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# The Effect of the Need Model on Systemic Thinking among Fifth-Grader Students in Biology

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The aim of the present study is to identify. The effect of the need model on systemic thinking among fifth-grader students in biology. The research sample consisted of (65) students from the second intermediate class in middle school for boys, affiliated to the General Directorate of Education for Kirkuk, and two people were chosen A school to represent one of the experimental groups, which numbered (33) students, which were taught according to the Nidh model, and another officer, whose number was (32) students, which was taught according to the usual way. Intelligence, past mathematical knowledge, and systemic thinking skills test) A systematic thinking skills test was prepared and consisted of (12 paragraphs), and it was presented to a group of arbitrators in the methods of teaching life sciences and psychology, and its validation was verified by using factor analysis (correlation matrix) and consistency was calculated using the Cronbach-Alpha equation and the stability factor has reached (0.85). Using appropriate statistical methods. In light of these results, a researcher recommends adopting the model, which we need in teaching biology, and training teachers of biology on modern models and strategies, and from these models, we need the model.

**Key words:** *Need Model, Systemic Thinking, Fifth-Grader Students in Biology*

**Research problem:**

Thinking and teaching thinking skills are two primary goals for those who work in the field of education, and we notice at the present time that linear thinking is prevalent in learning and teaching processes where topics and concepts separate from each other are studied for any course, which leads to the accumulation of knowledge in an inconsistent manner, and it may be The task of this accumulation is to help students when passing exams that are limited to measuring a cognitive aspect only at its minimum levels. (Saeed, 2004: 1), where a learner can

analyze concepts and systems into their parts in a scattered manner, and deal with each part separately, without taking into account the relationship that binds these elements, which affects his perception, i.e. weakness in the systemic thinking and his skills of the learner. It also emphasized that all teachers do not take into account systems thinking when teaching, and they do not use modern non-lecturing models or strategies and methods of teaching, and few of them use cooperative learning. Based on the above, a research problem can be identified by the following question:

(The effect of the Nedhom model of systemic thinking among students of the fifth science students in the subject of biology?)

**Important research:**

**Theoretical significance:**

1. As far as a researcher knows, this is the first research of its kind (locally and in the Arab world) that works on measuring the effect of the Structural Needham Model on Systemic thinking on the subject of biology. Fifth scientific students

2. Emphasizes the importance of modern educational models based on the constructive theory of teachers and supervisors through the establishment of workshops and training courses, and an emphasis on their importance. Teaching methods as a tool for developing their systems thinking.

**The importance of application**

Research provides tests. Thinking skills. Systemic and possess psychometric properties suitable for the second intermediate stage and are reliable for further research.

1. It is one of the best choices that are placed in front of teachers, and it facilitates their task to follow an appropriate model for teaching and develop their organizational thinking skills.

**Research hypothesis:**

• There is no difference. Statistically significant at the level of significance (5 0.0) between the average scores of the students of an experimental group who studied according to the Nedham model and the scores of the students of a control group who studied the same subject subject according to the usual theoretical method in an experimental test.

**Research limits**

1. The research will be applied in the academic year 2019-2020 AD.

2. The research is applied in one of the preparatory schools affiliated with the Directorate of Tikrit Education for the academic year (2019-2020).
3. A research is applied to a random sample of the students of Fifth Alami students at Al-Furqan School for Boys.

**Defining terms:**

- Nedham Model: (Mohammad, 2012) as "a model consisting of five stages (orientation, idea generation, organizing ideas, and contemplation) in which the learner is active and responsible for his learning." Mohammad, 2012: 10).
- Systemic thinking skills: It is a system of complex mental processes that reflects the learner's ability to think systems through (analyzing the main system into subsystems, filling gaps that are within a system, realizing relationships within a system, and re-installing systems from its components).

Procedural definition: a set of mental processes that enable learners to form a comprehensive systemic view of the subject to be learned by analyzing it and perceiving relationships between its parts and filling gaps within the parts, then installing those parts from their components and measuring the degree obtained by the students of the fifth science students in their answer to the test items.

**Needham's constructivist model and constructivist theory**

Needham presented his model in (1987) within Project. My education, titled "Learning. Science among Children" in the Kingdom is united and its goal was to encourage children to integrate into their studies with vitality and activity. "It is based on the ideas and principles of constructive theory. (Al-Ashqar, 2018: 55).

It consists of a five-step model and is as indicated by: (Needham & Hill K 1987).

1. Guidance: Represented in a psychologically and mentally appropriate preparation for learners towards a topic by displaying pictures, shapes, or videos, as well as presenting questions that help stimulate and provoke an educated mind to think. A position on the causes or results of that phenomenon or a solution to that problem.

