A Refereed Journal of Northern Europe Academy for Sudies & Research
--Denmark - 13/01/2021 (Tenth issue)

The effectiveness of the Schwartz model in achievement and development of mathematical proficiency among fourth-graders in mathematics

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Abstract

The current research aims to identify (the effectiveness of the Schwartz model in achievement and development of mathematical proficiency among students of the fourth grade scientific in mathematics) The research chose Al-Rayyan High School for Girls in Salah al-Din Governorate / Samarra District, in which there are three divisions for the fourth scientific grade, the researcher chose two classes randomly And distributed into two groups, the first group of experiments (36) students who studied with Schwartz strategies, and the second control group (34) students who studied in the usual way, and the parity between the two groups was achieved in some variables, including (chronological age in months, previous achievement, IQ score, parental education level Two tools were used for the first research, represented by an objective achievement test of the multiple choice type (40) test items, while the other tool was to test mathematical prowess (20) test items, using statistical methods that fit the research, the results showed that there are statistically significant differences at the level (0.05)) Between the two groups of research on the averages of achievement test scores and mathematical aptitude test scores in favor of the experimental group.

Key words: Schwartz strategies, achievement, mathematical prowess)

Introduction:

Mathematics is considered one of the intellectual activities that contribute to the development of the student's thinking abilities and accuracy in expression, on the one hand, and on the other hand, in the areas of knowledge, mathematical and engineering skills, And mathematics is one of the important subjects that are taught in all stages of education, as there is no stage of study that is devoid of it in the general education stages, And that the most important characteristic of it is its cumulative nature in its topics and its abstraction in its concepts and relations, as it is one of the complex fields of knowledge for the learner, In other words, learning it raises multiple problems and difficulties for the learners, It is noticeable that most students find common and severe difficulties in mathematics to the extent that learning difficulties represent the most important, polarizing and common educational difficulties for human interest in its various types and orientations, Understanding the basics helps learners to understand the mathematical structure or its structure and

gives them the ability to apply rules and theories, whether within the subject matter or within its fields of knowledge, and that understanding the basics of mathematics contributes to acquiring skills on the basis of deep understanding (Obaid et al., 2000: 37)

Research problem:

The research problem was formulated with the following main question: What is the effectiveness of the Schwartz model in achieving and developing mathematical proficiency among fourth-graders in the science in mathematics?

1- What is the effectiveness of the Schwartz model in the achievement of fourth-grade students in mathematics?
2- What is the effectiveness of the Schwartz model in mathematical prowess among fourth-grade students in mathematics?

Research importance:

Represented by the following points: goal setting, needs assessment, studying the characteristics of students, identifying and developing educational content, evaluation and re-planning, and perhaps one of the most important models used is the Schwartz model (Al-Sheikh, 2017: 2)

The importance of the current research can be summed up as follows:

1- Current research provides information on Schwartz's model and mathematical prowess
2- It is possible to discuss the current research in the training courses which are held in the directorates of education to learn how to apply them.
3- There is no study as far as the researcher is aware at the time of writing the paper for Schwartz's model and mathematical prowess in mathematics.

Research objectives:

The current research aims to find out the effectiveness of the Schwartz model in: -

1- Fourth-grade students ’achievement in mathematics.
2- The athletic prowess of the fourth grade female students.

Research assumes:

1. There is no statistically significant difference at the level (0.05) between the average score of female students for the experimental group, which is taught by the Schwartz model, and the average grades of female students for the control group, which are taught in the usual way in mathematics for the fourth scientific grade.
2. - There is no statistically significant difference at the level (0.05) between the average scores of the mathematical proficiency of the experimental group students, which are taught by the Schwartz model, and the average scores of the control group students who are taught in the usual way in mathematics for the fourth scientific grade.

Search limits: The current search is limited to

1- Fourth grade students in governmental day schools and middle schools in the city of Samarra.
2- The first semester of the academic year 2019-202
3- The first and second chapters of the fourth-grade mathematics textbook to be taught by the Ministry of Education.

Defining terms:

Potency: As "the ability to accomplish goals and inputs to achieve the desired results and reach them as far as possible" (Zaitoun, 2003: 54)

Operational definition of Potency: The effect of the independent factor (Schwartz model) on the dependent variables (achievement, mathematical prowess) and the effect is determined statistically through the ETA square.

Schwartz model

As a student-centered educational model, it is geared towards mastering learning processes instead of memorizing and memorizing information; it organizes a set of thinking skills and processes in the categories of comprehension and comprehension, creative thinking, critical thinking, decision-making, problem-solving, and in each category a set of skills and thinking processes, It clarifies the strategies for performing each skill and process and how to integrate it into the educational curriculum and teach it, using many methods, methods and tools. ”(Swartez et al, 2008)

Procedural definition:

It is a thinking education model that aims to train students to develop higher-order thinking skills and solve problems (scientific inquiry) and it consists of three basic methods (graphic organizations, verbal thinking maps, writing based on thinking)

Attainment

As "what the student acquires in terms of knowledge, skills, methods of thinking and ability to solve problems as a result of a scheduled study, and it is measured by the grades obtained by the one on whom the test was applied" (Obaid, 2010, 308)

Procedural definition

The amount of scientific achievement by fourth-grade students after passing through educational experiences related to mathematical subjects measured by the degree they obtained by the final achievement test, which was prepared for this purpose.

