixth Grade Students in the Directorate of Education of Bani Kinana

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Abstract

The study aimed to identify the impact of the effectiveness of the fishbowl strategy on the development of science concepts in science among the sixth grade students in the directorate of education of Bani Kinana compared to the regular approach. The study sample consisted of (80) male and female students who were distributed into two groups: experimental that consisted of 40 male and female students and control which consisted of 40 male and female students. The experimental group adopted the fishbowl strategy and the control group adopted the regular method in studying the same units. The researcher prepared an achievement test to measure achievement which had a sufficient validity and reliability; it was applied on the study sample. The proper statistical analyses were conducted. The results showed that there were statistically significant differences in the post test which were attributed to the method of teaching in favor of the experimental group in addition to a significant difference in the post-test which is attributed to gender in favor of the females.

Keywords: (strategy, fishbowl strategy, sixth grade, science concepts)

Introduction

In light of the current scientific and technological development along with the explosion of knowledge, those interested in scientific education face many challenges in the areas of science education and learning, especially in the development of science curriculum and its teaching strategies. Therefore, some researchers in scientific education affirm the fact that teaching science is not merely a transfer of information from the teacher; it is a process making students memorize their courses without understanding, realizing or employing them in their lives (Zaytoun, 2008). One of the main objectives of teaching science in the 21st century is helping students understand the process of scientific thinking and work according to the multiple issues and challenges they face.

The fishbowl strategy is one of the main strategies based on active learning which depends on group training and provides a direct experience for the group process of students through observing students' groups (Keck-mcnulty, 2004). This strategy is based on the interpersonal and intrapersonal education that occurs among the groups observed by the students and the impact of such education on the behaviors and outcomes of groups' members.
The fishbowl strategy is called so since it includes one group of students examining another smaller group of students in a way that does not differ from watching fishes through a transparent cup of fish; there is a small group working on discussing the subject while the external group listens and prepares questions and comments for the discussion. These roles are often exchanged to ensure that all students play an active role in discussion, listening and questioning (Green, 2000).

The fishbowl strategy is one of the methods that help you teach students some social skills; it highlights the use of social skills in either expanding or closing a particular topic (Al-Shammari, 2011). It consists of two groups of students that might be in the form of two circles:

-Inner circle: it is called the discussion group and it consists of 5-8 students one of whom is the leader of discussion and dialogue; however, it is better to have the teacher as the one running the discussion especially at the beginning of learning this method so that they can acquire discussion skills and manage the dialogue, idea or discussion issue; it also allows for one of the outer circle students to join them in discussion. The discussion lasts for 30 minutes that the remaining time is set for joining the rest of observers.

- outer circle: it is called the observers' group; it consists of five or more students and may reach (20) students. They observe silently, listen well, take notes and receive questions later by the teacher; one of them can set on the empty chair and at the end of the discussion, he goes back to his place in the observers' circle. This group, after spending the available time of 30 minutes, would join the inner discussion group.

To apply the fishbowl strategy, the following steps must be followed (Al-Fatli, 2015):
-    Selecting the subject after reading it so that it conforms to the life experiences of students.
-    Preparing a variety of useful and different questions on the subject selected.
-    students sit in the following order:

- "Fish Group" students or participants sit to discuss the subject in a small circle by (3-5) students; one of them can be appointed as a facilitator for the group.

- The observers can sit in a larger circle around the students of the fish group that each student in the fish group has partners or observers who take notes for his tasks and strategies; such partners or observers cannot speak during discussion and they have to observe, listen and take notes in preparation for discussion sessions that follows the discussion of the fish group.

4. the fish group discussion starts on the prepared questions; each member has his role and opportunity in the discussion organized by the group facilitator. The discussion can last for half an hour or according to the time allowed and previously agreed on. However, the partners listen and observe the dynamics of discussion and dialogue without interference in discussion and they also take notes (Candido et al., 2007).

5. After the end of the fish group discussion, the partners are given a period of silence in which they write the main ideas they heard from the discussion of the fish group. Afterwards, the fish group students are distributed among the observers into small groups to discuss matters and clarify any observations or comments made during discussion i.e. merging the two groups. This discussion can last 30 minutes or according to the time allowed and agreed on.

6. All students return to their seats to conduct a final discussion in which a number of questions are asked for each group: fish and observers.

7. At the end of the application of strategy, the teacher may ask his students a final question to give each one of them an opportunity to answer; their answers might be written (Qatami, 2013, 623 – 624).

