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*Research Article*

# Creativity enhanced program for twice exceptionally gifted: effects of mathematics anxiety level

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**Abstract**

This research aimed to verify the effectiveness of a program based on the creative problem-solving strategy in alleviating mathematics anxiety among gifted students with mathematics learning difficulties at public primary schools in Saudi Arabia. To achieve this goal, the researcher employed the experimental approach in its quasi-experimental design. Raven Progressive Matris Test (RPMT) was applied to determine the general mental level. The mathematics anxiety scale was applied immediately after the training, as well as during the follow-up testing after four weeks of post-measurement. The sample of the study consisted of 10 grade-six gifted students with mathematics learning difficulties, whose ages ranged between 132 and 135 months. The sample was divided into two randomly chosen groups. The first is the control group, which consisted of five students. The second is the experimental group, which consisted of five students. The experimental group students received 18 training sessions, which were applied over six weeks, three days per week. Immediately after the training and during the follow-up test on the mathematics anxiety scale. Data were analyzed using the Statistical Package for Social Sciences (SPSS). The results revealed that the experimental group were superior to the control group in the performance on mathematics anxiety scale. In addition, there were no statistically significant mean score differences among the experimental group students immediately after the training and during the follow-up test on mathematics anxiety scale. This indicates a decrease in the mathematics anxiety scale. The researcher recommends the use of a creative problem-solving strategy to help those students.

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## Introduction

Many people find it difficult to assimilate that a student can be gifted and at the same time suffers from learning mathematics difficulties, because they consider this a kind of contradiction. So how can we understand that a student can be gifted and also has difficulties in learning mathematics? Many educators and researchers have found it difficult to accept and understand that these students get high levels in the official intelligence quotients while obtaining average achievement at school. It seemed unpalatable for researchers and educators that a child is gifted and has educational disorders or difficulties that leave him with learning difficulties (Sternberg, Lipka, Newman, wildfeuer, & Grigorenko, 2003).

In the last quarter of the twentieth century, the concepts of talent and excellence developed to intersect with concepts of learning difficulties in understanding and knowing that there are new groups among those with special education needs who carry at the same time a clear contradiction in their special needs. These groups are still neglected in our schools. Many general and special education teachers, as well as parents, do not understand the needs of the double-needs category; the children do not have one special need but two, such as the category of gifted students with learning difficulties (Al-Haroub, 2012).

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Therefore, gifted students with learning difficulties show talent in certain aspects, but they suffer from mathematics learning difficulties. Studies and research conducted in the field of mathematical learning difficulties indicate that there are a very large number of gifted students who also have difficulties in learning mathematics and dealing with arithmetic problems, and at the same time they can achieve academic success in other subjects. Often the problem starts from the primary level and extends to the secondary level and affects their professional and work lives (Al-Zayat, 1998).

This may lead to a high level of anxiety and a feeling of fear among some students. So, this category needs many programs that meet their needs, show their talent and strength, and adapt teaching strategies in an environment that suits their personal and creative capabilities. The task of creative problem-solving training is very necessary because it will address issues and problems they face with unconventional methods and help them adapt successfully (Al-Asar, 2000; Jarwan & Al-Abadi, 2014). For this reason, the current research attempts to determine the effectiveness and impact of a training program based on the creative problem-solving strategy and its reduction of mathematics anxiety among the gifted pupils who have also learning difficulties at the primary level.

**Importance of the Study**

This study derives its importance from identifying a program based on a creative problem-solving strategy in alleviating mathematics anxiety among the study sample. We summarize it as follows:

Firstly, theoretical Importance: The study highlights the importance of two special education areas, namely the gifted and excellent students and the mathematics learning difficulties. It is noted that the majority of studies draw attention to the gifted/distinguished students or students with learning difficulties separately. However, previous studies did not pay attention to students who show the characteristics of these two groups at the same time, despite the agreement on the necessity of studying them. Nevertheless, they are often ignored when students are evaluated in the field of talents/excellence or the field of learning difficulties. In addition, it is important to treat the issue of mathematics, which is an important life skill. The students who mastered mathematical concepts and skills at the beginning of their lives have a better future than those who do not master it (Al-Rashidi, 2013).

Secondly, importance of Application: The importance of applying the study is manifested through the application of a program based on a creative problem-solving strategy, which could contribute to alleviating the extreme mathematics anxiety. Results may also be draw attention of Education Ministry's officials who are in charge of curricula and teaching methods for gifted with mathematics learning difficulties students to seek the program's help to relieve the MS among the target group.

Thirdly, the primary stage occupies a prominent position in forming the various aspects of the learner's personality, because it is the medium in which the acquisition of various learnings begins. The primary education in all countries is the base for all the following educational levels, and whenever the primary education stage is strong the output will be greater for the following stages. Primary education is the basis through which young adults are prepared for the following stages of education (Saadat, 2014). Therefore, helping learners at this stage to overcome their difficulties will have a positive impact on their achievement.

**Problem of Study**

The purpose of this study is to alleviate the mathematics anxiety among gifted primary school students with mathematics learning difficulties by using the creative problem-solving, and to reveal the continuity of improvement through the follow-up testing.

By returning to the literature, we note that the majority of studies were conducted on the gifted students or those with difficulties in learning mathematics separately, such as Abd Rabbu's study (2018), Alodat's study (2019), Al-Rashidi's study (2014), Cosar, Çetinkaya & Çetinkaya's study (2015), and Uçar, Uçar & Calişkan's study (2017). However, it is rare to find studies concerned with both aspects. Therefore, the current study takes a different path that is excluded by many; it is to search for a topic that reflects idiomatic contradiction and educational conflict.

