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The difficulties that faced students in dealing with mathematics

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Abstract

The research highlights the critical role of mathematics in academic success and the cascading effect of early difficulties in math on later academic performance. It aims to investigate the challenges faced by middle school students in Egypt in mastering mathematical concepts and proposes solutions to enhance their proficiency and overall academic achievement. The study utilizes various data collection methods to gain insights into the behavioural, psychological, and academic aspects of math learning, with the goal of developing targeted interventions to support students and improve learning outcomes.

Key words: Questionnaire, Examinations, Observation, Math difficulties.

1. Introduction: Learning difficulties in mathematics, often referred to as dyscalculia, encompass a range of challenges individuals may face when acquiring mathematical skills and understanding. Unlike simple math anxiety, dyscalculia involves persistent difficulties with numerical reasoning and mathematical concepts, which can significantly impact a person's ability to perform math-related tasks.

These difficulties can manifest in various ways, including struggles with basic arithmetic operations, understanding mathematical symbols and language, comprehending concepts like time, money, and measurement, and applying mathematical principles to solve problems. Individuals with dyscalculia may also experience challenges with spatial reasoning, memory retrieval, and organizing information sequentially, all of which are crucial for mathematical understanding and problem-solving.

The causes of dyscalculia are complex and may involve a combination of genetic, neurological, and environmental factors. While it is often identified during childhood, dyscalculia can persist into adulthood if not adequately addressed. Early detection and targeted interventions are essential for supporting individuals with dyscalculia and helping them develop strategies to overcome their difficulties and succeed in mathematics.

According to Qanswa, et al. (2018) "The effectiveness of a brain-based learning program for treating difficulties in learning mathematics," there is a close relationship between students' motivation toward learning mathematics and their level of achievement in it.

In addressing difficulties in mathematics learning, Zulfa et al. (2018) examined the impact of deictic gesture types on problem-solving HOTS algebra tests.

Ardi et al. (2019) investigated elementary students' learning difficulties in mathematics by considering factors such as mathematics anxiety, mathematics self-efficacy, and value beliefs, using Rasch measurement.

Sugilar (2020) conducted a Delphi survey to gather tutors' opinions on the challenges students face in learning mathematics in distance higher education settings.

Before identifying the factors of the problem, the pillars and components of the educational system must be identified.

Components of the educational system:

The students:

The first beneficiary of the education process, and those who are directly related to the problem.

The teachers

School curriculum:

Books and scientific content taught by the student.

The environment:

School, class, external community, parents, etc.

2. The Theoretical Framework

Types of learning difficulties in mathematics:

Difficulties that students suffer from:

- **Account weakness (weakness of mathematics talent)**
- Some students face a general account, suffering from some problems in the basics of mathematics and the sequence of steps to solve complex operations, such as: conducting borrowing operations in the offering and pregnancy operations in the plural, it is worth noting that the problem of arithmetic weakness is not related to a few The student understands the terms of different mathematics subject, but it is the result of his lack of practice.
- **Difficulty understanding the system of written symbols**.
- The system of symbols written in mathematics (the language used in expressing mathematics) is an obstacle to understanding a large percentage of students for this subject, especially students in the primary stage, and some teachers often double this problem when they ask students to solve more than A calculation at the same time before they have sufficient experience to distinguish and link these different processes.
- **Difficulty understanding mathematical terms**.
- Students with learning difficulties face some linguistic and verbal problems, while mathematics terms are concerned.

The study Problem

To understand the problem more deeply, we must answer the following questions:

1.What are the most difficult mathematical concepts for students?

2.What factors may contribute to students failing to understand these concepts?

3.Are there specific teaching methods that appear to be more effective in facilitating understanding of mathematical concepts?

4.What are teachers' experiences in dealing with students who have difficulties in mathematics?

5.Are there external factors such as the school or family environment that affect students' learning of mathematics?

6.How can students be encouraged to participate actively in mathematics lessons and increase their involvement in the learning process?

7.Are there any recent developments or new problems that affect students' performance in mathematics?

Asking these questions and searching for their answers will help in a deeper understanding of the challenges students face in learning mathematics and in developing effective strategies to help them achieve academic success in this area.

