ALGORITHMIC SKILLS AND THEIR RELATIONSHIP TO THE EFFICIENCY OF COGNITIVE REPRESENTATION AMONG FIFTH-GRADE STUDENTS IN MATHEMATICS

M. Shima Hussein Mohammed
Karbala Education Directorate
Shaimaa.hussein1203a@ihcoedu.uobaghdad.edu.iq

Dr. Elham Jabbar Faris
University of Baghdad, College of Education for
Pure Sciences, Ibn al-Haytham
ilhamfaris2017@gmail.com

Abstract

Current research aims at identifying the relationship between algorithmic skills and the efficiency of cognitive representation of fifth graders in mathematics. The two researchers used the descriptive curriculum (study of relationships and associations), applying the algorithmic skills test and measurement of cognitive representation efficiency, from which the following questions emerge:

❖ Do fifth graders possess algorithmic skills?

❖ Do fifth graders possess the competence of cognitive representation?

❖ What is the direction and strength of the correlation between algorithmic skills and the efficiency of cognitive representation of fifth graders?

In order to achieve the objective of research and answer his questions, a set of hypotheses was developed. The research community was identified, representing students in the fifth grade. The research sample was identified, consisting of 155 students distributed to 97 students and 58 students.

The results indicated a good correlation of statistical significance.

Keywords: algorithmic skills, algebraic thinking.

Introduction

The current era is an era in which information and knowledge compete, and the sources of the relationship between science and technology are multiple. One of the most prominent goals of educational institutions is to build the

student's self through teaching practices and educational situations that make them ready to employ and use mental processes more efficiently. Algebra is one of the fields of mathematics that aims to develop students' skills in employing shapes. Symbols and the use of relationships.

The importance of teaching algebra and the need to focus on algebraic thinking skills, algorithmic skills, solving verbal problems, and algebraic problems that support students in mathematical representation processes. Algorithmic skills include many skills, including analyzing the mathematical problem, predicting the results of the solution according to precise and specific algorithms, deducing the solution, in addition to deducing algorithms that can be generalized in situations. And other mathematical problems. Developing mathematical problem-solving skills has an important role in school mathematics. There are many difficulties that students face in using the correct algorithms in solving a mathematical problem or using algorithms that are not related to the algebraic problem. These difficulties are attributed to the difficulty of employing the skills correctly.

Search Problem:

The problem of research is to highlight algorithmic skills and the efficiency of cognitive representation, which are important pedagogical concepts. Through the work of the two researchers, it has been shown that one of the difficulties facing students is the difficulty of using algorithmic skills accurately. The problem of current research is a tangible reality, and in the light of the lack of studies and as far as the two researchers know, Linking algorithmic skills to the efficiency of cognitive representation, and to the urgent need to refine students' skills, develop their abilities and competence in order to succeed in their scientific life, the idea of conducting research has emerged. The problem of current research was identified by the following question:

What is the relationship between algorithmic skills and the efficiency of cognitive representation in fifth graders.

The importance of research: The importance of current research is as follows:

1- Guide those who develop the educational process, innovate and develop educational applications suitable for modern innovations and help students to use them in learning to facilitate access to information.

2- This study benefits teachers and developers of mathematics curricula in reviewing content organization and incorporating the skills of algorithms.

3- The importance of research comes from the novelty of the subject and the need of the Arab Library in such subjects with a high degree of research in the specialization of mathematics teaching methods as well as the applied aspects of the results of such research in the field of education.

4- The results of the current research contribute to making recommendations that inform educators of the importance of algorithmic skills in the acquisition and sustainability of knowledge.

Research Objectives:

The current research aims to identify the relationship between algorithmic skills and the efficiency of cognitive representation of fifth graders in mathematics. The two researchers used the descriptive curriculum (study of relationships and associations), applying the algorithmic skills test and measurement of cognitive representation efficiency, from which the following questions emerge:

1- Do fifth graders possess algorithmic skills?

2- Do fifth graders possess the competence of cognitive representation?

3 - What is the direction and strength of the correlation between algorithmic skills and the efficiency of cognitive representation in scientific fifth graders?

Research hypotheses: -

To achieve research objectives, the following zero hypotheses are formulated:

1. There is no statistically significant difference at the indicative level (0.05) between the actual and hypothetical performance averages of 5th grade scientific students in the algorithm skills test.

2. There is no statistically significant difference at the indicative level (0.05) between the actual and hypothetical performance averages of 5th grade scientific students in the cognitive representation efficiency measure.

3. There is no statistically significant correlation at an indicative level (0.05) between algorithmic skills and the distance of cognitive representation of students in the fifth grade of science.

Search Limits:

Current search results are determined by:

1- Human limitations: Research was limited to students in the fifth grade for the academic year 2021- 2022 the second semester.