Study Problem and Questions

Many prevalent practices in teaching science in Jordan are still below the required level; most science teachers use regular and traditional methods and adopt a limited number of educational activities reflecting on the students who face difficulties in understanding and applying science concepts in life situations leading them towards rote learning; they do not show any enthusiasm towards studying science, which reflects negatively on achieving the targeted learning outcomes that suit the knowledge economy data making the process of learning science meaningless depriving students from understanding the science concepts which are considered basic tools of thinking and the main basis on which the person depends in solving the problems he faces. The researcher, through his experience in teaching and meeting with some science teachers, noticed a weakness in the achievement of science concepts; this is attributed to the methods used in teaching science that depend on the method of memorization by the teacher along with his negativity, which reduces the students' achievement and their level of scientific thinking. To help these students, it was important to use strategies and teaching methods related to students' understanding of knowledge and employing it in the development of his thinking and achievement. As a result of the abstraction and complexity of most science concepts, there emerged a need for looking towards teaching methods that can help both teachers and learners teach and learn such concepts. One of those strategies considered by the researcher as helping the acquisition of concepts is the fishbowl strategy. Accordingly, the study problem lies in answering the following questions:

1.   What is the impact of the fishbowl strategy on the development of science concepts in science among the sixth grade students in the directorate of education of Bani Kinana?
2.   is there a statistically significant difference at the level ($\alpha = 0.05$) among the means of the performance of students regarding their achievement in science as a whole that is attributed to the variable of gender?

Study Importance

The importance of the study stems from the following:

-This study provides a test for measuring the science concepts that can be useful in teaching science and preparing tests similar to those measuring the science concepts, and adapting them in teaching science.
-the possibility of applying the results of this study at educational institutions; such results may also contribute to improving the level of students in acquiring the science concepts.
-it is possible that this study, along with other future studies in this field, will contribute to the development of methods of teaching science, because of the weakness of teaching results with regards to learning the science concepts.
-It is one of the earliest studies-as far as the knowledge of the researcher- that tackled the employment of the fishbowl strategy and identifying its impact on the acquisition of science concepts in science for the sixth grade.

Study Objectives

-   Validating the impact of the fishbowl strategy on the development of science concepts in science among the sixth grade students in the directorate of education of Bani Kinana?
-   Figuring out if there were statistically significant differences among the means of the performance of students regarding the achievement in science as a whole that is attributed to the variable of gender.

Study Limitations

Temporal Limitations: This study was applied in the first semester of the 2017-2018 academic year.

-Spatial Limitations: This study was implemented in the schools of Bani Kanana directorate of education in the Hashemite Kingdom of Jordan.
-Objective Limitations: This study was limited to studying the impact of the fishbowl strategy on the development of science concepts in science among the sixth grade students.

Procedural Definitions

Fishbowl strategy:

-(Saadah et al. 2006) defined it as a teaching strategy whose job is done through forming a small group in the form of a circle inside a larger student group which listens to what is said in accordance to the questions of the large group targeted to the small group on a certain topic or issue.
(Al-Shammari, 2011) defined it as one of the methods focusing on using the social skills in either expanding or closing a certain topic.
- (Qatami, 2013) Defined it as the strategy of small groups aiming to deeply research a certain topic or issue, not merely superficial treatments.
- Procedural definition: In light of the previous definitions, the procedural definition can be identified as a group of procedures set by the sixth-grade students when interacting with the scientific material of science and they include preparing a group of discussions to extract the science concepts.
- Sixth grade: All students studying in the first semester of 2017/2018.
- Science Concepts: A set of ideas circulated on specific occasions, observations or situations that might be formed to each individual consisting of a meaning and understanding associated with specific words, phrases or processes.

Previous Studies

Many studies tackled the fishbowl strategy, such as (Swaidan and Mohammed, 2017), which aimed at identifying the effectiveness of the fishbowl strategy as one of the active learning strategies in the achievement among the middle-school students in geography. To achieve the objective of the study, the researcher prepared the study sample that consisted of the middle second graders in Nour Al Moustafa middle school which had 3 sections for the middle second grade for 2015-2016.

The sample consisted of (64) students distributed to section (c) representing the experimental group that adopted the fishbowl strategy and section (b) that is the control group which adopted the regular method. Each section had (32) students. The researcher used the achievement test to conclude the results. Data were statistically processed by the related means such as T-test for two independent samples, Chi Square, and Pearson correlation coefficient. The results of the study showed statistically significant differences in the experimental group which adopted the fishbowl strategy.

(Al-Zaidi and Al-Attar, 2016) aimed to identify the fishbowl strategy in understanding the reading texts among the fourth grade students/scientific branch in teaching the reading curriculum. To achieve this, the two researchers adopted an experimental model with partial parameters in addition to a final test for the two research groups: one experimental and the other controller. The researchers randomly selected (Al-khansaa' school for girls) located in Babil province center. In the same way, they selected section (c) to represent the control group with an amount of 40 female students and section (b) to represent the experimental group amounting to 38 female students. As for the research tool, a test was prepared for the reading comprehension consisting of 3 questions. The researchers used the following statistical methods: T-Test for two independent samples, Chi square, Pearson correlation coefficient, difficulty and discrimination coefficient, and the equation of the incorrect alternate effectiveness. After statistically analyzing the results, the researchers concluded that the students of the experimental grouop which adopted the fishbowl strategy in reading exceeded the students of the control group which adopted the regular method in understanding the reading texts.

