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The Effect of a Program Based on TRIZ Theory to Develop the Creative Thinking Skills Among Male Students with Mild Intellectual Disability

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Abstract

This research aims to identify the effectiveness of a (TRIZ) program on developing creative thinking skills among male students with mild intellectual disability. The research sample consisted of (7) male students with mild intellectual disability. Their age ranged between (11 and 13) years old, and they attend the school of intellectual education male in Kuwait. The research tools consisted of the Torrance test of creative thinking figural form B and the training program on developing creative thinking skills. One group quasi-experimental method was used in the research. The research results showed that there are statistically significant differences between the mean scores of the pre-test and post-test for the experimental group, in favour of the post-test. The research results also showed that there are statistically significant differences between the mean scores of the post-test THG8KUYK8JRF FOKM9I PRV MKFV [=R094IERKDFV and the follow-up test for the experimental group, in favour of the follow-up test, which demonstrates the effectiveness of a (TRIZ) program on developing creative thinking skills among male students with mild intellectual disability and maintained the skills students obtained from the program. The research recommended the preparation of special educational programs to train the students with an intellectual disability how to solve problems creatively and develop creative thinking skills and Providing a stimulating and encouraging environment through various activities and educational situations that
develop the creative abilities and skills of students with intellectual disabilities and enhance their self-confidence.and to training teachers and educational specialists on the TRIZ program and how to integrate program strategies with the educational curriculum and design other educational programs based on how to solve problems in creative ways. Also Encouraging researchers in the field of people with intellectual disabilities to design and develop similar programs to develop creative thinking skills within the curricula provided for these students or other independent programs.

Keywords: creative thinking, TRIZ program, intellectual disability

1.Introduction

The individuals with intellectual disability are considered as national energy and productive human wealth, in case of the means of care and attention that develop their abilities are provided and undertaking to provide ongoing care through a long-term vision, with following-up that focused on the individual through extended planning for several years to address all aspects of his life, capabilities, special abilities and preparations. In addition, to undertake the developing training programs & curricula for his care, development during his growing stages develop and follow it according to an organized scheme. Where it becomes a lifestyle that is interacted with and dealing based on (day-to-day) daily behavior and preparing

the individual for a promising future. This is the essence of the educational process for individuals with intellectual disability (Wells & Sheehey, 2012).

The role of educational institutions at all different academic levels lies in preparing, encouraging, and creating the appropriate environment to motivate student's creativity in various fields, adopting exploratory methods rather than the explanation and interpretation, focusing on understanding and application instead of memorizing, and benefiting from the accumulated experiences and expertise all over the world. According to a constructive-critical perspective, the formation of the creative personality of all categories of students, the development of their creative abilities towards useful and valuable things, and the develop their feelings towards working for the welfare and happiness of humanity (Habash, 2005).

In this time of acceleration, it is important to research and investigate all that is new in the educational fields and to benefit from it. And to employ theories in the field of special education that help us in developing teaching skills, thinking skills, and developing the field of research for people with intellectual disability in the future. When individuals with mild intellectual disability are taught and trained to acquire and develop creative thinking skills, they will be able to overcome the problems they face in their lives.

A student with a mild intellectual disability possesses latent creative talents and abilities regardless of the deficiencies in his physical, sensory, or mental abilities, as he can move towards society and others, where he begins to discover himself and his abilities and work to develop them, to come out in a creative form in which he competes with others. From members of the community, and thus his disability constituted a strong motive for him to prove himself in front of others (Abdat, 2013).

Creative thinking is one of the most important elements of thinking and its skills. Teachers must aspire to develop it among learners by developing their abilities to create ideas, training them to participate in developing knowledge and information of originality, fluency, flexibility and clarification, enabling them to solve their problems themselves after getting to know them and identifying their nature. And the search for solutions to them, then choosing the most appropriate solution to make the appropriate decision about them, which develop the-thought-out and well-executed educational program, by integrating creative thinking skills with the topics of the lessons, to achieve the required development for such skills for learners throughout the stages of their studies, and this works on developing creative thinking skills and raising their level of understanding of the issues and the issues they face in their daily lives (Al-Hallaq, 2010).

Special education is a fruitful field, in which workers can benefit from theories that have been tested in other fields, such as psychology, and use those theories to develop the capabilities, abilities and skills of children and adults with intellectual disability (Al-Mawla, 2013). Therefore, there is a need for programs with a clear methodology used to solve problems in creative methods, and based on a giant knowledge base of strategies that develop creative thinking skills, and the most famous and important of these programs is the (TRIZ) program, which began in the Soviet Union and was known as the solution theory " Theory of Inventive Problem Solving Also known as "TRIZ", the word is taken from the Russian acronym "Theory Resheniya Izobretatelskikh Zadatch", a relatively recent theory of creativity. Where the strength of this theory stems from its reliance on the various systems in the engi-

neering and technical fields that have been developed effectively and successfully, in addition to its ability to get rid of psychological obstacles that limit the interest of each group of people in their field of work only. This theory collected successful strategies and solutions from all fields of human activity and formulated them in the form of a set of tools that can be employed in various of these fields (Abu Jadu, 2012a).