Athletic prowess

The learner's abilities to acquire skills and perform mathematical operations, and to employ and process these experiences to form his cognitive building and adopt it in solving problems and producing new mathematical knowledge (Obaidah, 2017: 28)

The procedural definition of mathematical prowess

A measure of the fourth grade students 'scientific level with two components (conceptual understanding, strategic competence) through the test prepared by the researcher to measure the two components of mathematical prowess.

Theoretical framework and previous studies

The first axis: the Schwartz model

It is a model for teaching thinking that appeared in the late twentieth century in America and at the hands of Robert Schwartz, among these skills (classification, comparison, probabilities, analysis of the part-to-whole relationship, interview, prediction, and determination of the reliability of sources of information), Using verbal thinking maps, graphic organizers, thinking-based writing) it is a model that helps train learners to reach solutions to the problems they face and take appropriate decisions (Al-Zaq and Al-Hajjah, 2016: 13)

The thinking skills underpinning the Schwartz model

It is a set of skills in which students are trained in the model and it is a skill

-Comparing and contrasting: It is the search for similarities and differences between two things.

- Analysis of the relationship between the part and the whole: is aware of the way that contributes its part to perform the function of all, and its role in the installation of all the original.

-Classification: It is shorthand for the many meanings, organization and expression of information

- Determining the reliability of information sources: relying on specialized and reliable sources of information and verifying them in multiple ways.

- Prediction: It is expected to be in the future and building expectations and conclusions of the results of the likely options.

- generating possibilities and alternatives: means generating the largest number of ideas and solutions creative ways emphasizes mental openness (Zak and Ahadjahjh .2016: 14).

The importance of model Schwartz

1- Style learning individual, learning a meaning.
2- It is based on a set of organized steps that help the teacher present the topic from beginning to end according to organized steps.
3- It makes the learner an active element in the education process and raises his efficiency in thinking.
4- It trains students to increase self-confidence and self-control, being a participant in the educational situation, and it also contributes to training students to raise their level of intelligence (Al-Sheikh, 2017: 19)

Lesson components of the Schwartz model

1. Skill objectives: Achievement is measured by the students' ability to apply the skill in different situations.
2. Content objectives: Achievement is measured by students' mastery of the cognitive content of the lesson.
3. Means and tools.
4. Introduction to the lesson.

5. Active thinking: This is done by integrating the skill with the content of the lesson, and the teacher's success is measured by the ability of his students to apply the skill within the content of the study.
6. Thinking in thinking: to ensure that students master the steps of applying the thinking skill.
7. Application of the skill: At this stage, feedback is provided for the purpose of ensuring students' mastery of integrating thinking skills with the content of the study (Kattami and Alsakkar 2010: 865-866)

The teacher's role in the Schwartz model:

1. It helps students to organize and express ideas.
2. Training students to develop a set of higher-order thinking skills such as (analysis, comparison, interview and classification)
3. It encourages students to use their imagination, and develops them the skill of prediction.
4. It develops students' ability to generate possibilities and alternatives.
5. It provides opportunities for students to assess themselves.
6. Training students to exchange ideas between them. (Sheikh, 2017: 19)

The student's role in the Schwartz model:

1. Conveyor and acquisition of knowledge.
2. An interlocutor, discussion and active participant in presenting ideas
3. An active element in the educational position, and an organizer of the important ideas that he acquires.
4. It builds learning around the key concepts. (Sheikha, 2017: 20)

Second: Mathematical Prowess:

1. The student's ability to use his information to solve problems within mathematics
2. The student's ability to use the language of mathematics to communicate ideas.
3. Ability to infer, analyze and understand concepts.
4. Inclination towards mathematics and grasp its nature.

Athletic prowess components:

1. Conceptual assimilation
2. Procedural fluency

3. Strategic competence
4. Adaptive reasoning
5. Productive desire

Previous studies were on two axes:

The first axis: Studies that dealt with the Schwartz model, including:

1-Study (Sheikh, 2017)

2 Studies (Al-Zaq and Al-Jahjeh, 2015)

The second axis: studies of mathematical prowess:

1- Obaidah's study (2017)
2- Zidane's study (2018)

Search procedures:

Experimental design

The researcher adopted the experimental design, which is called the semi-hermetic experimental design

Research community and sample:

The research community consists of secondary and preparatory schools for fourth-grade students in Salah al-Din Governorate / Samarra District, and their number is (346) students, The research sample consisted of (70) female students, two divisions were chosen randomly, and they were divided into two groups (experimental (36) and control (34).

Interpretation of the results related to the mathematical prowess test: The researcher attributes that to the following reasons

1. Mathematical ingenuity increases learning motivation by dealing with mathematics as the scientific subject related to reality, and not an abstract subject that is difficult.
2. The diversity and interdependence of the components of mathematical prowess has a great and prominent role in understanding knowledge, which leads to its consolidation in the minds.

3. The diversity of activities and exercises contained in athletic prowess helped improve students ’learning and develop their thinking skills.
4. Adaptive reasoning is an essential component of mathematical prowess, which may aid logical thinking, justification, interpretation, and the ability to solve problems.

Recommendations

1. Reconsidering when building a mathematics curriculum for the various academic levels, so that it includes teaching models that follow the logical style by presenting their contents.
2. Conducting other studies for different stages, and studying the effect of the Schwartz model on other dependent variables such as conceptual comprehension and intelligent thinking skills.
3. Developing students ’ability to mathematical prowess, where the student has the ability to find solutions to problems and link mathematics with reality, and not to rely on routine solutions in solving mathematical problems.

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