3.Methods of Research and the tools used

The limitations of the study

The limitations of the study in this research include:

1. Target students: middle school students in a language school in Egypt.

2. Data collection methods: Using questionnaires, quizzes, and observations to collect data from students and teachers. In addition, guided analysis of conversations will be used to better understand the challenges students face and direct questions more accurately.

Questionnaires:

The data related to the behavioural and psychological state will be collected for students, and an idea of his desires and tendencies towards mathematics and its study, then analysed to determine the general behavioural status of students.

Short exams:

A short multi -selection exam for students will be taken, so that it contains questions related to the following basic concepts:

Arrangement mathematics operations

Apply basic operations to fractures and negative numbers.

To analyse the extent of students' achievement of basic mathematical concepts

Observation:

A lesson will be conducted in a regular mathematical class, care will be taken to attract students 'attention and motivate them to participate, while the following data is collected by noticing students' behaviour during the lesson: The extent of students responding to the teacher in terms of participating in the lesson and discussing it Student discipline during the lesson.

3. Mathematical concepts involved: The focus is on basic mathematics concepts taught in the initial stages of education, such as basic arithmetic operations and understanding numbers, fractions, and negative numbers.

4. Additional tools: Focus groups and workshops for teachers and students will be used to gather more local opinions and experiences.

5. Data analysis: Quantitative and qualitative analysis techniques will be used to understand and interpret the data collected from its various sources.

6. Time scale: Data will be collected and analysed over a specific period of time, during a specific semester.

Orienting these elements helps determine what needs to be done to best achieve the research objectives and within a specific time frame and resources.

The study hypotheses

The study hypotheses can be defined as follows:

1. First study hypothesis: Students face difficulties in understanding and applying basic mathematical concepts.

2. Hypothesis of the second study: There are multiple factors that contribute to the exacerbation of students' mathematics learning difficulties.

3. Third study hypothesis: Using various data collection techniques will help in in-depth understanding of the challenges students face in learning mathematics.

4. Fourth study hypothesis: There is a need to develop new teaching strategies that focus on improving students' understanding of basic mathematical concepts.

5. Fifth study hypothesis: By analysing the collected data, researchers will be able to provide practical recommendations to improve students' mathematics learning experience.

6. **The causes of poor academic achievement in mathematics subject**

Reasons for the student:

-Mathematics requires a lot of focus and attention, and the student may lose his attention with the share while explaining the teacher, which negatively affects the achievement.

-The accumulation of the subject on the student, which causes the accumulation of lessons, the inability to study it, and understand them in a short time. The student is not writing for class exercises.

-The student does not participate in solving mathematical issues in the class with the teacher. The student's fear of the teacher's question about any point he may not understand, for fear of embarrassment, or that he does not trust himself.

-The student is not constantly following the homework.

-The lack of desire for the student to attend the school.

Reasons for the teacher:

-Full control by the teacher on the class, where he explains and speaks on his own as if the class is free of students.

-Use the narration style, and traditional methods, which do not leave the student's chance to participate.

-Explain the lesson orally, without any means, or without using the board.

-Use the means incorrectly, or incomprehensible for the student.

-Not taking into account the individual differences between students.

-Failure to link mathematics to realistic practical life.

- Do not share students with the solution and explain with the teacher.

Other reasons for the student's weakness in mathematics:

The classroom congestion with students, which leads to a lack of time for everyone to participate.

The high share of the teacher from the classes, which leads to a lack of time to make a way to clarify the concept of the lesson.

The lack of devices and modern tools in the school that enable the teacher to change the classroom pattern.

The subject teacher may not be sometimes a specialist in mathematics but was given to him to complete his share of classes.

7**. The relatively new problems that negatively affect the academic achievement of students:**

Permanent absenteeism:

Permanent or repeated absenteeism has become a negative social phenomenon, especially for high school students.

Parents are not able to withstand study expenses:

After the high prices of textbooks and private lessons, many parents have come out of their children from education because they were unable to pay the academic expenses for their children. Students may continue to study, but with difficulty to understand lessons due to the lack of supplies of books and private lessons.

