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"The Effectiveness Of A Problem-Centered Education Strategy For Developing Systemic Thinking Skills In Science For First-Grade Female Students"

Asst Ins. Muna Abdullah Ismail University Basic Education Diyala.

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ABSTRACT

T of the problem-centred education strategy in developing the systemic thinking skills in science for first-grade female students in the middle school. By random assignment, Division B to form an experimental group that included 38 female students who taught him the last five chapters of the Science Book, which are in order: static electricity, current, electronics, magnets, and metals.

With the strategy of problem-centered education and section C) a control group included 32 female students who taught the same content in the usual way. The students of the research sample in the two groups were rewarded with the variables (intelligence test, prior information, systems thinking). The researcher prepared a systemic thinking skills test consisting of a number of paragraphs amounting to (16) paragraphs. The researcher confirmed the validity and stability of the test by Richardson's Keystone-81 and Beller's Equation 81. 0, and when applying the t-test for two independent samples, the result was that there were statistically significant differences at the significance level ($\alpha = 0.05$) between the average scores of the female students of the two groups in the experimental systemic thinking skills test in the two groups of students of the two groups studied the problem. The study recommended the need to use the problem-centered education strategy in teaching because of its ability to teach female students so that they can reach knowledge on their own.

Keywords: effectiveness, centered education strategy, logical skills

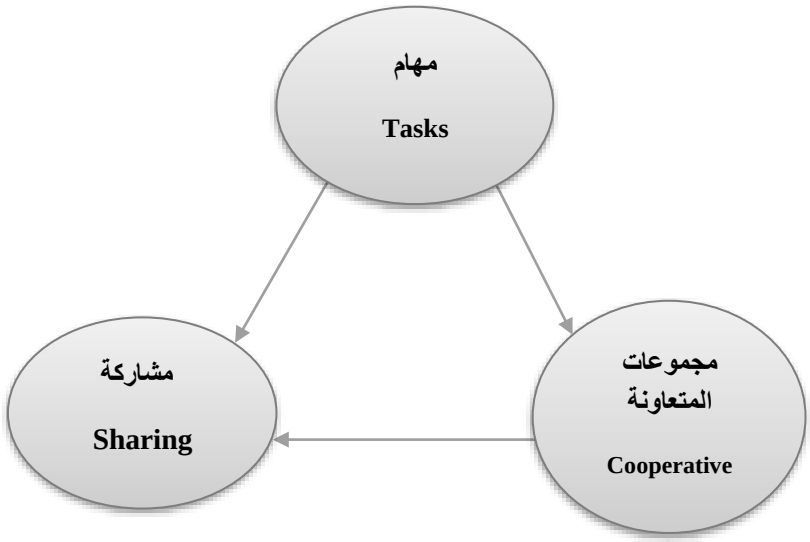
Chapter One (Theoretical Framework)

The nature of the present time in which we live, and the rapid technological and social changes that have appeared in it, have caused the need to search for a set of new educational strategies that can meet the requirements of this age, and this is what prompted educators in all countries to adopt a number of new educational strategies that can To increase students' motivation towards the subject matter, as well as increase their degree of self-control, and among those strategies that have

proven effective in this field is the problem-centered learning strategy (Han & Teng, 2005, p. 1).

Wheatley (1991) is considered one of the most supportive of the constructivist theory in the modern era, and presents this strategy as an alternative to the method of explanation and practice that is used in science and mathematics education, during which a set of facts and principles that are not related to the life of the learner are taught. He established a problem-centered learning strategy based on three basic pillars: tasks, collaborative groups, and participation, as shown in the he current study aims to identify the effectiveness

figure below.



shape (1)

The main themes of the problem-centred learning strategy

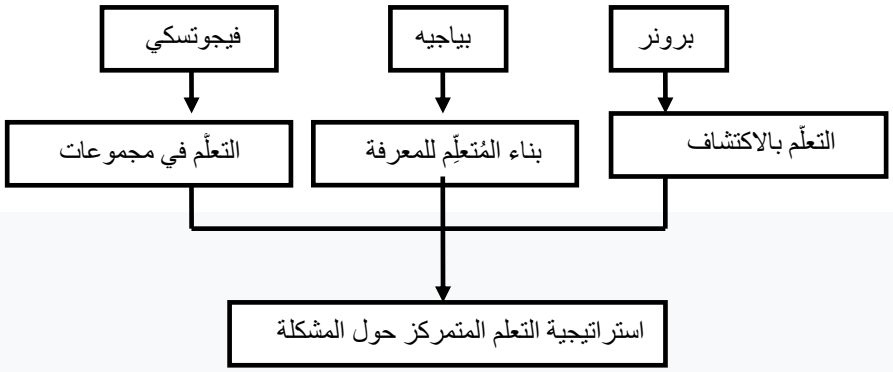
(Zaytoun, 2007, p. 462)

, Therefore, the use of the problem-centered learning strategy focuses on teaching the content through real and meaningful problems, in which students can define their own learning, since each individual has an idea or experience, or a knowledge different from the other that they exchange between them, which makes the students feel the importance of the responsibility placed on them, so they accept On this learning with enthusiasm, and in the long run, the student will become efficient and effective in assuming solutions to the problem. This type of learning The teacher should not impose on the students the information they need in their learning of certain readings, or assignments for studying. Rather, the role of the teacher is a guide and a guide, and this is what the problem-centred learning strategy tries to provide.