The researcher conducted a survey study by presenting a questionnaire to 120 sixth grade students studying in some primary boys-only schools in Dammam to identify the prevalence of mathematics anxiety among students. The survey results showed that the prevalence of mathematics anxiety reached 29%. According to Gresham (2009), students with learning difficulties suffer from mathematics anxiety, an acquired behaviour that can get worse and worse and lead to academic weakness if not addressed over time. The early treatment limits the emergence of more difficult academic problems in advanced educational levels. A study (Krinzinger, Kaufmann, & Willmes, 2009) found a correlation between learning difficulties and mathematics anxiety among primary school students. Baazzi (2012) views that gifted students with mathematical learning difficulties are prone to anxiety, which requires

designing strategies to circumvent their weaknesses and develop their capabilities to solve problems based on creativity and innovation.

It is clear from the foregoing that the problem of the current research lies in the scarcity of Arabic and foreign studies that the researcher could find, which treated the effectiveness of a program based on a creative problem-solving strategy alleviate mathematics anxiety among GLD students. This has motivated the researcher to adopt these variables and study them.

- How effective is a training program based on a creative problem-solving strategy in alleviating mathematics anxiety among a gifted students with mathematics learning difficulties immediately after the training?
- How effective is a training program based on a creative problem-solving strategy in alleviating mathematics anxiety among a gifted students with mathematics learning difficulties during follow-up testing?

**The Research Hypotheses**

The specific hypotheses that were tested are as follows:

- There are statistically significant mean score differences at 0.05 level on mathematics anxiety between the experimental and the control groups in the post test in favour of the experimental group.
- There are no statistically significant mean score differences at 0.05 level on mathematics anxiety for the experimental group in the post and follow-up tests.

**Theoretical Framework**

**Creative Problem-Solving**

Investing minds does not mean only teaching them literacy and numeracy skills, or providing them with some knowledge and information in various branches of science and knowledge, or even enabling them to have the skills to deal with some technological innovations such as computer generations, the real challenge for educators is to teach students creative thinking so that the learner becomes able to solve problems and face difficulties (Jassim, Alobaidi, Alobaidi, & Alobaidi, 2010). Therefore, today we need more education strategies that provide us with diversified and advanced educational horizons that help our students to enrich their knowledge, develop their mental skills ،and training them on creativity.

Some have defined creative problem-solving as "the ability to know and discover the problems involved in a situation, so that solutions that are different from the questions raised can be reached through the problem solving stages, starting from understanding it to solving it" (Amer, 2002, p. 22).

Darwan (2007) states that one of the advantages of learning of the skills of creative problem-solving is that it helps to identify and take advantage of available opportunities; face challenges; overcome difficulties; contribute to raising the efficiency of cognitive processes; develop self-confidence and some skills such as observation, idea building, analysis, composition and evaluation; help in solving life problems; and balance between convergent and divergent thinking.

Both Al-Habashi & Jad Al-Haq (2013) state that the creative problem-solving is a system that includes productive thinking tools, which can be used to understand and address problems to generate diverse, multiple, unconventional, new and appropriate ideas as well as solutions. It can also help evaluate and develop these ideas and solutions to reach creative solutions.

Creative problem-solving represents a state of complexity that requires the learner to think, meditate, and come up with innovative solutions and alternatives through an organized framework. Addressing a problem always requires looking from different and new angles in a way that makes you use all previous experiences, creative ideas and opportunities available to reach an innovative, creative solution (Ali, 2017).

The creative problem-solving strategy follows the scientific method of thinking, as it is based on raising the motivation of the learners and making them feel anxious about the existence of a problem that they cannot easily solve, far from using the traditional method of solving the problem, provided that the problem is appropriate to the students' level, and related to their lives and previous experiences, and related to the topic of the lesson (Goldman, 2011; Dawson &Venville, 2010).

The effectiveness of this strategy appears in developing students 'ability to creatively adapt to the variables of life, as it provides solutions characterized by novelty, originality and realism, while increasing students' class interaction, and developing their cognitive and social skills, which in turn are considered a basis for decisions-making, which make this strategy anchor in most other thinking and life skills (Cáceres-Serrano & Conejeros-Solar, 2011).

**Mathematics Anxiety**

Some studies indicated that mathematics anxiety is an acquired psychological response as a result of exposure to failed situations related to the ability to understand and perform any mathematics-related task, whether inside or outside the class. It is also evident that mathematics anxiety is higher among females than males. Causes of anxiety could be individual or attributed to the school or community (Ali, 2017).

Al-Tawil (1988) defines mathematics anxiety as a feeling of tension and anxiety that emerges in dealing with numbers and solving various mathematical problems, trying to evade these situations in public or private life, and making poor performance in learning or using mathematics.

Mathematical anxiety is defined as negative feelings associated with solving mathematical problems, represented in the formation of a withdrawal pattern from situations that include mathematical problems (Sparks, 2011). Devine, Fawcett, Szűcs, & Dowker (2012) defines it as a state of tension and discomfort associated with performing mathematical tasks, and Maloney, Sohaeffer, & Beilock (2013) as negative reactions that individuals exhibit when placed in situations that require solving mathematical problems.

On the other hand, Beilock and Maloney (2015) defines mathematics anxiety as negative emotions include tension and fear that many individuals display when dealing with mathematics. Harrari, Vukovic & Bailey (2013) and Passolunghi, Caviola, Agostini, Perin, & Mammarella (2016) agreed in their definition of mathematics anxiety as a feeling of tension when dealing with numbers and solving mathematical problems in daily life and academic situations.