TRIZ theory of innovative solutions to problems included a group of (40) strategies that can be used to find some unusual solutions to educational problems. As these principles showed their effectiveness in solving many engineering, technological and scientific problems, and also led to the emergence of a large number of inventions in these areas, and it is assumed that the application of such strategies in the field of education and upbringing of children with intellectual disability may help to solve their problems inappropriate ways and lead to the acquisition of developing and improve many of their abilities, skills and strengths, knowing that some of these strategies can be used with students with intellectual disability, while others are not appropriate for them (Al-Mawla, 2016).

Many research and educational studies in the field of intellectual disability have confirmed the existence of creative skills among the mentally disabled to a small degree, (Ismaeel, 2006; Al-Bashbeshi, 2008; Hassan, 2018), and a study (Cote et al, 2010; Fard et al, 2014; Gagic). et al, 2014; (De caroli & Sagone, 2014); (Petrulioniene & Valantinaite, 2015); Karabulute & Ozmen, 2018; Lant, 2019), And the distinctive characteristics that they possess if they are given care and attention and provide training programs and curricula to discover the creative skills and special abilities that exist in this category. Most of the studies focused on studying the differences between the individual with intellectual disability and normal children in creative thinking skills or revealing creative thinking skills among individuals with intellectual disability, but a few of them focused on designing an educational program to develop creative thinking skills and know its impact on students with intellectual disability.

To create suitable opportunities for talented and creative students with intellectual disability in the future to develop their creative energies and abilities, and to contribute to the development of life in their community, they must be given the appropriate care and attention that helps them develop their energies, abilities and talents. This requires educational enrichment programs that contribute to considering their needs and developing their creative thinking skills and linked in the real-life and the daily experiences of students with intellectual disability (Al-Ataar, 2011). Creativity training in an organized manner helps to identify the main goals and objectives, provide multiple opportunities for students to develop their creative abilities and skills by raising awareness and enhancing the creative traits of each student and teaching creative thinking techniques to be able to enhance their independence and self-expression and acquire lifelong learning skills (Davis & Rimm & Siegle, 2011).

TRIZ Strategies, which consists of a set of tools, methodologies, and a knowledge base designed to bring creative ideas into strategies that help change students' thinking and interactions in the daily life, and may motivate students with intellectual disability to make distinguished contributions in the creative field of life and to change the way the conduct of business and the alteration of daily activities (Fulbright, 2011).

Therefore, in this current research, some strategies of the (TRIZ) program will

be integrated into the science curriculum for schools of intellectual education for students with mild intellectual disability, taking into account the concepts and skills that must be acquired, and the type of thinking skill required for them.

2.Research Problem

The process of creativity, with its distinct characteristics, is greatly affected by the surroundings and the environment in which the individual lives. It is affected by customs, traditions, values and beliefs, and everything related to the cultural heritage of the community. Societies differ in their structure, culture and beliefs from each other, and some societies encourage independence and self-reliance and the spirit of development and progress without any restrictions or reservations, while a type of society does not encourage independence, and tends to suppress human capabilities that seek progress and development with restricting them (Abu Jadu, 2012a). and this is with individuals with intellectual disability, where the focus is on the aspects of their shortcomings and weaknesses, and the lack of interest in the aspects of strength and creativity, and considering them as effective individuals in their societies, and that people with intellectual disability need to upgrade the provided services and the educational programs provided to them by societies to be active members of society, and they keep pace and adapt to changes, speed and development in the face of the problems they are experiencing. Creativity and its development are important pillars in the lives of individuals with intellectual disability.

It has become necessary for educational institutions that include students with mild intellectual disability to give the subject of teaching thinking skills and creative thinking great importance by adopting modern programs and strategies that encourage thinking, learning and self-work. as the programs and curricula provided to them do not encourage or stimulate motivation and creativity even the learner with an intellectual disability reaches the required level of education, can face the challenges of the future and interact positively with its changes and developments (AL-khamis, 2018).

Through the researcher's review of the database, he noticed that few studies focused on the field of creative thinking among students with mild intellectual disability and the absence of the application of (TRIZ) theory in enrichment and training programs to develop their creative thinking skills, but the studies that dealt with the development of creative thinking skills and the application of enrichment programs educational for the development of special abilities and creative thinking skills for the individual with intellectual disability in general. It recommended the need to pay attention to this field, and the field of intellectual disability needs to search for everything that is new and helps in developing creative thinking skills for students with intellectual disability and to change the strategies and curricula that are presented to them in a new image that strengthens and raise their motivation and creativity.

(TRIZ) theory is based primarily on innovation and not being restricted to a single pattern of thinking, so it is necessary to search for what is new and innovative to benefit students with intellectual disability, and to provide them with new knowledge, or to help them get rid of their shortcomings, implemented by simplifying These strategies, and appropriately presenting them, can benefit students with intellectual disability (Al-Mawla, 2013).