The relationship between constructivist theories and problem-centered learning:

Rizk (2008) cites Jaber (1999, p. 144) and Goodnough (p.3 Goodnough, 2003,) that the problem-centred learning strategy stems from the work of Brunner, Piaget and Vygotsky, and helps learners become autonomous.

Therefore, the problem-centered learning strategy with all its steps achieves both Brunner's constructivist theory through discovery-based learning by exposure to problems and tasks, and by working in groups that fulfills Vygotsky's constructivism. As for Piaget's constructivist theory, it is found in self-work on building knowledge from each learner through the processes of representation and matching, as in Figure (2):



Shape (2)

The relationship between constructivist theories and problem-centered learning strategy.

(Rizk, 2008, p. 47)

It mentions Krynock and Robb (that the problem-centered learning strategy is the essence or essence of constructivist philosophy; The student being self-reliant by solving and understanding the problem, and interpreting the information related to it, which makes him build meaning for what he learns, and this is the essence of constructivist philosophy (Dempsey, 2000, p. 10).

Concept of Problem Centered Learning:

Although there are several educational strategies that use problems as an introduction to teaching students, the problem-centered learning strategy is the most comprehensive. In this type of learning, the problem is put into use, and students in the environment of this learning exchange ideas and information among themselves in each group to deal with Problem, this type of learning results from a process aimed at understanding and solving a specific problem. Greening (1998) sees problem-based learning as "one of the alternative educational strategies to the traditional and dialectical methods in the learning process, which aims to enhance the quality of the educational process outcomes."

Kolmos et al., 2007 consider that problem-based learning is one of the learning strategies, which encourage what is known as learning to learn, and encourage working in cooperative groups to achieve In this type of learning, students learn to think critically and analytically in order to come up with appropriate solutions.

While Boyd (2011) sees that problem-based learning: “It is one of the learning styles that help to stimulate higher-order thinking skills by developing students’ skills to address problems through the actual application of problem-based learning strategies, and then evaluate the results and experiences that The students acquired it, and from the previous definitions, we see that the problem-centered learning strategy achieves the following:

1- An educational strategy based on learner effectiveness through research, discussion and reflection.

2- The teacher’s role as a planner for learning and as a guide for learners.

3- It is considered an alternative to the usual methods in the learning process, which aim to enhance the quality of the educational process outcomes.

4- It depends on building realistic situations and problems and on their actual application.

Stages of problem-centered learning:

Problem-centred learning is one of the strategies that apply the principles of constructivist theory and learner-centered learning (MacMath et al., 2009, p. 1). Also, according to this strategy, students learn through a set of scenarios or stages, and in each stage a number of students' skills are strengthened. This strategy consists of three basic stages: educational tasks, cooperative groups, and participation (Kwan, 2000, p. 1).

1- Learning tasks:

Learning tasks represent the main focus of problem-centered learning, in which students at this stage are faced with a real problem situation, through tasks or problems that require solving and focus attention on the basic concepts of the subject that leads the learner to build effective methods of scientific thinking, and these tasks must be receptive From each individual in the beginning and allows discussion and communication and encourages questions.

And ((Taconis et al.)) defines tasks as: “a set of sequential activities that lead to a specific goal or solution to a problem (Taconis et al., 2001, p. 444).

In this regard, many educators define a set of basic conditions that must be met in these tasks or scientific problems. Which:

(Gance, 2002, p. 255); (Zaytoun, and Zeitoun, 2003, pp. 197-198); (Zaytoun, 2007, p. 463); (Ali, 2008):

1- It should not be overly complicated, as it leads to frustration among students.

2- The tasks include a problematic situation, confusing situations, or an artistic plot.

3- To urge students to make decisions, so that they have more than one way to solve, and more than one correct answer.

4- To encourage students to use their own research methods, as they employ what they have of cognitive skills in addressing the problems included in the learning tasks.

5- To encourage students to ask questions of the type called "What would happen if...?" What if..? ".

6- To encourage students to discuss and debate, in the sense that it allows for a plurality of interpretations and opinions about it.