**Causes of Mathematics Anxiety**

Many researchers have studied the causes of mathematics anxiety in primary students according to four factors: (A) social factors, (B) cognitive factors, (C) academic factors, and (D) genetic factors. For instance, social factors include lack of parental support in low socioeconomic (SES) households (Rown-Kenyon, Swan, & Creager, 2012). Cognitive factors comprise dyscalculia (Sparks, 2011), and deficits in working memory (Willis, 2010), she states "when students are stressed, they can't use their thinking brains" (p. 10). Academic factors includes the traditional mathematics curriculum used in public school classrooms (Geist, 2010), ineffective teaching styles, and the influence of math anxious teachers (Beilock, Gunderson, Ramirez, & Levine, 2010; Bekdemir, 2010; Geist, 2010). In genetic factors, Wang et al. (2014) emphasized the important role that genes may play in a student's susceptibility to mathematics anxiety.

The causes of mathematics anxiety can also be categorized as following: Firstly, environmental reasons: These include negative experiences in mathematics lessons or with mathematics teachers. Secondly, personal reasons: These include low self-esteem and low self-confidence. Finally, cognitive reasons: These include innate characteristics, which are either low intelligence or weak cognitive abilities (Rubinsten & Tannock, 2010).

**Mathematics Anxiety and Students with Learning Difficulties**

Students with learning difficulties suffer from a high level of mathematics anxiety and have high or low levels of excitement. Therefore, they cannot control these levels to the degree needed by the student in the required tasks and different educational situations to solve mathematical problems. If they try to choose a specific strategy, they are not able to implement it as appropriate as a result of mathematics anxiety (Al-Zayat, 1998).

Other studies also indicate that mathematics anxiety represents a problem for students, especially those with learning difficulties, as they do not feel self-confident to learn mathematics, and thus lead to lower mathematics scores (Joseph & Mary, 2002). There are many studies on mathematics anxiety. Through reading on the topic, it became clear that anxiety was higher among females than males. Some studies indicate this, such as Yaqoub's study (1996), which found that females have higher mathematics anxiety than males.

**Gifted Students who Have Learning Difficulties**

They are the students who have high abilities and capabilities that enable them to achieve high and distinguished performance in various subjects, but they suffer from mathematics learning difficulties and deficiencies, which in turn leads to a decrease in their academic level in this subject. This consequently leads to failure in mathematics (Ibrahim, 2006).

Gifted student with learning difficulties can be defined as student with outstanding talent or intelligence who are capable of high performance, but at the same time, they face learning difficulties that make achieving some aspects of academic achievement difficult. It is seldom specified these gifted students and meet their special needs, because of the absence of accurate programs in schools that contribute to identifying them and meeting their needs. The

focus is usually on the problems caused by learning difficulties and the development of programs and treatment strategies in a manner inconsistent with their interest in detecting or diagnosing them. Among the characteristics that these students show are:

- Outstanding creative abilities and mental activities.
  - With the types of difficulties they have and the problems resulting from them, which negatively affect academic performance.
  - Outstanding talents and mental capabilities that enable them to achieve high levels of academic performance, but they suffer from specific learning difficulties that make some aspects of academic achievement or achievement difficult (Alattiyah & Dababneh, 2015).

**Prevalence of Gifted Students Who Have Learning Difficulties**

Through studies indicating their prevalence, there is no accurate statistic about the gifted and excellent students who have learning difficulties in the Kingdom of Saudi Arabia. However, it can be said that their percentage may reach 16% of the gifted students' community (Al-Zayat, 2000). According to Aba Al-Khail (2011), it was found that the percentage of gifted female students who have learning difficulties in the Saudi society reached 24%. This indicates the importance of caring for and revealing this category through drawing up plans and providing appropriate educational programs to address the problems they face. This is because the lack of interest in this category leads to significant negligence in the educational process. In addition, they suffer from the failure to provide appropriate services for them, as they have two contradictory characteristics – talent and the learning difficulty.

**Classification of Gifted Students with Learning Difficulties (GLD)**

According to Jarwan & Al-Abadi, (2014), GLD students are classified into three categories:

Firstly, gifted with simple learning difficulties: They are students with high intelligence and high verbal ability, but they may suffer from learning difficulties. While making achievements and shortcomings at the same time, they often have a variation in the actual and expected achievement.

Secondly, gifted with severe learning disabilities: They are students whose learning difficulty is so high to the degree to which they are identified as suffering from learning difficulties, but their capabilities have not been recognized or directed. The continuation of their potential as obscure and unknown is not due to the educational program. Because of this low evaluation or inflexible identification, they are rarely referred to or provided services as being gifted.

Thirdly, gifted with learning difficulties and they are not identified: They are a category that is difficult to identify, as they are not considered gifted or having learning difficulties. These students have difficulties that hide their talents, and they have talents that hide their difficulties and give them a false appearance. These students are often in ordinary classes where they do not benefit from the educational services provided to the gifted or those who have learning difficulties. Their potential and preparedness are rarely identified.

Hence, a GLD student is the one who has superior mental ability, but shows a difference between his academic achievement level and the expected achievement level depending on his mental ability - that is, he is gifted and smart but has difficulty in a specific academic field

**Previous Studies**

Jarwan & Al-Abadi (2014), aimed in their study to investigate the impact of an educational program based on a creative problem-solving strategy in developing creative thinking skills among GLD students. The sample members were deliberately selected with 28 male and female students after reviewing the files of students referred to the classrooms of the students with learning difficulties in private and public schools in Amman, according to the criteria followed by the Ministry of Education. The quasi-experimental approach was applied and the researcher found that there are statistically significant mean score differences at the level ($\alpha < 0.05$) between members of the experimental and control groups on fluency, flexibility, authenticity and testing skills in favour of the experimental group members. The findings also showed that there was no statistically significant effect of the interaction between the training program and the IQ score. This indicates that the impact of the educational program was similar for the students who obtained 115-124 IQ scores and those with higher IQ score.