2- 9Spatial boundaries: The study of this research was determined by the Karbala Holy Education Directorate

3- Time limits: The study of this research is determined by the time period in which this study was applied, the second semester of 2022.

4- Objective limits: The study examined the algorithmic skills and their relationship to the efficiency of cognitive representation. The study also identified the tools that the researchers have ascertained their honesty, stability and relevance to the sample and objectives of the research.

Search Terms:

Skill

Cottrell (1999): Skill is defined as the ability to perform and learn well whenever we want. It is an educated activity developed through the exercise of an activity supported by feedback and each skill consists of a set of sub-skills and a deficiency in any sub-skills affecting performance quality. (Cottrell: 1999,21)

Algorism

Knuth (2011) of the logical steps and serial instructions needed to solve a problem and named the algorithm relative to the original Tashkent Muslim scientist Abu Jaafar Mohammed bin Musa al-Khawarzmi. The word algorithm was limited to sports laws that use Arabic numbers and developed in Latin to include all procedures for problem solving and carrying out missions in a sequential and orderly. (Knuth: 2011,305)

Algorithmic skills:

(Abdou, 2010) is defined as a set of structured, sequential and followed steps and instructions that apply to a set of data and information to perform a particular task and apply to similar attitudes and lead to the achievement of the important result required by following step by step according to the appropriate concepts, generalizations, laws or theories to carry out calculations. (Abdou, 2010, p92).

Procedurally known algorithmic skills:

a set of logical steps and serial instructions needed to resolve issues using mathematical rules and laws and the word algorithm in Arabic was originally limited to sports laws and in Latin developed from the algorithm to become all procedures for problem solving and the implementation of processes and tasks in an orderly, sequential and sequential manner, taking into account the dimensions of speed and accuracy and determining algorithm skills: Assimilate the algorithms required in solving the matter and then apply the algorithms in solving the matter and then modify the wrong algorithm in solving the matter and produce and disseminate new algorithms and apply them.

Competence of cognitive representation:

It is known (Al-Qaisi and Abdulkhalek, 2012) as a mental process involving the organization, processing, encryption and coding of information so that it has meaning that helps the individual to adjust and guide.
(Al-Qaisi and Abdulkhalek, 2012, p. 7)
Procedurally known by the researcher: The ability of students to retain, assimilate and transform information into different intellectual meanings, thoughts and methods depicted visually, verbally or symbolically to form new meaningful connections and connections.

Research Curriculum:-

Descriptive Research Curriculum (Correlation and Relationship Study Curriculum) has been adopted.

Research community

The research community is:

A- Sample verification of Cyecometric Conditions for Research Tools: Students in the fifth grade of both sexes and for the school year (2021-2022). The number of students (242) distributed to (132) students and (110) students derived from one of the boys' schools of the Karbala Education Directorate, as well as "girls"

B- Basic research sample: 155 students were distributed to 97 students and 58 students.

Search Tools:

First: - Test algorithms:

1- Objective of the test: The current test aims to measure algorithmic skills of fifth grade scientific students.

2- Identification of algorithmic skills: After reviewing the literature from books and studies dealing with algorithmic skills, the theoretical background of these studies was used to identify algorithmic skills: (assimilation of algorithms required in solving the matter, application of algorithms required in solving the issue, modification of error algorithms when resolving the issue, production and dissemination of new algorithms and their application)

3- Presentation of skills to a number of specialists: A questionnaire has been prepared and presented to a number of arbitrators and specialists to determine their opinions on the suitability of the search sample for any algorithm skill according to their experience and in the light of their opinions and in an agreement (80%).

4- Identification of scientific material: The content of the scientific material was reviewed.

5- Drafting test paragraphs: A substantive paragraph (30) was prepared and presented to mathematics specialists and teaching methods to determine its relevance and suitability for the research sample. Minor adjustments were made to some paragraphs, where they were given an agreement ratio (80%) of their opinions, which referred to this amendment and thus made the test ready in its preliminary form.

6- Preparation of instructions: Special instructions for testing have been prepared and attached with the test.

7- Exploratory application: To ensure the clarity of the test paragraphs and their understanding by the sample of exploratory application and the clarity of the instructions to answer them, the test was applied to the sample of their number of individuals (30) and a student on Monday 2022/2/22 and to calculate the appropriate time for the test, the average time was calculated for the first (5) of them and the right time was (60) minutes.

8- Application to sample statistical analysis: The test was applied to sample statistical analysis consisting of 200) Student and student on Tuesday 2022/2/23.

9- Test correction: Typical answers were developed for the test paragraphs and one score was given for the correct answer and zero for the wrong answer for each paragraph, so that the total degree of the test was (30).

10- Cychometric properties of the test:

Honesty:
A- Apparent honesty: the preliminary test was presented to a number of mathematics experts and specialists and its teaching methods to judge its validity (36) To determine its suitability for the sample of research and verification of its wording and make such adjustments as they deem appropriate. Based on their opinions, the paragraphs that need to be amended have received an 80% agreement rate and more on the final version of the test after making minor adjustments.