2. Generating ideas: Here, all previous information, experiences and ideas in the students' cognitive structure that are related to the topic of the lesson are summoned to be discussed with the teacher by raising questions and writing down the answers, and these discussions are held in binary groups to exchange information and ideas through dialogues, writing and summarizing them.

3. Formation of ideas: In this stage, the teacher's role is highlighted in reconstructing previous experiences and ideas that may be misconceptions where:
Divide the learners into groups containing (4-6) learners, and encourage these groups to cooperate through activities and solve problems during those activities, and record all observations or conclusions and explanations, and an open dialogue is held between individuals. One group to discover contradictions resulting from the predictions of learners in the orientation phase, and each group presents new scientific experiences that they reached in front of other groups in the classroom, and an open dialogue is held among all groups about the resulting scientific experiences.

4. The application of ideas: a teacher and learners apply the experiences gained to a new educational situation by: Presenting new problems to learners that are similar to problems that have already been dealt with in order to use the method of solving themselves, and he creates a suitable atmosphere in a classroom to apply what learners have discovered for new educational situations , And follow-up them carefully during their experimentation of concepts and new experiences in order to evaluate them.

5. Meditation: A teacher allows learners to meditate collectively or individually to review their acquired concepts, and make sure that they acquire them through: Each learner reviews new ideas and compares them with previous ideas. Their previous ideas are to ensure the validity of those ideas. A group of learners were asked about basic concepts of the lesson to make sure that previous concepts were modified with new ones that proved correct during the course of lessons.

**Characteristics of this model:**

Focuses on taking an interest in learners' ideas. And developing previous experiences to discover new knowledge. It provides opportunities for work. Collaborative among learners, which enables them to achieve goals and positive participation. It gives an opportunity for learners to re-reflect on their own and collectively to review ideas and concepts that have been modified. It turns them on and attracts their attention towards. A learning process that allows learners to exchange opinions and discussions. It is binary and group and their ideas are presented, and educational content is presented in a way that challenges their thinking by presenting them in the form of scientific problems, and the learner is the focus of an educational process to build his knowledge on his own, while the role of a teacher is focused on guiding and following them and designing educational activities, and employing their previous experiences. Possessed by a learner in discovering and constructing subsequent experiences (Ayob, 2012: 222-226).

**Systems thinking:**

Its emergence represented a profound revolution in the history of Western scientific thought in which it prevailed, and that systemic thinking, as it does not leave an aspect or part of the problems, does not include them in an analysis and research in parts, leading to a definition of the causes of the problem in every part in order to facilitate the formation and composition of the whole, leading to A final solution to the problem, which is called systems analysis, so the solution of a part in the perspective of the whole is comprehensive, facilitating the solution of a problem. (Rida and Al-Amiri, 2013: 165). Open thinking that stems from a reality of awareness, and a comprehensive awareness of the dimensions of a problem that a person faces, so it starts from a (holistic) perspective and from the relationship of the whole to the part and the relationship of the parts to each other and their relationship to the overall position, and that systemic thinking requires the development of higher skills in thinking and sufficient competence that in turn enable him to adapt With changing and complex conditions for the distinguished human age, which requires teaching methodologies of thinking. (Al-Saeed and Al-Nimr, 2006: 221).

**Systems thinking skills:**

1. Analysis of a major system into sub-systems.
2. A comprehensive view of any subject without losing this topic of its particles.
3. Perception of relationships within one system and between other systems.
4. Re-installing the systems from their components (Al-Kubaisi, 2010: 60).

**Previous studies**

Table (1) studies on research variables (for the Needham structural model and systems thinking).

| Researcher's name | Aim of the study | Type of curriculum The size and gender of the sample | Subject and scientific level | Independent variable | Dependent variable | Statistical means | Results |
|---|---|---|---|---|---|---|---|
| Al-Baali, Ibrahim Abdulaziz | Identify the effectiveness of using the Needham structural model in developing decision-making skills and academic achievement | The experimental curriculum is 86 male students | Science Sixth Elementary | Needham constructivist model | Decision-making and collection | A t-test, retesting on the same sample | The presence of statistically significant differences in the decision-making skills test in favor of the experimental group. And the existence of differences between the mean scores of the experimental group and the scores of the control group students at a level of significance (0.01) in the achievement test in favor of the experimental group. And the existence of a statistically significant correlation at the level of significance (0.01) between achievement in the science subject and decision-making in favor of the experimental group students. |
| Saudi Arabia 2012 | The effect of using the structural model in teaching mathematics on developing and retaining systems thinking skills among seventh grade students | Male experimental | Seventh grade | Constructivist model | Systems thinking skills and retention | Pearson Correlation Coefficient | The experimental group that was studied according to the structural model outperformed the control group that was taught according to the traditional method. |

Benefit from previous studies: He benefited from his knowledge of previous studies, including:

1- Learn about constructivism theory strategy, models, characteristics and advantages.