Al-Rashidi (2014), aimed to explain the effect of mathematics anxiety and the trend toward mathematics based on the achievement ability of the students who have mathematics learning difficulties. A sample of 121 sixth-grade pupils from a Kuwaiti middle school, 60 of whom had learning difficulties and 61 were ordinary students. A set of tools for the study were applied, including a non-verbal intelligence test, a mathematics achievement test, the

personal assessment scale for those who have mathematics learning difficulties, a mathematics anxiety questionnaire, the mathematics attitude scale, and the mathematics anxiety scale. The researcher used the descriptive methodology and reached the following results - that is, there are statistically significant differences between mathematics phobics, mathematics anxiety scale, the learning achievement among students with learning difficulties, and ordinary students from among the sample. There is also a negative correlation between mathematics phobics and mathematics anxiety with learning achievement. However, the correlation between mathematics anxiety scale and academic achievement is significantly positive.

Abd Rabbu (2018), aimed to identify the extent of the impact of the use of brain-based learning strategies in developing mathematical proof and contemplative thinking and reducing mathematics anxiety among third-grade middle school students. The experimental researcher used a method with a quasi-experimental design and selected two third-grade classes. The experimental group included 31 students for the experimental group and 31 students for the control group. The mathematical proof test, as well as the contemplative thinking test and the mathematics anxiety scale were applied as tools for the study. The results showed a high learning level in favour of the experimental group, which was taught according to the brain-based learning strategies, over the control group.

The researcher benefited from the above studies in: (Choosing the study methodology and design, knowing the creative problem-solving models and tests that measure this skill, knowing what mathematics anxiety is and its multiple definitions, knowing the characteristics of the gifted students with learning difficulties, designing a suitable training program for this category, choosing appropriate measures related to anxiety and classifying difficulties, knowing the references and sources stated in the indexes of these studies, and determining the appropriate statistical treatments to be used in testing hypotheses and analyzing and interpreting their results).

Commenting on the previous studies:

- Jarwan &Al-Abadi study (2014) and Al-Rashidi's study (2014) agreed with the current study in terms of the sample, as they studied gifted students who have mathematics learning difficulties. The current study differed with Abd Rabbu's study (2018), the latter's sample was from middle school students.
- This study is similar to most of the previous studies in the experimental approach with a quasi-experimental design.
- This study will apply a set of tools, including the mathematics anxiety scale, which is consistent with the tools of Al-Rashidi's study (2014) and Abd Rabbu's study (2018).
- The results of Jarwan's study (2014) confirmed the effectiveness and impact of creative problem solving-based programs in reducing mathematics anxiety among gifted students with learning difficulties. Results of other studies indicated that there is a relationship between mathematics anxiety and academic achievement, such as Al-Rashidi's study (2014), as well as a progressive relationship between the effect of teaching according to differentiated instruction or a brain-based learning program or other programs and their reduction of mathematics anxiety, such as Abd Rabbu's study (2018).

What distinguished this study is that it dealt with the effectiveness of a creative problem solving-based training program for the variables as an independent variable and that the program mitigated the extreme mathematics anxiety as a dependent variable for the gifted with mathematics learning difficulties students' category and this was not studied before. No study emerged over the past five years, as far as the researcher knew, to tackle only these two variables among gifted with mathematics learning difficulties students in Saudi Arabia.

## Method

### Research Model

To achieve the research objectives, the researcher employed the experimental approach in its quasi-experimental design. This involved the use of a quasi-experimental design consisting of both experimental and control groups. Obaidat, Abdul-Haqq and Adas (2011) define this as a deliberate and controlled change of the specific conditions of the actuality or phenomenon that form the subject of the study, and then noting the effects of this change on that actuality or phenomenon.

### Participants

This sample was used to verify the psychometric properties of the tools applied by the current study. The sample included 28 six-grade students from Dammam, the same area where the main sample schools are located. The sample was selected during the academic year 2019/2020. Their age ranged between 132 and 135 months.

With regard to the main sample, the study's main sample consisted of 10 six-grade Gifted students with mathematics learning difficulties from four schools. It was taken into consideration while selecting members of the main sample that they were not from the preliminary sample school. It was also taken into account that they had the same characteristics, such as the gender, IQ and age. The main sample was divided into two groups, one is an experimental group n = 5, and the other is the control group n = 5.

Steps for selecting the study's main sample:

- Four primary schools applying a learning difficulties program were chosen. The number of the students in the program was 60 students.
- The sample consisted of 10 six-grade gifted students with mathematics learning difficulties, and they were diagnosed through the "Academic Achievement in Mathematics". The students who obtained lower scores than the average in the exam were identified at the end of the second semester of the academic year 2017/ 2018, as well as the first semester of the academic year 2019/2020 in mathematics. The following table shows the means and standard deviation for the students.

**Table 1.**

*Means and Standard Deviations of the Scores Obtained by the Students in the Mathematics Course*

| Semester | Second semester, academic year 2017/2018 | First semester, academic year 2019/2020 |
|---|---|---|
| Top score | 100 | 100 |
| A | 69.9 | 73.00 |
| O | 11.1 | 12.3 |
| A-O | 58.8 | 60.7 |

The student with a score less than A-O in mathematics was described in each of the two tests as being among the students with low academic achievement. The number of students who were excluded was 35. Thus, the number of the sample reached 25 students.