(Al-Fatli, 2015) indicated the effectiveness of the fishbowl strategy in developing the mental skills and academic achievement of the students of Physics department; the research sample consisted of (62) male and female students of the fourth grade in the Department of Physics-Faculty of Education-Qadissiyah University during the first semester of 2014-2015. The researcher used the experimental approach, set the behavioral objectives, prepared the teaching plans for the experimental group and the control group, and prepared the research tools that were represented by the achievement test and the test of mental skills. The research concluded that the students of the experimental group exceeded the students of the control group in the achievement test and the mental skills' test.

(Hmoud, 2014) aimed to identify the impact of the open and close fishbowl strategy in developing expression among the middle second-grade students. In order to achieve the objective of the research, 109 students were selected and divided into three groups: two experimental groups and one control group. The first experimental group (A) adopted the closed fishbowl strategy consisting of 37 students before the exclusion and (35) students after the exclusion; the second experimental group (B) adopted the open fishbowl strategy which consisted of (36) students before exclusion which later became (35) students after excluding one student and finally the control group (C) which had (36) students before the exclusion and (35) students after it. The three groups were taught five subjects of expression after the expert's approval during a period of ten weeks. The researcher prepared some teaching plans to be taught to two experimental groups through the open and closed fishbowl strategy in addition to a plan for the control group via the regular approach. The search tool was represented in the post-test for one of the five expression topics; the validity and reliability of the post-test were validated and it was applied at the end of the experiment, corrected and analyzed. The results concluded that the first and second experimental groups, which studied via the open and closed fishbowl strategy, surpassed the control group which adopted the regular method.

(Miller, Benz & Wysocki, 2002) was conducted in America, Sofia, Nebraska in Kearney, and aimed at figuring out the effectiveness of encouraging collaborative learning by computer: interactive fishbowl strategy. The research sample consisted of two groups: the first (38) students and the second (14) students. The researchers used the statistical means of (mean, standard deviation, and T-Test). The results concluded that using the fishbowl strategy is more effective with the presence of other technologies such as computer and that it allows for an effective participation inside class and helps them solve problems.

Comment on Previous Studies

Through examining these studies, we noticed that most studies have been conducted in different environments; they stated that the fishbowl strategy is useful in the knowledge and retention among teachers and students, which confirms the need to individualize education which is in line with the current developments. The current study has benefited from the theoretical literature of the previous studies in preparing the theoretical framework in addition to the study tool.

Study Methodology

The researcher used the quasi-experimental approach since it is suitable to the nature of the study and able to achieve its objectives through using the post-measure of the two groups: experimental and control.

Study Population and Sample

The study population consisted of the sixth graders where a random sample of male and female students from the sixth grade was chosen; they were divided into two groups: control (20) males and (20) females and experimental: 20 males and 20 females to study the impact of the fishbowl on developing the science concepts in science textbook among students. 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	20	50%
	female	20	50%
	Total	40	100%
group	Experimental	20	50%
	Control	20	50%
	Total	40	100%

Study Tools:

First: Educational Material

The study unit was selected from the science curriculum of the sixth grade in the directorate of education of Bani Kinana. The researcher analyzed the lessons, and identified the educational objectives expected to be achieved. After reviewing the previous literature and previous studies concerning the fishbowl 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 (9) 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 science textbook of the sixth grade, which is taught in the directorate of education of Bani kinana; the test was prepared using the science textbook 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 science concepts. In light of this, the items of the test of the science concepts were prepared amounting to (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 sixth graders in the science textbook.
2- Analyzing the content of the teaching material from the content of the science curriculum for the sixth 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, identifying the items' degrees, the total score, and test time and directing it in its preliminary case.

Test Validity

To identify the homogeneity between the test items and the test as a whole, the researcher would apply it on an exploratory sample of (20) 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 Pearson correlation coefficient, which should be positive, not less than 0.30 and statistically significant so that the test would enjoy a certain degree of validity.