2- I helped him in preparing research tools represented in the systemic thinking test
3- Studies helped in selecting an appropriate research methodology and design.
4- Learn about the statistical methods most appropriate to the search variables.

**Research methodology and procedures**

Curriculum and study design: An experimental approach was used, and the design of two equivalent groups of partial control with dimensional application was chosen according to the following table:

Table (2) the experimental design of the research

| Application | Experimental | Tribal application | Groups |
|---|---|---|---|
| Test the Systemic thinking | Needham model | Intelligence-<br>otis lennon<br>- Previous collection<br>- Chronological age<br>- Test the Systemic thinking | Experimental group 1 |
| | Normal program | | Control group |

Research community: The research community was identified with fifth grade students at Al-Furqan Boys School in Kirkuk.

**Research sample:** The study sample was chosen intentionally, and it is two groups: a control group that studied in a traditional way and numbered (33) students, and an experimental group that studied by applying the NEDHM model and their number is (32), and the total number of the members of the research sample was (65) students.

Third: Procedures for controlling parity of the research sample: Reward the researcher with a number of variables (prior knowledge, chronological age, systematic thinking test), and those variables were determined by obtaining information for chronological age from school records. As for previous knowledge, students' grades were obtained After testing them and determining the scores of each of them, and when a comparison is made between the mean scores of two experimental and controlled research groups using the t-test for two independent samples, it was found that the value of (t) calculated reached (1.403), meaning that it is less than the tabular value of ((2) in the three variables Which means that three groups are equal with the variables mentioned.

**Research Supplies:**

1- Determining the content of (scientific subject): It was adopted in determining the subject that will be studied on the book of the fifth grade of science of biology for the second course, which includes (Chapter Five/ Transport, Chapter Six/ Nervous coordination and sensation, Chapter Seven / Hormones and glands)

2- Analyzing the content and defining the concepts: A researcher analyzed the content of the biology book, identifying main concepts and sub-concepts and making maps of the concepts in order to achieve a research goal. He presented them to specialists in science teaching methods.

3- Preparing teaching plans: Teaching plans (52) were prepared for each group and presented to a group of referees, amending them and finalizing them.

**Research tool:**

**Systems thinking test:**

1. Objective of the test: to measure a systematic thinking test for the students of the research sample (students of the fifth science) from the two groups, experimental and control, who studied according to the Nedhm model and the other in the traditional way, and to judge any better methods in achieving the teaching goals.

1. The researcher relied on previous literature and studies in determining the skills of systems thinking, and identified four skills for systemic thinking, as indicated (Al-Kubaisi, 2010):

- The skill of analyzing major systems into subsystems.
- The skill of a comprehensive vision of any topic without losing its details.
- The skill of perceiving relationships within a system.
- The skill of re-installing systems from its components (Al-Kubaisi, 2010: 60).

2. After reviewing previous literature that tested systems thinking skills, and presenting a test to experts in teaching methods, measurement and evaluation, a number of test items were deleted and the items that obtained (80%) or more were kept from arbitrators' agreement, thus preparing a test ready for application.

3. A key was placed to correct the answers, one score was calculated for the correct answer, as for abandoned systems, they were given zero, and the test score became (100) marks for the test as a whole.

4. The test was applied to a sample of (25) students from middle class students in one of Kirkuk averages. In order to prove the time and clarity of its paragraphs, a time was specified (75) minutes.

5. To judge the authenticity of the test, the test was presented to a group of arbitrators, and it was modified according to their opinions.

6. The test was applied to a second exploratory sample consisting of (100) second-grade students of the intermediate class in order to ensure the validity of each of the test items, and verify its difficulty, ease and ability to distinguish, by using their own equations.

7. Using the (Alpha - Cronbach) equation, a test of the systematic thinking skills of the exploratory sample was calculated, which reached (85%).

Experiment application: the test was applied to the research sample after the end of an experiment. For the year 2019-2020.

**Statistical means:**

Appropriate statistical methods were used, and the statistical package SPSS (Odeh, 1998: 285-356) was used (Hassan, 2011: 271).