The RPM test was applied to determine the IQ of 25 students who were previously selected. The students who obtained 115 IQ scores or more were identified, which means that the students' scores in that test reflect a higher level of intelligence. 15 students were excluded. Thus, the number of the sample became 10 students.

The sample was divided into two groups – an experimental group consisted of 5 gifted students with learning difficulties and a control group consisted of 5 gifted students with learning difficulties from two different schools.

To verify parity between the experimental and control groups in the pre-test in the following variables: age, intelligence, and mathematics anxiety. The Mann–Whitney U test was used for two independent groups. The results showed that there is no statistically significant mean score differences between the experimental and control groups in all variables of the study in the pre-test, which means that there is a suitable parity between the average ranks of the experimental and control groups.

**Data Collection Tools**

**Raven Progressive Matris Test (RPMT)**

Through the use of this test, the current study aimed to determine the general mental level (general mental ability or so-called general intelligence), as a divergence measurement to identify the six-grade GLD students. This test is a non-verbal IQ test, which is consisted of five sets (A, B, C, D, E), each of which consists of 12 matrices, meaning that the total test items are 60. The five sets are arranged according to difficulty. The first term in each set is largely self-evident, and then the difficulty of the vocabulary within each set increases gradually (Raven, 1977). The first sets, which are the easiest, require precision in comparison and identifying differences and similarity. As for the difficult set, it requires understanding the logical relationships between shapes. The matrix is a geometric shape that lacks a piece placed among six to eight alternatives. The examined must choose the piece that completes the shape and records its number in the answers' form.

Each of the five sets that make up the test comprises a different type of response. The basic shape in the first pattern, represented by the items of set A, contains an engineering design, but part of which is cut out and placed within six alternatives below the basic shape. The basic shape in the second pattern, represented by the items of set B, contains four engineering designs that have a specific relationship between them at the horizontal and vertical levels. But one of these four designs were cut out and placed within six alternatives below the basic shape. The basic shape in the third pattern, represented by the items of the last three sets, contains nine engineering designs that have

a specific relationship at the horizontal and vertical levels. But one design was cut out and placed among eight alternatives below the basic shape.

The RPM test measures the general mental capacity, as it is untimed test. Therefore, it measures the accuracy of observation as well as the clear, ordered thinking that does not depend on previous information acquired by the individual. The researcher used this untimed test in the current study for this purpose. Several studies have calculated the validity of this test by relying on the trustworthiness associated with the benchmarks, such as Saleh's study (1978) whose results were indicative at the 0.01 level, which indicates that the test had a high level of trustworthiness. This test has good stability. Raven and his students applied the test to different age groups and found that the stability coefficient ranged between 0.83-0.93, and also in Oleary, Brouwers, Gardner, & Cowdry (1977).

**Mathematics Anxiety Scale (MAS)**

To build the scale, which was prepared by the researcher, many mathematics anxiety scales prepared for the primary stage were examined, such as the scale of Abed and Yaqoub (1994). The scale aimed to examine the mathematics anxiety level among primary school students. It consisted of 28 statements, each of which represented a behavioral situation that may arouse a degree of anxiety with the student, who expresses it by his response to one of the gradient points recorded in front of each term of the scale (Not at all bother me - bother me a little - bother me a lot). I gave it (1, 2, 3) points, respectively. The total score is 100, and a student who obtains a score higher than 76 is considered to have mathematics anxiety. Psychometric properties of the scale is evaluated in terms of scale validity;

*Validity of arbitrators:* The researcher relied on the validity of the arbitrators or the validity of the content of the scale after presenting the terms of the mathematics anxiety scale on a panel of arbitrators, consisting of 14 faculty members specialized in special education, and curricula and methods of teaching mathematics. This was meant to find out the appropriateness and representation of each scale term for the field it was prepared to measure. The majority of the professors agreed in their answers that the scale actually measures mathematics anxiety and that its terms are appropriate and clear to what was prepared to measure, after introducing minor adjustments to the formula of some terms (see Table 2.).

**Table 2.**

*Percentages of Arbitrators' Consensus*

| The number of statements | Agreement percentage | The number of statements | Agreement percentage | The number of statements | Agreement percentage |
|---|---|---|---|---|---|
| 1 | 100 | 11 | 100 | 21 | 100 |
| 2 | 100 | 12 | 85.7 | 22 | 78.5 |
| 3 | 92.8 | 13 | 100 | 23 | 71.4 |
| 4 | 85.7 | 14 | 92.8 | 24 | 100 |
| 5 | 100 | 15 | 78.5 | 25 | 100 |
| 6 | 100 | 16 | 92.8 | 26 | 100 |
| 7 | 100 | 17 | 100 | 27 | 92.8 |
| 8 | 100 | 18 | 100 | 28 | 100 |
| 9 | 78.5 | 19 | 100 | | |
| 10 | 100 | 20 | 100 | | |

*Criterion-related validity,* the Pearson correlation coefficient was applied to measure the scores of a number of the study members in mathematics. Their scores on the mathematics anxiety scale represented 0.83. Each of the correlation coefficient values were statistically significant at 0.01 level. Validity was confirmed by using the mathematics anxiety scale prepared by Abed and Yaqoub (1994).

The scale stability was calculated by applying it to the experimental group, and it was found that the value of the stability coefficient value was 0.86, which are high stability coefficients.

