

The Effectiveness of a Training Program in Developing Math Skills for Students with Learning Disabilities

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Abstract

The current study aimed to design a training program to develop math skills for students with learning disabilities in Irbid Governorate and measure its effectiveness. To achieve the study objectives, a quasi-experimental approach was used, and study tools were developed, including a math skills scale. The proposed training program, the study community consisted of students with learning difficulties in Irbid Governorate in the fourth grade present in schools, numbering 130 male students. The study sample was chosen intentionally and consisted of 30 students with learning difficulties, and divided into two experimental groups with 15 students, and a control group with 15 students who were distributed randomly. The data were analyzed and extracted. Quantitative results were obtained through the Mann-Whitney test to estimate the significance of differences for two independent samples, and the Wilcoxon test to estimate the significance of differences for one sample. The results of the study on the effectiveness of the training program in mathematics skills indicated the presence of statistically significant differences at the level ($\alpha \leq 0.05$) between the average ranks of the scores of the experimental and control groups on the mathematics skills scale in favor of the experimental group. In light of the study's findings, it recommended that the training program be extended to teachers of students with learning disabilities, and that studies be conducted on various special education groups.

Keywords: mathematics skills, training program, learning disabilities.

INTRODUCTION

Knowledge is the foundation for building civilizations. It is through it that countries are built. Therefore, education is a fundamental area of state care. Teachers are also the foundation and leader of the educational process, the one who opens our young eyes to new horizons. The Ministry of Education in Jordan works to develop teachers and help them develop their abilities and potential. This is to ensure that the educational process is moving forward in order to achieve the desired goals and anticipated hopes, thus creating a truly educated generation. The early years of education are of particular importance in the lives of students in general, and those with learning difficulties in particular. There is hardly a classroom at any educational level without a number of students with learning difficulties whose academic level is lower than that of their peers in mathematics skills. Therefore, teaching them mathematics skills at the early stages is essential.

Early education is of great importance, as many students with learning difficulties complete the third grade of primary school without the ability to calculate. Therefore, the recommendations of the fifth scientific conference of the Egyptian Society for Reading, Writing, and Arithmetic emphasized the need to diagnose academic difficulties among students with learning difficulties (Al-Bataineh, 2021). Mathematics learning difficulties are a learning difficulty that impairs students' ability to learn concepts related to numbers and perform accurate mathematical calculations. Individuals with mathematics learning difficulties face significant challenges in all areas of mathematics, and these difficulties are not explained by a lack of appropriate education or mental disabilities. Other disabilities, such as these, complicate everyday aspects of life, including mathematical concepts such as telling time, counting money, and performing mental calculations. Students with learning disabilities find mathematics confusing, frustrating, and difficult to learn; their brains require more instructional effort and more targeted learning experiences (Frymedically, 2020).

(Al-Azmi, 2021, Al-Batayneh, 2021, Al-Amri and Braima, 2020, Mustafa, 2016) also indicated that learning difficulties are a category of special education that is widespread in all countries of the world at different rates from one country to another, and there is a continuous increase in the number of students with learning difficulties. By reviewing previous studies, such as those by Muhammad, 2020; Abdullah, 2020; Khadir et al., 2020, and daily observations and parents' constant complaints about their children's lack of skills in various skills, particularly mathematics skills, which are considered a fundamental characteristic of students with learning difficulties. For students with learning disabilities.

1. Are there statistically significant differences at the significance level ($\alpha \leq 0.05$) between the mean scores of the control and experimental groups on the mathematics skills scale in the post-test, attributable to the training program variable?

This research focuses on developing mathematics skills among students with learning disabilities. The importance of the research is enhanced by the fact that it is conducted in a classroom environment, providing an opportunity to make it a topic of discussion.

Experiments and its advancement and development, as it lacks such field research and studies, and the importance of the age group it deals with, which is characterized by flexibility and the ability to be shaped, namely students with learning difficulties in the primary stage. The results of this study contribute to finding solutions to some of the problems associated with the category of learning difficulties and contribute to building an educational strategy to improve the mathematics skills of students with learning difficulties.