7- It should be extendable, that is, it opens the way for students; To keep searching and not stop simply because they have found solutions, they may ask new questions and then keep looking for an answer.

8- It should be closely related to the students' previous experiences, and be related to the students' interests, and be realistic, meaningful and significant, and help to solve life problems later on.

9- The tasks are intertwined together to support the construction of conceptual processes in multiple fields.

Co - Operative Groups :

One of the pillars of this strategy is the principle of collective learning, where the students are divided into several groups, each group includes (5-6) students. Collaborating groups have two advantages: one is theoretical, and the other is practical. In theory: Collaboration allows learners to engage in real contact while engaging in a scholarly activity. As learners exchange ideas and provide explanations and justifications for their thinking, the opportunity to resolve conflicts and conflicts of view and negotiate a solution In practice: Collaborative situations preclude students seeking help from the teacher. Cooperative pairs help learners learn from others (Wood et al., 1991).

Johnson (Jonsone, 1997) recommends that the teacher follow some guidelines while dividing cooperating groups, including:

1- Reduce the group size from 3-5 students.

2- Forming heterogeneous groups of students in terms of academic achievement.

3-Give each student in the group a specific responsibility or role that contributes to the success of the group as a whole. These roles include: the principal investigator, the material manager, the recorder (or rapporteur), and the observer (or the observer).

4- Reward the group to motivate the students within it.

5- Give the students clear instructions on how to work in the group before working in the small groups.

6- Encourage the students to exchange questions among themselves, and do not answer their individual questions until after the student inquires from the members of his group.

At this stage - the cooperating groups - the student has the main role, and this role is to clarify his personal solutions as his companions in the group, listen to their explanations and try to understand them, and cooperate with them to complete the activity, and reach consensus. The consensus is achieved when the students agree on a general answer even if it represents methods. different solutions to the solution (Coob et al., 1995, p. 242).

Sharing:

The participation represents the last stage of teaching with this strategy, where students of each group present the solutions they have reached, and the methods they used to reach those solutions. Because of the possibility of disagreement between groups about the proposed solutions to the problem and the methods leading to it, discussions between groups may lead to agreement among them, or serve to deepen students' understanding of each of: the solutions and methods used to reach them, and it represents an intellectual forum for students They explain their different epistemological inferences.

Han and Tang (2005, p. 3) indicated that one of the most important stages of the problem-centered learning strategy is the stage of participation or interaction between groups of friends, as it helps students develop social skills during the learning process, and students cooperate in what between them; In order to come up with solutions to the mathematical problems they face. There are many rules and criteria that must be observed in the participation stage, identified by Harman (Harman, 2000, p. 87) as follows:

1- The teacher should practice the task of facilitating communication between learners.

2- The teacher should circulate among the learners and encourage them to be mentally independent.

3- The first student to explain the solution reached by his group is to be chosen by the teacher based on his careful observation of the groups as they work on solving the problem.

4- The teacher explains to the learners that the main objective of this stage is for the learners to learn from each other.

5- That the teacher accustoms his students to take advantage of the available waiting time that he gives them; To prepare before offering them an explanation for solving the problem.

6- Giving most students the opportunity to participate in the discussion in class.

Since the problem-centered learning strategy is based on the activity of the learner, this activity sets a set of practical steps for the teacher that changes the role of the traditional teacher and imposes on him new roles commensurate with the stages and nature of the strategy. .

Chapter II

The study Problem:

If we assume that the student is the center of the educational process, and that his role is not limited to receiving information only, but rather as an investigative researcher, as the traditional teaching methods and strategies followed by teachers and based on memorization, memorization and memorization do not meet the needs of students and qualify them to live in the knowledge society, which It requires high thinking skills and the ability to search, investigate and explore, hence the importance of the study, whose problem is to answer the following main question:

What is the effect of the problem-centered education strategy on developing and retaining systemic thinking skills for first-grade intermediate students?

The following sub-questions are derived from the main question:

What are the systematic thinking skills to be developed for first-grade intermediate students in science?

What is the effect of using the problem-centered education strategy on developing the systemic thinking skills in science for first-grade intermediate students?

Study assignments:

1-There is no statistically significant difference between the mean scores of the students of the control group and the experimental group in the pre-application of the systematic thinking skills test in science.

2-There is no statistically significant difference between the mean scores of the students of the control group and the experimental group in the post application of the systemic thinking skills test in science.

3-There are no statistically significant differences between the average scores of the experimental group students in the post and delayed test to measure their retention of systemic thinking skills in science.

The importance of studying:

The importance of the study stems from the following considerations:

1-The study contributes to directing the attention of those in charge of the educational process to:

-The effectiveness of employing the problem-centered education strategy in science teaching on developing the systemic thinking skills of first-grade intermediate students.