**Data Analysis**

To achieve the goals of the study and answer its questions, the researcher statistically processed the data by: Changing the degree of response included the terms to degrees starting with the first level as follows: one degree for "Not at all bother me", two degrees for "bothers me a little", and three degrees for "bothers me a lot". Since the mathematics anxiety scale uses 28 statements, the total score is 100. The student who obtains a score higher than 75 is considered to have mathematics anxiety.

Entering the data into the computer and analysing the data by the Statistical Package for Social Sciences (SPSS) program, where the following analyses were used: Calculating the arithmetic mean, the standard deviation, and the percentage of mathematics anxiety scores, Pearson correlation coefficient, RPM test, Mann-Whitney

**Procedure**

A training program based on a Creative Problem-Solving strategy, prepared by the researcher.

A. The overall objective of the training program:

The program aims to reduce the mathematics anxiety in a sample of students gifted with mathematics learning difficulties in the experimental group in Dammam.

B. The private objective of training program aims to make the student:

- Uses a creative problem-solving strategy to find multiple and varied solutions to problems.
- Analyses the problem to its components.
- Cooperates with his colleagues in finding solutions to the problem.
- Collaborates with his colleagues to choose the best solutions to the problem while supporting them.
- It also develops the students' skills in generating ideas and providing original alternatives to solve problems.

C. Tools used in implementing the program:

The researcher used several strategies and methods to implement the theatrical performance (the puppet theatre), brainstorming, cooperative learning, discussion dialogue, and doing the homework.

D. Content and components of the training program:

It is a set of problems for which the students are asked to find creative solutions. The program consists of 18 sessions, implemented over a period of six weeks, 3 meetings per week. Each session lasts for 45 minutes. They can be summarized in the following table:

**Table 3.**

*Title and Time of Training Sessions, and the Objectives of Each Session*

| Session | Session's title | No. of sessions | Session time | Objectives |
|---|---|---|---|---|
| 1 | Introduction to the training | 2 Briefing sessions | 35 minutes | 1. Introduce the students to the sessions and their objectives.<br>2. The student has to distinguish between the traditional solution and creative problem-solving.<br>3. The student has to know how to use the creative problem-solving. |
| 2-18 | Creative problem-solving training | 17 executive sessions | 45 minutes | 1. After completing the session, the student will be able to find a number of unfamiliar solutions to the situation that contains a problem. |

E- Theoretical basis for the training program:

To prepare the program, the researcher reviewed study that focused on the use of creative problem-solving with GLD students, such as Jarwan & Al-Abadi study (2014).

F- The researcher's role before and during the briefing and executive training sessions:

First: Before the program, the researcher:

- Prepares the training hall.
- Determines the objectives of each session to determine what each learner in the experimental group should do during the training to make sure that each session has achieved its goals before it wraps up.

Second: During the program:

- Explain the roles that the students should do in the experimental group during the sessions.
- Summarise opinions and proposals and propose solutions when necessary.
- Write down what was observed on the students after performing the tasks assigned to them.
- Train in the use of creative problem-solving.

G- Program validity:

It was made sure that the training program achieves the goal for which it had been developed. Therefore, the program was reviewed by 15 arbitrators, faculty members specialized in special education, learning difficulties, and curricula and methods of teaching mathematics. They were asked to read the content of the program and express their opinions and suggestions, in terms of its goals, training procedures, and training sessions, among

other aspects. The comments and suggestions of arbitrators were reviewed and taken into account, and the necessary adjustments were made.

**Procedures for Applying the Study**

-Visit the four schools that have been identified to apply the study tools there.

- Meet the study sample (the experimental group and the control group) and inform them about the nature of the study.
- Identify the sample from among gifted with mathematics learning difficulties students through the discrepancy and exclusion criterion.
- Apply the RPM test to raise the IQ to identify the gifted with mathematics learning difficulties students.
- Divide the study's 10-students sample into two groups; one is an experimental group consisted of 5 students from two different schools, and the other is the control group which shall be consisted of 5 students from different schools.
- Achieve parity between the two experimental and control groups in the pre-test in the following variables: lifetime, intelligence, and mathematics anxiety.
- Apply the mathematics anxiety scale, a pre-test to be applied to the experimental and control groups.
- Hold the 18 program sessions throughout six weeks, three sessions per week as group training. The duration of each meeting is 45 minutes for the experimental group.
- Apply the post-test by applying the mathematics anxiety scale to the experimental and control groups.
- One month after the completion of the program, conduct the follow-up testing by applying the mathematics anxiety scale to the experimental group only.

## Results

Theme 1: The first hypothesis states: "There are statistically significant mean score differences between the experimental and control groups about the performance on the mathematics anxiety scale immediately after the training in favour of the experimental group".

To validate this hypothesis, the researcher used the Mann-Whitney test in asymmetric pairs to examine the significance of the differences between the experimental and control groups, as shown in the following table:

**Table 4.**

*Results of Calculating the U Value for the Mean Grades of the Two Experimental Groups*

| The variable | Group | Number | Mean score | Total scores | Mann-Whitney U | Z-value | Significance level |
|---|---|---|---|---|---|---|---|
| Mathematics anxiety | Experimental | 5 | 3.5 | 17.50 | 2.500 | 2.14 | Significant |
| | Control | 5 | 7.5 | 37.50 | | | |
| | Total | 10 | | | | | |

Table 4 shows that the mean score in the performance on the mathematics anxiety scale for the experimental group is 3.5 and for the control group it is 7.5. The Mann-Whitney U is 2500 at a significance level of 0.05. There is therefore a significant difference between the experimental and control groups about the performance on the mathematics anxiety scale immediately after the training in favour of the experimental group.