B- Building sincerity Found:
1-The degree of the paragraph relates to the degree of skill to which it belongs.
2-The degree of the paragraph is also linked to the test as a whole.
3-Internal linkages between testing skills and testing as a whole. All the linkages referred to earlier were found to be a statistical function at an indicative level (0.05) and a degree of freedom (198), since the calculated T

values were greater than the table of 1,96. This is a high indication of internal consistency between the test paragraphs.

2- Test stability: The Alfa Kronbach method was used to test algorithm skills. The degree of stability calculated using the Alfa Kronbach equation is (0.838). This result is good and reassuring. (Nabhan, 2004:240)

10- Analyze the test paragraphs statistically: After correcting the responses of the survey sample students and ranking them downward, the highest (27%) of the highest and highest grades (27%) of the lowest grades were taken, with the number of students in each group (54) students. The difficulty and ease of the paragraph ranging from 0.20 to 0.80 is found. (Delimi and Adnan, 2002:65)

The formula for the paragraph-to-paragraph differentiation coefficient was adopted. The results showed that all paragraphs had the capacity to distinguish, i.e., acceptable, as they ranged from * 0.56) -0.83. (Dahir and others ., 1999:132)

Effectiveness of alternatives: the effectiveness of alternatives to substantive paragraphs was found and the wrong alternatives were found to have attracted

C. Effectiveness of alternatives: The effectiveness of alternatives to the substantive paragraphs has been found and it has been shown that the wrong alternatives have attracted lower group students at least 5% of the total student population, all of which are camouflaged

Second : - Cognitive representation efficiency measure:
1- Defining the objective of the scale: To identify the efficiency of the cognitive representation of the student's ability to retain, assimilate and transform information into different meanings, thoughts and intellectual perceptions through verbal, symbolic and visual methods to create new and meaningful cognitive connections and connections.
2- Determining the dimensions of the scale: After examining the pedagogical literature and in the light of previous studies, the dimensions of the efficiency of the cognitive representation have been determined to five dimensions:

1- Information Retention: The applicant's ability to retain the information presented to him.

* Tabular value of 1,96 at an indicative level of 0.05 and a degree of freedom of 106

2- Understanding the meaning of Understanding Meaning: The student's ability to understand the meanings and connotations of the subjects presented to him and to understand their importance.

3- Synthesis: The student's ability to synthesize information to produce new knowledge information different from the information presented to him.

4- Multiple representation formats: The student's ability to translate ideas and information into meanings expressed verbally using letters and words and visually using shapes and drawings or symbolically using symbols and numbers.

5- Mental Flexibility student's ability to diversify cognitive processing formats by finding different solutions and applications to solve problems and diverse uses of objects and information and to measure the efficiency of cognitive representation procedurally to the degree that the student receives in the scale prepared by the researchers for this purpose.

3- Presentation of the dimensions to the arbitrators and specialists: they were presented to a group of arbitrators and specialists.

4- Formulation of the paragraphs of the scale:
The preliminary picture of the scale, which consists of (40) paragraphs divided into dimensions by (8) paragraphs per dimension, has been drawn up.

5- Preparation of instructions: Correction instructions were prepared by identifying five alternatives according to the Lycert quinquennial scale (I agree, I strongly agree, neutral, I disagree, I disagree strongly). The previous five responses take scores (1,2,3,4,5) in order to make the total score of the scale 200 degrees.

6- Survey application: The scale was applied to an initial survey sample of students, who numbered 30 students to determine the clarity of the scale's

instructions and poverty while extracting the necessary time. It was applied on Monday, 2/22/2022. The average time required to answer the scale was calculated for the first five students and the last five was (45) minutes.

7- credibility of the scale:

A - Ostensible truthfulness: the measure was presented in its preliminary form to a number of arbitrators and specialists (36) To judge the validity and appropriateness of each paragraph to the dimension to which it belongs in addition to alternatives to answering the paragraphs of the scale and their weight. Based on their views, the paragraphs requiring modification were amended and received an agreement rate of 80%.

B. Building honesty: Found

1- The degree of the paragraph relates to the degree to which it belongs.
2- The degree of the paragraph relates to the scale as a whole.
3- Internal linkages between the dimensions of the scale and the scale as a whole.

All the linkages referred to earlier were found to be a statistical function at an indicative level (0.05) and a degree of freedom (198), since the calculated T values were greater than the scale of 1,96. This is a high indication of internal consistency between the scale paragraphs.