To confirm the validity of the constructive validity of the test and confirm the homogeneity 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	.802	10	.364
2	.498	11	.397
3	.482	12	.498
4	.853	13	.397
5	.528	14	.853
6	.332	15	.593
7	.482	16	.485
8	.482	17	.482
9	.593	18	.332
19	.397	20	.767

Table (2) shows that all the correlation coefficients between the test items and the test as a whole ranged from (0.332-0.853), 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 (20) male and female students from outside the study sample by finding the Chronbach's alpha of the questionnaire, which amounted to (0.82) 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 incorrect alternatives, and one valid alternative; the correct answer to the item is given one degree, and it is given zero if the student gives an incorrect 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 Bani Kinana 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 fishbowl strategy for the experimental group and implement the lessons through the regular method to the control group and coordinating with the male and female teachers to conduct the study.
3. Identifying the study population and members; the study members were divided into two groups: experimental and control.
4. The fishbowl 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.

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 :(two-way ANOVA) test to verify the equivalence of the control and experimental group, means and standard deviations of the pre and post-measures according to the group and gender variables and (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-measurement.

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	7.225	1	7.225	1.233	.274
Gender	38.025	1	38.025	6.492	.015
Error	216.725	37	5.857		
Corrected Total	261.975	39			

Table (3) shows that there are no statistically significant differences for the variable of group; however, there was a statistical significance for the variable of gender in the pre-measure; the significance of gender was (0.015) which is less than the level (0.05) and the (F) value was (6.492) compared to the statistical significance of the variable of group which was (0.274) which is greater than level of significance of (0.05) and the F value of 0.815; thus, there is no 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 hypo thesis: There is an impact for the fishbowl strategy on the development of science concepts in science among the sixth grade students which is attributed to the gender of students (males and females) and the group.

Alternative hypothesis: There is an impact for the fishbowl strategy on the development of science concepts in science among the sixth grade students which is attributed to the gender of students (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	4.90	1.10	14.60	1.71	9.75
	Females	9.70	1.64	17.10	.57	13.4
	Total	7.30	2.81	15.85	1.79	11.6
Experimental	males	8.60	2.07	15.90	.74	12.25
	Females	7.70	2.63	18.40	.97	13.05
	Total	8.15	2.35	17.15	1.53	12.65

- mean of 20 degrees.

Table (3) shows that there are virtual differences between the pre-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 4.9 and 9.7 respectively, and the means of the same gender in the experimental group amounted to 8.6 and 7.7 respectively.
The means for the males and females in the post-test of the control group were 14.6 and 17.1 for the control group, and 15.9 for the males and 18.4 for the females of the experimental group. The mean of the control group was 11.6 and the mean of the experimental group was 12.65.

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	15.700	1	15.700	13.333	.001	0.372
Gender	50.638	1	50.638	43.001	.000	0.716
pretest	.207	1	.207	.176	.677	0.597
Error	42.393	36	1.178			
Corrected total	122.000	39				

Table (5) shows that there are statistically significant differences at the significance level (0.05) for the variable of the group in the post measure where the F value was (13.33) by a statistical significance (0.001), and they were in favor of the experimental group where the adjusted mean was (12.65), while the mean of the control group was (11.6) and the (Eta Square) was (37.2%). (think, duplicate and participate) strategy is at the top rank since it makes students the focus of the educational process and gives them the freedom to express their opinions without fear or hesitation, which has a positive impact on their education and achievement; the fishbowl strategy is one of the modern teaching methods which increases the teacher's freedom during teaching and creates positive attitudes towards following-up the lesson and respecting the other opinions. Providing many and various thoughts helped create a pleasant atmosphere among students that they loved the material. The topics studied during the experiment might fit the fishbowl strategy which led to an increase in students' achievement in such subjects. This study was consistent with all the studies such as (Sweidan and Mohammed, 2017 ; Al-Zaidi and Al-Attar, 2016), which showed the superiority of the experimental group that adopted the fishbowl strategy; this study was not inconsistent with any of the previous studies.

-There were also statistically significant differences at the significance level (0.05) for the variable of gender in the post-measure where the (F) value was (43.001) by a statistical significance (0.000) in favor of the females' group where the mean was (13.05), while the mean of the males was (12.25) in the experimental group and the mean of the females was (13.4) and it was (9.75) for the males in the control group; (Eta Square) was (71.6%). The researcher attributes this finding to the fact that female students are exposed to a more disciplined educational environment, in terms of classroom environment and teaching methods, especially in classes taught by female teachers; The educational environment in which the female students learn is less punitive and more enthusiastic while that of the male students is less disciplined and less enthusiastic especially if education is received from a male teacher where the male students face harsher punishments than the female students. Furthermore, follow-up and work organization differ between males and females since there is more focus on follow up and work organization when dealing with the female students. Through reviewing the previous studies, it is obvious that they did not tackle the variable of gender at all.

Recommendations

The researcher recommended some points including:
Adopting the fishbowl strategy in teaching science and circulating it to all textbooks and teachers.

-the need of holding training courses by the Ministry of Education to train the male and female science teachers on the method of employing the fishbowl strategy in education.
- Conducting a study similar to the current one on the students of the other levels.

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