Theme 2: The hypothesis states: "There are no statistically significant mean score differences among the experimental group in the performance on the mathematics anxiety scale immediately after the training and during the follow-up test."

To verify the validity of this hypothesis, the Wilcoxon test was used to examine the significance of the differences between the scores of the experimental group students immediately after the training. Their scores were arranged during the follow-up test, as shown in the following table:

**Table 5.**
*The Z Results Show the Mean Differences of the Experimental Group Students Immediately After the Training.*

| Variable | Ranks | Number | Mean ranks | Sum of ranks | Z | Significance |
|---|---|---|---|---|---|---|
| Experimental level | Negative ranks | 0 | 0 | 0 | 1.4 | Not significant |
| | Positive ranks | 2 | 1.5 | 3 | | |
| | Equal ranks | 3 | | | | |
| | Total | 5 | | | | |

The Z results show the mean differences of the experimental group students immediately after the training. their scores were arranged during the follow-up test on the mathematics anxiety scale. Based on the calculated value of (Z) as it reached (1.4), Table 5. reveals no statistically significant differences between the average scores of students in the experimental group in either after the training and during the follow-up test. This means that the decrease in the mathematics anxiety level that appeared immediately after the training continued during the follow-up test among the experimental group students.

## Discussion

The data of the above Table 3 shows that there is statistically significant mean score differences between the experimental and control groups in their performance on the mathematics anxiety scale, which is significant and positive at the 0.05 level in favour of the control group. This indicates a decrease in the mathematics anxiety level among students of the experimental group as a result of training on the creative problem solving-based program, which was not undertaken by students of the control group.

Therefore, these results indicate the presence of an impact of the creative problem solving-based training program in alleviating the extreme mathematics anxiety among gifted students with mathematics learning difficulties from members of the experimental group. We can say that these positive results are due to the nature of this training program and its various components and training activities related to the targeted creative skills in the training. This program treated a number of problems that were translated through staged scenes that had a great role in encouraging students to develop their capabilities, skills and confidence, which led to their communication and learning more independently. This is consistent with what Darwan (2007) mentioned. This independence has developed their self-awareness, curiosity, their ability to bond and mix with other students and take responsibility. This is consistent with what Jarwan's study (2014) reached. Therefore, it can be concluded that the program was able to help students develop the motivation, confidence, knowledge and skills they need to communicate and learn more independently. That is, the students reached a degree where they can make their own decisions with psychological comfort, because they felt that they possessed a method of their own that helped them a lot in mastering and overcoming mathematical skills, and passing the challenge that was difficult before implementing the training program that they underwent. This finding appears consistent with that of Cáceres-Serrano & Conejeros-Solar (2011) who found that the effectiveness of this strategy appears in provides solutions characterized by novelty, originality and realism, while increasing students' class interaction, and developing their cognitive and social skills, which in turn are considered a basis for decisions-making.

One of the primary ways to help learners reach independence is to teach learning strategies. In order to provide a learning environment in which learners can learn independently, learners must receive strategy training. In other words, teachers must train students on how to develop and use effective learning strategies. This happened through the training, which also focused on the storm strategy, which strengthened their creative mental skills, leading to a variety of different creative performance. This put their mind in a state of excitement and preparedness to think about the directions to generate largest number of ideas about the problem or the topic raised in mathematics. This is consistent with Al-Habashi and Jad Al-Haq (2013). We know that the greater the number of ideas proposed by the student, the greater the probability of reaching as many authentic or helpful ideas as possible proposed by the student to reach a creative solution. This is especially needed in mathematics, because mathematics cannot be learned in an atmosphere of negativity or by memorization. Rather, it must be taught in an atmosphere of activity and enthusiasm. This helps students to develop creative thinking, which in turn leads to reducing their anxiety. This seems to be consistent with that of Jassim et al. (2010) who mentioned that the real challenge for teachers is to teach

students creative thinking so that the student becomes able to solve problems and face difficulties. Taking into consideration that the problem is appropriate to the students' level, related to their lives and previous experiences, and related to the topic of the lesson (Goldman, 2011; Dawson &Venville, 2010).

One of the goals of this training program is to help the student to collaborate with his colleagues in finding solutions to the problem. We know that cooperative learning is one of the factors that must be taken into account when creating independent learners. The reason is that it aims to create a study environment in which students can ask and discuss questions in a free manner and in cooperation with other students. In fact, cooperative learning contributed to the exchange of ideas between students and allowed to review different views, which contributed to alleviating mathematics anxiety among gifted with mathematics learning difficulties students, because everyone is involved in the information exchange. This is will not happen in ineffective teaching methods, because one of the cause of mathematics anxiety is ineffective teaching styles, and the influence of math anxious teachers (Beilock et al. 2010; Bekdemir, 2010; Geist, 2010). In addition, it helped in breaking the routine and creating activity and enthusiasm in the classroom. I did not find this in traditional teaching methods applied with the control group, who did not undergo this training. So, we can say that this training helped the experimental group students to develop their thinking and their spirit of competition and participation and boosted their motivation to learn because it added a more pleasant atmosphere to the learning process. This is consistent with Goldman (2011), and Dawson & Venville (2010) who mentioned that this strategy based on raising the motivation of the learners and making them feel anxious about the existence of a problem that they cannot easily solve. This contributed to alleviating mathematics anxiety, as each student had the freedom to express his ideas and discuss them with other colleagues out loud. This helps students to be involved in the learning process and benefit from each other.