8. Scale stability: The Alfa Kronbach method was used to measure the efficiency of cognitive representation. The degree of stability calculated using the Alfa Kronbach equation is (0.86). This result is good and can be ascertained. (Nabhan, 2004:240)

Final application: In order to achieve the objectives of the current research, the algorithm skills test and the cognitive representation efficiency measure were applied by removing the five students on the basic sample of 155 students (97) students and 58 students from the scientific fifth grade on 15/3/2022 on Monday.

* View and interpret search results:

1. First question: Does fifth graders possess algorithmic skills?

Derived from it the following zero hypothesis:

its interpretation	significance	Calculated T	Hypothetical Average	standard deviation	real average	sample	variable
Low D	**0.00**	**7.32-**	**15.00**	**3.98**	**12.45**	**155**	**Algorithm Skills**

* There is no statistically significant difference in the level of indication (0.05) between the average real performance and the hypothetical performance * of 5th grade scientific students in the algorithm skills test.

The one sample T test was used to measure the difference between average real performance and average hypothetical performance * in students of the research

 sample for algorithmic skills and the result was as in the table below.

Test hypothesis = total number of paragraphs × ½

From the table it is clear that the average computational performance of students in algorithmic skills is (12.45) with a standard deviation of (3.98) while the value of the hypothetical average (15.00) shows that the real average is lower

From the hypothetical average where it can be said that the level of students is below the hypothetical level and to know the significance of the difference, the T value of one sample was calculated at (-7. 32) It is greater than the tabular value of (1.96) at an indicative level (0.05) and a degree of freedom (129) which means that the students of the Mathematics Department do not possess algorithm skills because Difference D is statistically low.

This result may be due to their poor training in algorithmic skills due to the small number of examples and exercises aimed at developing algorithmic skills in mathematics curricula since the lower stages of study as well as to the weak presentation of mathematics subjects in a sequence leading to their association or interest in them and the limited use of logical sequences in school teaching.

2- Second question:

Does fifth graders possess the competence of cognitive representation?

Derived from it the following zero hypotheses:

- There is no statistically significant difference at the indicative level (0.05) between the actual and hypothetical performance averages of 5th grade scientific students in the cognitive representation efficiency measure.

The T test was used to measure the difference between the average real and hypothetical performance of research sample students to the dimensions of cognitive representation efficiency.

its interpretation	significanc	Calculated T	Hypothetical Average	standard deviatio	arithmetic averag	sampl	variabl
High D	0.00	38.66	120	11.99	160.66	155	**Efficient cognitive representation**

From the table we note that the calculation averages of students for the scale as a whole are higher than the hypothetical average and for the indication of difference the test (t-test) was approved for one sample. The measured T value as a whole is greater than the tabular value of 1.96 and freely (129). This means that the zero hypothesis has been rejected and the alternative hypothesis accepted, i.e. there is a statistically high difference in this at an indicative level (0.05) between the real average performance and the hypothesis (120) among students.

3-Third question:

What is the direction and strength of the correlation between algorithmic skills and the efficiency of cognitive representation among scientific fifth graders?

Derived from it the following zero sub-hypothesis:

- Astatistically significant correlation exists at an indicative level (0.05) between algorithmic skills and the degradation of cognitive representation competence among scientific fifth graders.

This hypothesis has been verified by calculating the correlation factor between algorithmic skills and removing the competence of cognitive representation of students as shown in the table below:

T values of connectedness				Link transaction values				dimension
connectio	life	mathematica	field	connection	life	mathematica	field	
4.68	3.59	4.68	4.40	0.380	0.300	0.380	0.360	Cognitive representation

As the table shows, there are linkages between all algorithmic skills and diminishing the efficiency of cognitive representation among students as a whole. This can be ascertained by noting that the T values of correlation indication are greater than the adult tabular (1.96) indicating a good correlation between algorithmic skills and the degradation of students' cognitive representation efficiency, i.e. by increasing their possession of algorithmic skills.

Conclusions:

1- Fifth graders have a low level of algorithm skills.

2- Fifth graders have the dimensions of cognitive representation efficiency.

3- There is a positive correlation with good algorithm skills and the removal of cognitive representation efficiency.

Recommendations:

1- To benefit from the scientific materials planned for students in the fifth grade by presenting mathematics applications that ensure the development of algorithmic skills.

2- Design training programmes for students of the fifth grade to train in the possession of vulnerable algorithmic skills to develop the ability to think about things in depth and the ability to analyse to confront the problems and challenges facing the teacher and learner and conform to future variables in the educational process.

3- To promote the cognitive representation of students, including the objectives, methods and evaluation of its dimensions in order to continue this possession of students.

Proposals:

1- Conduct a study to detect the growth of students' algorithmic skills.

2- Building a training programme for teaching staff according to algorithmic skills and removing the efficiency of cognitive representation.

3. Build a training programme for students according to algorithmic skills and study their effectiveness in some variables.

4- Conduct a descriptive study to determine the level of efficiency of cognitive representation of mathematics teachers and their students.

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