A Framework for Teaching Mathematical Skills for the Development of Thinking in Elementary School Students

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إطار عمل لتعليم المهارات الرياضية لتنمية التفكير لدى طلاب المرحلة الابتدائية

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Abstract:
The purpose of the article is to design a proposed framework to enhance the thinking skills of 5th grade students and to measure the impact on their results and ability to solve mathematical problems. A dedicated cognitive acceleration sub-framework is used to develop intellectual progress through science and mathematics courses This structure unites two sub-frames: CASE subframes and CASME subframes and the experiment used is based on a sample of (56) students selected from elementary schools and divided into two groups. (28) students in the first group and (28) students in the second control group. t-test was created for the two independent groups. Results shew a significant difference between the two hypotheses was outlined. **Keywords:** t-test, psychometric, cognitive acceleration, mathematical reasoning, mathematics teaching model.

الملخص:
الغرض من هذه المقالة هو تصميم إطار عمل مقترح لتعزيز مهارات التفكير لدى طلاب الصف الخامس الابتدائي وقياس الأثر على نتائجهم وقدرتهم على حل المشكلات الرياضية. ويتم استخدام إطار فرعي متخصص للتسريع المعرفي لتطوير النمو الفكري من خلال دورات العلوم والرياضيات. ويجمع هذا الهيكل إطارين فرعيين هما الأطر الفرعية CASE والاطر الفرعية CASME، وتستند التجربة المستخدمة إلى عينة مكونة من (٥٦) طالبًا تم اختيارهم من المدارس الابتدائية ومقسمة إلى مجموعتين. (٢٨) طالبًا في المجموعة الأولى و (٢٨) طالبًا في المجموعة الضابطة الثانية. تم إنشاء اختبار t للمجموعتين المستقلتين. وقد أظهرت النتائج اختلافًا كبيرًا بين الفرضيتين.
الكلمات المفتاحية: اختبار t، قياس نفسي، تسارع معرفي، تفكير رياضي، نموذج لتدريس الرياضيات.

Introduction

Understanding and practicing basic math skills is an important skill. A pleasant surprise for elementary schools to prepare students' achieving in high school and beyond. The best teaching strategy is to increase proficiency in basic mathematics. Although the cost of implementing this strategy is high, it aims to raise the standard of empowerment through in-depth teaching and learning resources. This should also be supported by a professional training program for teachers [1]. It is known that the reasons behind the low-profile collections of many mathematics facts were motivated by the mental ability of students that is related to enhancement of conceptual, practical and technical knowledge. In other words, when students use thinking procedures for solving major kinds of math problems will face difficulties even if the students attend mathematical major coursesIt is not enough to rely on structural thinking theories, such as Piaget's theory, which states that human intelligence changes between the ages of twelve and eighteen. This mental approach is called the process of moving from sensory absorption to cognitive thinking. For example, let's look at other variables such as genetic variants that accompany students in the environment and are close to school learning processes. Experts in the field of reproduction confirm the importance of genetic variables so that students treat the reproduction process as advanced knowledge and pay more attention to learning and teaching [2]. Students, in this case, rely on virtuous teacher's approaches and the learning process adopted. The article emphasizes on the stimulus of pupil thinking and using the process of try and error approaches to find solutions for problems of math. This kind of thoughtful enhances students retrieving process [3] and will lead to a positive development of mental structure.

The Aim of This Research

In this research article a number of important items were outlined as follows:

1) Propose a new framework to enhance the math thoughtful skills of fifth grade students and study the effectiveness approaches for increasing students' performance.

2) Suggest an experiment framework for a sample of professional development training students and to understand the effect of solutions of math problems on students, given a new insight of teaching Several key aspects are described in this paper, for example:

1) Suggest new ways to improve 5th grade math thinking skills and find effective ways to improve student performance.

2) To understand the impact of solving math problems on students, we propose an experimental model for a sample of professional development training students, which provides a new perspective on education approach that supports training students on logical thinking and developing the correct steps for solving math problems.

3) Enlighten theories and approaches that are related to thinking process development, speeding up, enhancing and joining these to form a new framework for the learning math processes.

4) Reform the framework to be reused for other subjects that require reflection of continuous capacities.

5) Incorporate the load accompanying scientific expansion and take into consideration new rising problems, develop new methods of mockery which put students at the center of groundwork for the new revolution of information.

6) Draft the proposed framework to improve fifth graders' mathematical reasoning skills.

7) Enhance the consequences of the proposed framework for the use of the fifth grade students during problem reasoning strategy.