These hypotheses form the basis for the research process and direct efforts towards achieving the specific objectives of the study.

The Importance of the study

The Importance of the study for:

1. **Teachers**:

Providing a deep understanding of the challenges students face in learning mathematics enables teachers to improve the learning experience for students.

- Providing the necessary guidance and support to students who have difficulties in understanding basic mathematical concepts.

- Develop customized teaching strategies to meet different students' needs and enhance their understanding of mathematical subjects.

2. **Students**:

- Providing an opportunity for students to express their challenges and problems in understanding mathematics, which helps them obtain the necessary support and appropriate solutions.

- Improving the learning experience for students by developing teaching methods and educational programs that enhance their understanding of mathematical concepts and motivate them to participate effectively in the learning process.

- Providing a supportive and stimulating learning environment that helps students make the most of their educational experience.

3. **Researchers**:

- Providing new insights into the challenges students face in learning mathematics and the factors that influence their academic performance.

- In addition to scientific literature in the field of mathematics education and improving understanding of the nature of the challenges facing students and how to deal with them effectively.

4. **Curriculum makers:**

- Providing guidance for developing educational curricula and designing educational programs that meet students' needs and enhance their understanding and understanding of mathematical concepts.

- Providing the foundations and directions for developing educational curricula aimed at improving students' performance in mathematics and enhancing their skills in this field

. Study procedures.

The study proceeded as follows:

A. Identifying the difficulties that students face while learning mathematics in the middle school, through:

1-Reviewing research and studies related to the topic.

2- Study the nature and characteristics of students with difficulties.

3- Analysis of the objectives and content of the mathematics curriculum book for the middle school stage.

4- Prepare a questionnaire for students to identify related problems.

5- Prepare a discussion with mathematics teachers to understand some of the related problems from their point of view.

6- Preparing a diagnostic test to identify difficulties in learning mathematics in the curriculum book

B. Determine the foundations and standards through:

1-Determine the nature of difficulties in learning mathematics and the foundations and approaches to teaching it.

2-Determine the standards for each element of the program (goals – content – teaching strategy – evaluation methods)

3-Determine the effective way to solve the problem

C. Building the program and study materials:

1-Determine general and specific goals.

2-Determine the program content and organization.

3-Determine the steps for using the program in teaching.

4- Determine evaluation methods.

5-Preparing the student's exam in light of the program.

6-Preparing a guide for the teacher to teach in light of the program.

7-Prepare the diagnostic test as previously explained.

8-Preparing a scale for students' motivation to learn mathematics and determining its credibility.

D. Determine the effectiveness of the prepared program:

1-Determine the study sample of students with mathematics learning difficulties (story problem Questions).

2-Apply a diagnostic test before implementing the program

3-Applying the program to the sample students

4-Apply a diagnostic test after implementing the program.

5-Monitoring and processing data statistically

4. Results of Research

Based on the data extracted from the questionnaire submitted to the students, it can be said that:
We note that the largest percentages in questions 1-4 are in the following answers:

The first question: Solve long problems that require many steps (60.47%)
The second question: The difficulty and unexpectedness of the questions – the lack of time required to complete the exam (35%)
Question Three) I do not answer with a wrong answer for fear of punishment or embarrassment – if the teacher asks me to solve a question whose answer I do not know (42.86%)
Question Four) – Explaining in many effective ways (78.38%)

In the higher percentages of answers to questions 5(41.94%) ,6(54.29),7(51.43%), we find that most students do not suffer from deficiencies in the topics that were presented to them.

If middle school students have difficulty solving long problems that require many steps, there may be several factors that can contribute. Here are some ideas and suggestions that may help improve their ability to solve these issues:

- Use of technology: Technology such as educational videos can be used to

provide interactive exercises and activities that help students understand key concepts and apply them in solving longer problems.

- Converting long problems into real-life problems: they are easier for students to understand and imagine, so students can solve them with less difficulty.