An educational strategy for improving mathematics skills among students with learning difficulties.

- Spatial limit: Public elementary schools in Irbid Governorate.
- Time limit: The second semester of the 2023/2024 academic year. The training program lasted five weeks and consisted of seven sessions, two sessions per week.
- Human limit: Students with learning difficulties in Irbid Governorate who are enrolled in the resource room at Irbid School.
- Objective: Design a program to develop mathematics skills for students with learning disabilities and ensure its effectiveness.

A training program is defined procedurally: a set of activities and tasks for which students with learning disabilities are trained. These activities are presented during training sessions over a specific period of time. These sessions are conducted in a special classroom equipped with the means and tools to implement the program within the school.

Learning disabilities are operationally defined as students diagnosed with learning disabilities and receiving special education services in the Ministry of Education's resource room, who are in the fourth grade in Irbid Governorate.

Mathematics skills are operationally defined as the score obtained by students with learning disabilities on the arithmetic skills scale developed for the purposes of this study.

Some theories explaining learning difficulties:

As explained by (Abdullah, 2022). (Ouherrou, 2.19)

1. The delayed speech theory: The proponents of this theory explain learning difficulties as reflecting a slow maturation of the visual, motor, linguistic, and attentional processes that characterize cognitive development. Given that each individual with a learning disability exhibits different aspects of slow maturation, each individual differs in the rate at which they progress through developmental stages.

2. Behavioral Theory: This theory attributes learning difficulties to the incorrect causes of low academic achievement, which may be due to the use of inappropriate teaching methods due to the lack of appropriate educational tools and educational activities, the large number of learners, and their lack of motivation to learn and study, in addition to the existence of circumstances. An unfavorable environment in the family, school, and community, therefore, advocates of this approach see the need to study environmental conditions and socialization factors.

3. Psychological Theory: This theory focuses on the fact that the mind's processing of information depends on cognitive processes, attentional abilities, memory, and basic psychological factors, including sensory perception, memory, conceptual formulation, and language, and its role and use in thinking and learning.

2. Information Processing Theory: The basic psychological processes are based on special abilities to process information. These abilities are: listening, seeing, and touching, through which we acquire information. Special abilities to process information are also based on attention, discrimination, memory, information representation, concept formation, and problem solving.

Definition of arithmetic difficulty: It is defined as difficulty in understanding and perceiving numbers and their arrangement, understanding, decoding and interpreting arithmetic symbols, and difficulty in performing arithmetic operations such as addition, subtraction, multiplication and division. It also includes difficulty in understanding geometric shapes and their properties, such that every student who exceeds 25 points on the applied scale is considered to suffer from arithmetic learning difficulty (Mansouri and Wakhol, 2016).

Indicators of arithmetic difficulties:

Difficulty associating a number with its symbol, difficulty distinguishing numbers in reverse, writing numbers in reverse, reversing numbers written in columns, and difficulty mastering some concepts related to basic arithmetic operations (Zumra, 2018)

Hanashi (2022) also conducted a study aimed at the effectiveness of differential teaching in improving the arithmetic performance of third-year primary school students with learning difficulties. The study sample consisted of (30) students, who were distributed into two groups: the experimental group, which consisted of (15) students, and the control group, which consisted of (15) students. The study used the quasi-experimental approach, and the study also used the test. The results showed the positive effect of differential teaching in improving the arithmetic performance of students with learning difficulties.

The group (2018) conducted a study that aimed to identify the effectiveness of an educational program based on learning strategies to reduce the difficulties of learning mathematics. The study sample consisted of 40 students, who were distributed into two groups: the control group, which had (20) members, and the experimental group, which had (20) members. The study also conducted