A Proposed framework)

Scientists and teachers of mathematics need to understand this in order to accelerate the process of mental development and to investigate thoroughly insight of mental speeding up activities using the approach of training. To understand the proposed framework, one needs to go through the two sub-frameworks as outlined below:

- Seyer and Adey sub-Frameworks (CASE)
- Math sub-Framework (CASME)The proposed framework requires the modification of some rules and procedures that support the process of a proper mental thinking and reliable improvement activities.These frameworks, Seyer and Adey Frameworks (CASE), aim to accelerate intellectual development process through the use of science education, and also adapt the approach of using cognitive acceleration through science education [4].Formulated by Felipe Addy and Michael Sierra in 1989, this framework is intended to accelerate the development of scientific thinking skills [4] and has been tested in eight British schools over an extended ten years' time and tested for excellence in English. Science and mathematics [3]. The project was based on Piaget's psychological schema, which predicts many changes in students' mental structures at a certain age, and Vygotsky's sociological schema, which states that the environment influences the way learning is done the student [3]. Previous studies have referred to the structure as "cognitive acceleration", "thinking acceleration" or "thinking", and these studies [5, 6, 7] support the curriculum found in most teacher guides, textbooks, laboratories, materials, and student records. The proposed work is approached using seven subsequent steps starting with:

1- Introduction which emphasizes on:

a. activity improvement objectives.

b. clarify ideas that will be focused on.

c. outline material for each activity.

d. identify methods of individual procedure enlightenment.

2- Tools aid for students which contains the following items:

a. business stationery, produce copies, declare results and conclusions.

b. card of business for Instructions to solve problems.

c. images, slides and transparencies.

3 - Transfer method which proposes the following items:

a. pupil reflection development but not the knowledge of acquisition.

b. teachers training for activities management.

c. best practices in counseling, observing experiences, recording results and observations.

d. students strive to achieve the end result of the activity.

4- Discussion in the class, which takes place in several stages, including:

a. before the experiment.

b. in experiment process.

c. Based on tests from the central source of knowledge, instructions, guided learning and related events and discussions

5. Conflicts in knowledge expose students to unexpected observations that do not match their expectations. Students may feel that their frame of mind and way of thinking is overwhelmed by the new evidence they

6 - Outside box of thinking which allows instructor to ask students how they did it or why they did it. In other words, explain to your class mates the justification of how and why did you follow the underlying approach.

7. Connection which links students' observations to the ones that they experience during the academic courses. In reality, it is essential to advance the intellectual connections to the practical life [3].Another

comprehensive framework, the Mathematics Framework which aims to accelerate the thinking process by connecting mathematics and ensuring maturity of cognitive thinking in all mathematics classrooms. The structure is based on series that transfer students thinking regarding math in the current close to an advanced one. The framework has been experienced in the last few years in a numerus of schools in the United Kingdom, United States aa well as other schools in well-educated countries [8]. This framework involves a smooth transition from observation to abstraction, reasoning and relational construction to improve students' thinking and mathematical performance [9]. The framework is built on the theory of Figo Testi and the theory of Piaget. The research on this framework includes everything that has teaching experience for the framework, as reported by the predecessors (Sir and Eddie), as well as how to sharpen mathematical thinking, especially for the following elements:

- To deepen the imagination of the students' mathematical understanding.
- Replacing the current solution steps with new creative solutions
- Emphasizing on using creative thinking skills when solving problems [10].

The improvement of mathematical thinking skills was experienced through the subject of learning effectiveness as explained by [11] Which leads to improved cognitive functions. This process occurs when learners discover consistent and meaningful associations between cognitive abilities and latitudes in everyday life. Faculty in general, and mathematics in particular, have brought in many strategies, structures, and methods to stimulate and teach thinking, including special educational needs [11]. The knowledge intended to translate excellence into a sample structure depends on the physical characteristics of the students, such as their age, reputation of schools, educational background, and teaching contents that support the proper decision of choice.

Methodology and Procedures

The methodology and procedures used in this study are based on a survey of all fifth-grade elementary school students in the district who regularly attend the formal public school system. The population sample consisted of randomly selected mixed primary school students (56) and the sample was divided into two parts, the first was the experimental test (28 students) and the second was the control part (28 students). The criteria and tools used to conduct the experimental tests are described below:

1. Consistency of testing. Academic testing consistency was based on age variables, overall fifth-year performance level, and other mathematical variables. The results of the analysis showed that there were no actual significant changes in the above variables, meaning that the pre-test and control groups were equal for the variables selected.