**Chapter Four: Research Results**

**Research hypothesis:**

The results were shown using the accompanying variance analysis equation (ANKOVA), and the Schiffie test for comparisons with two dimensions, the performance of the students of an experimental group who studied according to the Nedhm model over the students of a control group who studied according to the traditional method of testing systematic thinking skills and each of his four skills, this hypothesis is rejected.

And it states that there is no statistically significant difference between the mean scores of the students of an experimental group that studied according to the NEDhm model and the students of the control group that studied according to a usual method in testing systems thinking skills as a whole and in each of his four skills. Table (3) analysis of variance accompanying ANCOVA of the scores of the two groups: A study in the systemic thinking skills test as a whole, and each of its four skills

Table (3) ANCOVA analysis of variance associated with scores of two research groups in testing systemic thinking skills as a whole and each of his four skills.

| Statistical significance at the level of 0.05 | Table value | Calculated value | Average sum of squares | Sum of squares | df | Sources of variance | the field |
|---|---|---|---|---|---|---|---|
| sign | 3.99 | 74.6 | 1617.0 | 1617.0 | 1 | Between "adjusted" groups | The skill of analyzing major systems into subsystems |
| | | | 21.8 | 1346.0 | 62 | Within "modified" groups | |
| sign | 3.99 | 46.8 | 173.0 | 173.0 | 1 | Between "adjusted" groups | The overall vision skill for any subject without losing its parts |
| | | | 4.0 | 232.0 | 62 | Within "modified" groups | |
| sign | | 8.0512 | 67.1 | 67.1 | 1 | Between "adjusted" groups | The skill of realizing relationships within the system |
| | | | 3.1 | 148.0 | 62 | Within "modified" groups | |
| sign | | 32.4 | 92.2 | 92.2 | 1 | Between "adjusted" groups | The skill of reinstalling systems from their components |
| | | | 2.9 | 176.1 | 62 | Within "modified" groups | |
| sign | | 386.750 | 96.2 | 96.2 | 1 | Between "adjusted" groups | Systematic thinking |
| | | | 1.11 | 69.1 | 62 | Within "modified" groups | |

Table (4) Scheffe test results for the experimental and controlling group's scores in the systemic thinking skills test as a whole and each of the four skills

| | Table value | Calculated value | Average sum of squares | the number | the group | the field |
|---|---|---|---|---|---|---|
| sign | 3.99 | 74.624 | 58.5 | 33 | Experimental | Systematic thinking |
| | | | 48.5 | 32 | Control | |
| sign | 3.99 | 46.4 | 19.5 | 33 | Experimental | The skill of analyzing major systems into subsystems |
| | | | 16.2 | 32 | Control | |
| sign | | 28.4 | 14.3 | 33 | Experimental | The overall vision skill for any subject without losing its parts |
| | | | 12.3 | 32 | Control | |
| sign | | 33.4 | 14.4 | 33 | Experimental | The skill of realizing relationships within the system |
| | | | 11.9 | 32 | Control | |
| sign | | 88.9 | 11.1 | 33 | Experimental | The skill of reinstalling systems from their components |
| | | | 8.1 | 32 | Control | |

**Impact size:**

Table (5) shows the results obtained by the researcher in order to find the size of the effect of an independent variable (Nedhm Model) on a dependent variable (systems thinking skills as a whole and each of his skills).

Table (5). The magnitude of the effect of the independent variable: the model we need on dependent systemic thinking on the dependent variable (systemic thinking skills as a whole and each of its four skills)

| Effect size | Value d | Value η2 | Domain |
|---|---|---|---|
| Very Big | 1.3 | 0.3 | Systematic thinking |
| Very Big | 1.1 | 0.3 | The skill of analyzing major systems into subsystems |
| Very Big | 1.2 | 0.3 | The overall vision skill for any subject without losing its parts |
| Very Big | 1.3 | 0.3 | The skill of realizing relationships within the system |
| Big | 0.9 | 0.15 | The skill of reinstalling systems from their components |

(Hassan, 2011: 283)

**Conclusions:**

- The Nedhom model worked on developing systems thinking skills among the students of the fifth science students.
- The model we need as a constructive model stimulates learners' thinking, and strengthened their self-confidence through group discussion, research, exploration, and making the learner the center of the educational process.

**Recommendations:**

Training life sciences teachers on modern models and strategies, which emphasize the active role of the learner in building his knowledge of himself, under the guidance of a teacher, and among these are models of their need, and the preparation of model lessons by experts in teaching methods to benefit from them.

**Proposals:**

Conducting a similar study to identify the effect of the NEDHEM model on the development of dependent variables that differ from a current study variable such as (acquisition of scientific concepts, critical thinking, metacognitive thinking, the motivation of learning towards science).

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