This training dealt with a set of situations and problems, which gave accumulated knowledge about these problems that contribute to the development of creativity. Discussing these problems in detail contributed to expanding their knowledge and creativity structures and enabled them to feel the various aspects of these topics. This is consistent with the creative problem-solving model that begins with identifying and highlighting the problem, then searching for and formulating relevant information, and coming out with generating a number of ideas and finding genuine solutions. It is clear from the above table 4. that there are no statistically significant mean score differences among the experimental group students immediately after the training and their scores during the follow-up test on the mathematics anxiety scale in total score, which indicates that the decrease in the mathematics anxiety level that appeared immediately after the training continued during the follow-up test among the experimental group students. Therefore, today we need education strategies that help our students to enrich their knowledge, develop their mental skills ‹and training them on creativity, taking into account the causes of mathematics anxiety which include social factors (Rown-Kenyon, Swan, & Creager, 2012), cognitive factors (Rubinsten & Tannock, 2010; Sparks, 2011; Willis, 2010), academic factors (Geist, 2010), and genetic factors Wang et al. (2014).

The researcher attributes the superiority of the creative problem-solving strategy over the traditional method about the continued reduction of extreme mathematics anxiety during the follow-up test to the techniques applied during training on the creative problem-solving strategy. This mean those students need some programs in schools meet their needs. This is consistent with Alattiyah & Dababneh (2015) who indicated that it is seldom specified these gifted students and meet their special needs, because of the absence of accurate programs in schools that contribute to identifying them and meeting their needs. The use of this strategy in teaching mathematics helped, through a variety of activities, examples and questions, in developing creative thinking skill, such as fluency, flexibility, and authenticity. This strategy is based on the role of the teacher and the student. The student plays a bigger role in this strategy. The participation of students is largely evident in the educational process inside classrooms by giving students a great measure of freedom to interact with each other in discussion, dialogue and solving problems. Interaction is encouraged to present multiple, varied and new solutions to problems. Interaction also takes place with the teacher. The use of this strategy evoked and motivated students to learn mathematics, increasing their eagerness to learn and solve various mathematical problems during the learning process. This makes the student active and positive in the learning process, rather than being a passive recipient. This mean that the students will not display negative emotions in situations that require solving mathematical problems, as mentioned in definitions of mathematics anxiety by (Sparks, 2011; Devine et al. 2012; Beilock, 2013; Beilock & Maloney, 2015; Harrari, Vukovic & Bailey, 2013; Passolunghi at al. 2016). These factors worked together to boost self-confidence among the experimental group students, thus providing them with an appropriate opportunity to show their best.

This contributed to their integration in the teaching activities. Therefore, their participation was active in discussing problems, developing appropriate solutions, and making them more persistent in solving activities and challenges provided to them. According to Joseph & Mary (2002), mathematics anxiety represents a problem for students, especially those with learning disabilities, as they do not feel self-confident to learn mathematics and, consequently, obtain lower mathematics scores. Therefore, we think that those gifted students need unconventional problem solving strategies and this is consistent with Abd Rabbu's study (2018).

## Conclusion

This research aimed to verify the effectiveness of a program based on the creative problem-solving strategy in alleviating mathematics anxiety among gifted students with mathematics learning difficulties at public primary schools. The findings of the study showed statistically significant mean score differences between the experimental and control groups in their performance on mathematics anxiety scale in favour of the experimental group. In addition, there were no statistically significant mean score differences among the experimental group students immediately after the training and during the follow-up test on mathematics anxiety scale. This indicates a decrease on mathematics anxiety scale, which appeared immediately after the training and continued during the follow-up tests of the experimental group students.

## Recommendations

In light of the results of the study, the researcher recommends the following for further studies and for applicants.

### For Further Studies

Future studies could be extended to other areas of the education field. In addition, this study could be replicated and extended to include middle and high schools. Furthermore, this study could be extended to explore teachers' views and experiences. Conduct similar studies to identify the impact of other strategies on teaching gifted students with mathematics difficulties. Conduct further studies to identify the difficulties and obstacles hindering use of creative problem-solving strategy to help those students with mathematics difficulties. Conduct a study that measures teachers' attitudes toward using creative problem-solving strategy with those students.

### For Applicants

In teaching mathematics, focus on using modern teaching methods and approaches and avoid traditional methods that focus on memorization without paying attention to the active participation of students. There should be a specialist in talents and mathematics learning difficulty to provide the appropriate teaching services for gifted students with mathematics learning difficulties. It is necessary to reduce mathematics anxiety among gifted students with mathematics learning difficulties by providing an interesting educational environment in which motivation and enthusiasm prevail, and they work to achieve creativity and development. Provide educational enrichment services for gifted students that help in making optimal use of their mental abilities. Introduce and apply program and strategies to develop creative problem-solving skills and creative thinking skills in the different school curricula for ordinary students, those with learning difficulties, and gifted students with mathematics learning difficulties at different educational levels. Design and create a classroom environment that encourages the acquisition and application of creative problem-solving skills for gifted students with mathematics learning difficulties by integrating mathematics with appropriate activities inside and outside the classroom. Make sure to use learning strategies that challenge students' abilities, which could, in turn, improve their motivation toward the learning process and encourage them to actively participate. Prepare a training program for teachers during service to train them on how to use the creative problem-solving in teaching mathematics to develop creative thinking in mathematics.

## Limitations of Study

Human limitations: Gifted sixth grade students who have mathematics learning difficulties. Objective limitations: Creative problem-solving strategy and mathematics anxiety. Spatial limitations: Primary schools for boys in Dammam Governorate. Time limitations: First semester of the academic year 2019/2020.

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