Therefore, one of the proposed methods is to transform the format of long questions into a practical format that they can understand more, such as rephrasing them into real-life issues. Modern aids can also be used for better visualization in students' imaginations, such as using visual video clips.Sample videos used as one of the methods of explaining to students:

- video 1
- video 2
- Video 3
- video 4
- Video 5

The sample students were subjected to an exam containing a set of questions of the type that had been previously determined, and it can be said that there was a clear improvement in the students' performance in the exam that was created after applying the method used to increase students' understanding, compared to the exam that was before the application.

The two exams were administered to 19 students, and their total score for the first was 70.

The average grades of students in the first exam were 3.68, while the total score for the second was 170.

And the average grades in the second exam were 8.95

Percentage improvement = (difference ÷ old mean) x 100%

Percentage improvement = (5.27 ÷ 3.68) x 100% Percentage improvement ≈ 143.82935439354999714

So, the percentage improvement is approximately 143.82%.

5. Interpretation of Results

Based on the interview conducted with school mathematics teachers, it can be said: The presence of primary, preparatory, and high school students together may negatively affect the behaviours of the younger students, as for example we see that primary students may gain negative behaviours from high school students, imitating them.

Based on the discussion of students, we can say that: A large percentage of students do not want additional mathematics lessons outside the schedule specified for them, which makes students not ready to direct their attention to the lesson. And Difficulty attracting students 'attention to the lesson in the last classes of today.

we conclude that the problem that students suffer from in general is that they are accustomed to one type of question, as the student may be accustomed to the questions in the curriculum examples, which are often short and direct and do not require time to solve, while the actual exam questions are longer and require ideas. Different approaches and different methods of solution. This problem may also result from a lack of training in solving problems that have diverse ideas for the same topic.

Also, the student's failure to participate in discussing the lesson with the teacher and asking him about methods of solving or different cases of a particular law will keep him dependent on only one case of applying the mathematical term. Also, the student's failure to participate in discussing the lesson with the teacher and asking him about methods of solving or different cases of a particular law will keep him dependent on only one case of applying the mathematical term.

Based on the results of the questionnaire, it can be said that the questions that students struggle with most are long problems

After conducting the two examinations, a high degree of effectiveness was found in applying the identified method.

6. Conclusion

Based on the findings in this research, it appears that understanding long problems is a major challenge that hinders students' progress in mathematics. To solve this problem, it was chosen to use the method of converting long question formats into formats that students can understand better, such as placing long questions in an interesting real-life context. In addition, video clips were used to bring the idea of long problems closer together and illustrate the steps to solve them in a visual way in the students' minds. Based on these results, recommendations can be made to improve teaching practices and design educational curricula that focus on simplifying long problems and presenting them in a way that attracts students' attention and enhances their understanding, which contributes to improving their performance in mathematics and increasing their engagement in learning processes.

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References and Sources

1.Shahd Al-Yosef. December 13, 2021
صعوبات تعلم الرياضيات
21 Nov 2023

mawdoo3.com/صعوبات_تعلم_الرياضيات

2.Ilham Sarhan. July 20, 2017. (ضعف التحصيل الدراسي في الرياضيات
). 21 Nov 2023. mawdoo3.com/ضعف_التحصيل_الدراسي_في_الرياضيات

3.Qanswa, M. A.-S. A.-F. I., Qandil, A. A.-A., & Metwally, A.-D. S. (2018). The effectiveness of a brain-based learning program for treatment difficulties in learning mathematics and developing motivation among students with learning difficulties at this stage Preparatory School. Retrieved from http://search.mandumah.com/Record/947116

4.Analysis of difficulties in mathematics learning on Students with deictic gesture type in problemsolving HOTS algebra test, H Zulfa et al 2018 J. Phys.: Conf. Ser. 1108 012074

5. Exploring the elementary students learning difficulties risks on mathematics based on students
mathematic anxiety, mathematics self-efficacy and
value beliefs using rasch measurement, Z Ardi et al 2019 J. Phys.: Conf. Ser. 1157 032095

6.Tutors' opinions on students' difficulties of learning Mathematics in the distance higher education: A Delphi survey, e: S Sugilar 2020 J. Phys.: Conf. Ser. 1663 012009