Using a test of arithmetic skills, she also used the quasi-experimental approach, and the results of the study showed the effectiveness of the educational program based on strategies to develop mathematics skills. Muhammad (2018) conducted a study aimed at improving some academic skills and adaptive behavior in children with non-verbal learning difficulties through a training program. The research sample consisted of (5) fifth-grade primary school students with non-verbal learning difficulties (2 males, 3 females). The study Using a scale of academic skills, the study employed a quasi-experimental approach. The results of the study indicated that all of its hypotheses were met, demonstrating the effectiveness of the proposed training program in improving some academic skills and adaptive behavior in children with non-verbal learning difficulties. Qasi and Sakrah (2022) conducted a study aimed at identifying the most common academic learning difficulties (reading, writing, arithmetic) among primary school students, and the pedagogical care methods used to help this group. To achieve this endeavor, a questionnaire was applied to a sample of (20) male and female students from the fourth year Elementary students who had learning difficulties in reading, writing, and arithmetic were intentionally selected based on their teachers' observations and assessments. A descriptive approach was used. The study found that the most common academic learning difficulties among these students were difficulty learning to write, followed by difficulty learning to read, while arithmetic came in last place. The results indicated the effectiveness of pedagogical lessons in developing academic skills. It is clear from the above presentation of previous studies that they focused on different aspects,

without other important aspects, and the current study is merely an attempt to fill the gaps and complete the successive construction process over the years.

The researcher benefited from previous studies in writing the theoretical framework for the current study, defining the study problem and formulating it in a scientific research style, enriching its theoretical literature, developing the study methodology, constructing the study tools, and discussing and interpreting the results.

A training program to develop mathematics skills among students with learning difficulties in Irbid Governorate. The results of the study can be generalized to the study population.

Despite the above, the current study stands out from previous studies in its objective, population, sample, location, and time in the educational field.

The study examined the effectiveness of a training program in developing the mathematical skills of students with learning difficulties. The results of this study are expected to draw researchers' attention to research in this field.

Methods and Procedures

Study Population: The study population consisted of (130) students with learning disabilities in Irbid Governorate, diagnosed by the Ministry of Education and receiving part of their education in learning resource rooms.

Study Sample: The study sample was intentionally selected from those with low mathematics skills on the scale. It consisted of 30 students divided into an experimental group of 15 students and a control group of 15 students.

Study Methodology: A quasi-experimental approach was chosen, enabling us to identify and define the magnitude of the impact between the study's problem variables, as well as collect and prepare data, establish the basis for classifying it, and arrive at and interpreting results.

Study Tools:

First: The training program: By referring to previous references and studies, including the study of (Ronimus, 2.19 Aqoun and Abdel Qader 2018; Zumra, 2018; Hijazi, 2018; Muhammad, 2018; Aino and Khilaf 2020; Khoja 2019), a training program was developed that aims to develop mathematics skills among students with learning difficulties Program Validity: The validity of the training program was confirmed by presenting it in its initial form to a group of (10) arbitrators with experience and expertise in special education at Jordanian universities in order to verify the general and subsidiary objectives of the program, and the clarity and comprehensiveness of the phrases. The modification was carried out in light of the opinions and suggestions of the arbitrators

Program Objective: The overall objective is to determine the effectiveness of the training program in developing mathematics skills among students with learning difficulties.

Program Contents: The program includes (7) training sessions over a period of one and a half months, with each session lasting (30-45) minutes, divided into two sessions per week.

Program Contents: Table No. (1)

Math Skills	Skills to be Developed	User Method	Number of Sessions	Total Sessions
Arithmetic	Distinguish between larger and smaller	Active learning	1	
	Distinguishing between larger and smaller numbers	Lecture, Collaborative Learning	1	7

	Distinguishing between mathematical symbols	Discussion, Case Study	1	
	Masters arithmetic operations (+, -, /, *)	Active Learning, Discussion	1	
	Distinguishes the concept of time, date, and clock	Lecture, Discussion	1	
	Memorizes multiplication tables	Cooperative Learning, Discussion	1	
	Constructs a series of arithmetic operations	Cooperative Learning, Discussion	1	

By reviewing previous studies, including those by (Franceschini, 2018; Muhammad, 2018; Qasi and Sakra, 2022; Mustafa, 2016; Al-Amshawi, 2020; Najia, 2013), the researcher developed a math skills scale to verify the effectiveness of the training program in developing math skills among students with learning disabilities.