The effectiveness of employing the problem-centered education strategy in science teaching and its reflection on students' demand for learning and improving the quality of education.

2-Provide those in charge of the curriculum planning process with skill and practical competencies that enable them to employ modern strategies in teaching, train teachers on practical skills for teaching the curriculum, and enrich and enhance the curricula with activities that employ problem-solving strategies.

3-Alert those in charge of teacher preparation programs in faculties of education to the need to train science teachers during preparation and service and to develop programs that provide them with skills to employ the abilities of the human mind among students through the use of teaching strategies that help take advantage of the mental abilities possessed by students.

Chapter III

The limits of the study:

1-A sample of (70) middle school students were divided into an experimental group, numbering (38) female students, and a control group, numbering (32) female students.

2-The study is limited to developing the following systems thinking skills (reading the figure/systematic position - analyzing the figure/position and realizing the relationships –

complementing the relations in the figure/systematic situation – drawing the systematic figure).

3-Choosing the topic (Strengths) from the science book for first-grade intermediate students.

Study tools:

1-Systematic thinking skills test in science in the subject of powers for first-grade intermediate students. (Prepared by the researcher).

2-List of systematic thinking skills in science in the subject of powers for first-grade intermediate students. (Prepared by the researcher).

Study Approach :

1-The descriptive approach: It was used in defining the theoretical framework of the study, and presenting previous studies.

2-The educational experimental method: used in applying the study tools, and measuring their effectiveness..

The study sample:

The sample of the study was selected from first-year middle school students from a secondary school, and the number of sample members was (70) female students, of whom (38) female students represented the experimental group, and (32) female students represented the control group, and the following table illustrates this:

Table (1) Distribution of the study sample members

The ratio	The number	Statement
% 54,3	38	**experimental group**
% 45,7	32	**control group**

%100	70	**Total**

:Study tools: 1-) A test of systemic thinking skills in science

Studies, theoretical research and previous studies related to the topic were reviewed

Studies, theoretical research and previous studies related to the topic were reviewed

Systems thinking skills, and a number of related measures, with the aim of preparing a test of systemic thinking skills in science for the first intermediate grade. The test, in its final form, consists of (16) paragraphs, and is divided into four dimensions, as shown in the following table:

Table (2): Dimensions and paragraphs of the systemic thinking skills test on the topic (Strengths

number of paragraphs	**paragraphs**	**Test dimensions**	م
4	4-1	The skill of analyzing the main system into systems Secondary	1
4	8-5	The skill of bridging the gaps within the system	2
4	12-9	The skill of perceiving relationships within the system	3

4	16-13	The skill of reconfiguring systems from their components	4
16	**total paragraphs**		

The total score of the test ranges from (80) degrees, and (5) degrees were calculated for each paragraph.

The validity of the systemic thinking skills test in science:

To ensure the validity of the test, the validity of the arbitrators was relied upon. The researcher presented the test in its initial form to a number of arbitrators, specializing in curricula and methods of teaching science, in order to verify the following:

*The extent to which each question measured the level it was set for.

*The correctness and integrity of the linguistic formulation for each word

*The suitability of the wording for the level of first-grade students, average

The fourth chapter

Results :

There are no statistically significant differences between the average scores of the experimental group students and the average scores of the control group students in the post application of the systemic thinking skills test in science.

To verify the validity of this hypothesis, the average scores of the experimental group students were compared with the average scores of the control group students in the post application of the systemic thinking skills test in science using the t-test to detect the differences between two independent samples as in the following table:

Table (3): T-test for the difference between the mean scores of the experimental group and the control group in the post application of the systemic thinking skills test in science

Indication level	value (t)	standard deviation	average score	the number	the group	Test type
function	4,208	13,66	37,1	38	Experimental	**Systemic thinking skills**
		9,07	14,9	32	control	
Tabular value (T): at the significance level of 0.04 = 1.80 and at the significance level of 0.02 = 1.96						

It is evident from the previous table that there are statistically significant differences at a level less than (0.02) between the average scores of the experimental group students who studied using the problem-centered education strategy, and the scores of the control group students who studied by the traditional method in the post application on the dimensions of the systemic thinking skills test, which You know Rejection of the null hypothesis, and acceptance of the alternative hypothesis "There are statistically significant differences between the average scores of the experimental group students and the average scores of the control group students in the post application of the systemic thinking skills test in science.

This result can be attributed to the fact that teaching using the problem-centered education strategy helped through the diversity of its activities, and the diversity of sources of obtaining scientific information, and teaching with the problem-centered education strategy helped the students to have the ability to ask questions and answer them, describe and explain The specific information, and this helped in developing the skill of reading the systemic figure, developing the skill of analyzing this figure, developing suggested solutions, developing the skill of complementing relationships and links in it, and developing the communication and cooperation skills of the students.

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