2. Research tools: A two-test quasi-experimental test was chosen because it is more appropriate for the present study. If the pre-test is applied to both tests in the first year of the 2021-2022 school year, it will be applied to both credits and tests. The research depends on three tools:

a) Questions and Queries: Open-ended questions deal with students and teachers with an open-ended query to “thoughts used to solve math problems. They were put in front of the teachers on a clean paper and countered by them. The teachers and researchers interviewed the students and question them regarding these ideas. A number of these concepts were well-read by students while they were dealing with math problems and their solutions were recorded and used in creating proper actions in the proposed framework.

b) Pre-test: Covers twenty-two paragraphs of text on a variety of topics including (squares and angles, large numbers, natural numbers and their properties, functions of numbers and groups). Clear thinking skills to outline and find solutions. The rationality of the mock test was suggested by providing a special team of mathematics teachers in addition to teachers and professors of the major.

They were randomly selected from the Department of Mathematics at Tikrit University. The majority voted in favor of the test, although the wording and wording changed slightly. As a result, the P View and Passive In commands were entered.

c) Posttest: Consists of 30 paragraphs of oral questions on the topic (shapes, proper fractions, geometry, arithmetic operations with fractions, arithmetic operations with decimals, decimals, spaces). It wasn't a simple solution. It was tested to test mathematicians who must use their students' mental abilities and avoid giving the most correct answers possible, and who rejected the validity of hypothetical tests, and the following observations were made:

i. Remove two paragraphs and change them so that they do not disturb the content of the test.
ii. Modify the wording of four paragraphs.
iii. Edit items of information in three paragraphs.

The above comments were incorporated, and the two paragraphs were substituted to be consistent with the underline paragraphs.

i. Remove 2 paragraphs and change to be consistent with test content.
ii. Correct the text in four paragraphs.
iii. Organize the information into three paragraphs. The above note has been merged and both paragraphs have been replaced with underlined paragraphs.

3. Stages of Examination: The examination consists of the following stages:

- Search for previous literature and studies related to the research topic.
- Look for a math problem to solving test that requires more thinking to solve.
- Reviews the content, annual curriculum and schedule of mathematics textbooks used in the 5th grade of elementary education taught in schools in 2021-2022.
- Apply an open questionnaire to students and faculty before the end of the first semester, especially on December 2021, when students complete the first semester and pass two exams.
- Write test items based on concepts learned from previous measurements by the students and observers and give both groups a test January of 2022 and before the semester exam.
- Make a plan for learning the content of the second semester mathematics textbook, test remote structure to improve ideas and train a math teacher in the two frameworks,
- Simulate and follow-up tests during the experiment period, while the teacher consults with the management of the partner school.
- Construct a post-exam period examining the literature and standards mentioned, as well as the student's skill level, as well as ideas developed in the pre-exam and their application before the final exam.
- Prepare data tables and statistical analysis to illustrate the results.

Experiment Observations.

1) observations of the first experiment: the effect of the framework of the improvement of students of the experimental group is shown in Table 1Table 1: observations of pre-post test

Test	number of students	Mean	Std. Dev.	Degrees of freedom	T value calculated	T value tabular
Experiment	28	62.1	5.7	27	9.78	2.142
Control	28	69.9	2.69			

Table (1) shows that the mean score of the post-test group is higher than that of the pre-test. The t-test for paired samples was used to determine statistical significance. The statistical t (9.78) value is greater than the t (2.142) value. Therefore, the null hypothesis is rejected and the alternative hypothesis establishing the existence of a difference is accepted. 2) Observations of the second experiment are shown in table 2. Table 2 : two tests in the post-test

Test	number of students	Mean	Std. Dev.	Degrees of freedom	T value calculated	T value tabular
Experiment	28	72.3	2.42	54		
Control	28	65.5	2.96		2.67	2.23

From table (2) we can see that the mean score of the experimental group is higher than that of the control group. The t-test was used for independent samples to provide statistical significance. The t-value (2.67) is greater than the t-value (2.23). Therefore, the null hypothesis is rejected and the alternative method of proving the existence of the difference is accepted.

Conclusions and Recommendations

Both outcomes show that the expected conclusions from implementing the proposed framework. The framework is considered, after the collection and grouping of thoughts, more enjoyable and interesting for elementary school students, challenge the psychological attributions that fulfill them and try to rise to the

of Piaget's hierarchy, rather than staying at the bottom based on memories of having overcome a lot over the years. Students confront problems with innovative ideas that lead to precise solutions. The underlying work is in the same line with all research and studies that have demonstrated the dominance of theproposed frameworks. The research aimed to speed up thinking according to certain structure (improving brainstorming), the method of proof reading develops other correct ideas to solve mathematical problems, and this is present in the experimental test curriculum.The proposed framework provides elementary school students with an understanding of appropriate thinking a applying correct and concise selectable rules to solving math problems related to data management. It also provides teachers with detailed information about nonprofits' institutions to improve administrative issues, track progress, and increase student achievement and success.

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