Validity of the Study Tool:

Apparent Validity: The validity of the study tool was verified by presenting it to a group of (10) experienced and specialized arbitrators from Jordanian universities. Their comments and amendments were taken into account, in terms of linguistic formulation, paragraph affiliation to the field, and paragraph suitability, in addition to their suggestions for any appropriate amendments. Based on the consensus of more than (90%) of the group of arbitrators, the tool was approved in its final form.

Stability of the study tool: To ensure the stability of the study tool, the test-retest method was used to verify the reliability of the scale. The scale was then re-administered two weeks later to a

group of (20) students from outside the sample and within the community. The Pearson correlation coefficient was then calculated between the scores.

Table (2)

Cronbach's alpha internal consistency coefficient and test-retest reliability for the domains and total score

Domain	Retest reliability	Internal consistency
Math skill	0,86	0,88

Study variables:

The study consisted of the following variables:

Independent variable: Training program. Dependent variable: Mathematics skills.

Statistical processing used in the study:

The SPSS program was used to answer the study questions. The Mann-Whitney test and the Wilcoxon test were used to answer the study questions.

Study Procedures:

1. Reference was made to previous literature in designing the program and study scale.
2. The study population and sample were identified.
3. The study used appropriate statistical equations to determine the study sample size.
5. The study applied both the scale and the training program.
6. The results were interpreted, discussed, and linked to previous studies, and recommendations and proposals were presented in light of the findings.

Presentation and discussion of results

The second question states: Are there statistically significant differences at the significance level ($\alpha \leq 0.05$) between the mean scores of the control and experimental groups on the mathematics skills scale attributable to the training program?

To answer this question, the Mann-Whitney test was used to determine the significance of the differences between the mean ranks of students with learning disabilities in mathematics skills in the post-test. The table below illustrates this.

Table (4-1) Results of the Mann-Whitney test to determine the significance of the differences between the mean ranks of the control and experimental groups in mathematics skills in the post-test

For dimensions	Group	Number	Average ranks	Total ranks	Mann-Whitney U	Wilcoxon W	Calculated Z-value	Significance level
Math skill	Experimental	15	20.73	311.00			-3.264	

	Cont roller	15	10.27	154.00				
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Table No. (4-3) shows that there are statistically significant differences ($\alpha \leq 0.05$) attributed to the experimental group in mathematics skills, as the calculated Z value reached (-3.264) with a statistical significance of (.001), and the differences were in favor of the experimental group

That is, the members of the experimental group who were subjected to the training program to develop mathematics skills possessed better mathematics skills than the control group who were taught mathematics skills in the traditional way.

This result confirms the effectiveness of the proposed training program to develop mathematics skills among students with learning difficulties. This result is attributed to the fact that the training program included a set of exercises, activities, and integrated methods that encourage students to learn mathematics skills in a simple and appropriate way.

Their educational needs, and mathematics skills are considered necessary and basic skills for students to help them complete the academic tasks assigned to them by the teacher, and increase their level of academic achievement, and help them in the ability to complete daily tasks, and independence in dealing with others.

Through the application of training program sessions to develop mathematics skills among students with learning difficulties, which included a set of methods including discussion, lecture, active learning and other strategies used in this study, which contributed significantly to the learning of students with learning difficulties.

For their math skills and integration with the surrounding environment, this result is attributed to the training program and techniques used in the method, including the repeated practice of basic math concepts such as counting, addition, subtraction, multiplication, and division, and the use of small groups of students.

This result is consistent with many previous studies that focus on students with learning difficulties, as this result is consistent with what was reached by Muhammad's study (2018), which indicated the effectiveness of training programs in developing the arithmetic skills of students with learning difficulties. It is also a result consistent with Hijazi's study (2018) Qasi and Sakra (2022); Hanashi (2022); Zamra (2018); Nasaireh, Obeiadat (2022) The improvement in mathematics skills among students with learning disabilities in the experimental group was attributed to the training program

Developing training programs to develop independence and social skills for students with learning disabilities.

- Developing mathematics skills training programs for other special education groups.

- Developing training programs to develop mathematics skills for children with learning disabilities in the early elementary stage.

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