The current research seeks to employ some strategies of a program based on (TRIZ) theory, which is represented in the strategy (Segmentation, Combining /

Merging, Inversion) to develop creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure) For the students with mild intellectual disability.

Therefore, the study problem can be formulated in the following main question:

What is the effect of a program based on (TRIZ) theory on developing creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure), among students with mild intellectual disability in the State of Kuwait?

The following questions arise from this question:

1. Does the (TRIZ) program lead to the development of creative thinking skills among a sample of students with mild intellectual disability?
2. Does the (TRIZ) program continue to develop creative thinking skills for a sample of students with a mild intellectual disability after a while (two weeks)?

3.Research Aims

The current research aims to:

3.1 Verifying the effect of a program based on (TRIZ) theory on developing creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure) among students with mild intellectual disability.

3.2 To verify the continuing impact of the program in developing creative thinking skills for a sample of students with a mild intellectual disability after a while (two weeks).

4. Research Terms

4.1 Intellectual Disability:

Students with mild intellectual disability can be defined procedurally as they are students with a mild intellectual disability according to the diagnosis of the Developmental Medicine Unit in the State of Kuwait, and their IQ ranges between (52-68) on the Stanford Binet Scale, and (55-69) on the Stanford Binet test Wechsler for children and their chronological ages (11-13 years).

4.2 Creative Thinking:

Creative thinking can be defined procedurally as the degree that the student obtains from the study sample on the Torrance test of creative thinking, formal form (B).

4.3 (TRIZ) Program:

Simon Safransky considers (TRIZ) as a systematic, human-oriented, knowledge-based methodology that aims to solve problems creatively (Abu Jadu, 2012a).

It is procedurally defined as a set of educational activities and aids aimed at developing creative thinking skills for students with a mild intellectual disability based on some (TRIZ) strategies: (the turned/reversal strategy, the merging/linking strategy, and the division/segmentation strategy).

5. Research Category

This research was applied in the first semester of the academic year 2020-2021 AD in the State of Kuwait on a sample of (7) students in the sixth grade.

6. Research Methodology

The research relied on quasi-experimental research to study the research problem and answer the questions about the problem, it was selected because it was the appropriate method to observe the changes resulting from the introduction of the independent variable and to achieve the goal of research. An experimental group was used to design the single group with a prior, post and follow-up test, as shown in Table (1). to verify the effectiveness of a program based on (TRIZ) as an independent variable in developing creative thinking skills for students with mild intellectual disability as a dependent variable.

Table 1. Experimental design for research

Group	Pre-test	processing	Post-test	Follow-up test
group				
Experimental one-group design	Torrance Test of Creative Thinking Figure B	Enrichment program based on (TRIZ) theory	Torrance Test of Creative Thinking Figure B	Torrance Test of Creative Thinking Figure B

7. Research Variables

The research included two types of variables, as follows:

7.1 Independent Variable

A TRIZ-based enrichment program to develop creative thinking skills in students with mild intellectual disability.

7.2 Dependent variable

It is the degree of creative thinking skills of a student with mild intellectual disability represented in Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure, on the Torrance Test of Creative Thinking, Figure. (B).

8. Research Community

The target research community consists of all students with mild intellectual disability in the School of Intellectual Education for Boys in the State of Kuwait, (169 students), according to the statistics of the Intellectual Education Schools of the Ministry of Education for the academic year 2020/2021 AD.

9. Research Samples

The research sample consisted of (7) students in the sixth grade in the School of Intellectual Education for Boys, and they were selected intentionally from several classes in the school, and their ages ranged between (11-13 years). The sample was selected according to the following criteria: that the student has a mild intellectual disability, that the student's intelligence rate on the Wechsler Test of Children's Intelligence ranged between (55-69), and on the Stanford Binet test in the State of Kuwait between (52-68), the student's chronological age should range between (11-14) years, and the student should not have any other disabilities associated with the intellectual disability.

10. Research Tools

To achieve the objectives of the current research, two tools have been used to measure the impact of the program in developing creative thinking skills, and measures for obtaining and analyzing **information** in the prepared research. The tools used in the research are detailed as below:

10.1 Torrance Test of Creative Thinking Shape (B)

This test aims to measure the degree of creative thinking, and this test was prepared by Paul Torrance and published in (1966 AD), and it can be used for all age levels, as the age range of the test ranges from (6-60) years, and it can be used for all levels of research, from the kindergarten to the postgraduate studies. the test measures four abilities: fluency, flexibility, originality, and Elaboration. In (2008) the test correction was developed to address the different divergent thinking skills, namely, fluency, originality, Elaboration, Abstractness of Titles, and Resistance to Premature Closure. The Torrance Shape Test (B) consists of three activities: the first activity (Picture Construction), and the second activity (completing the lines):

The psychometric properties were extracted by referring to the Torrance Tests of Creative Thinking (2008) manual, so the stability coefficients of the creative abilities of the Torrance formal form were calculated as shown in Table 2. It is noted that the stability coefficients for creative abilities are high and statistically significant, the reliability coefficients ranged between (0.966-0.999).

The Torrance test, in its American form, has different truthful connotations, with Torrance referring to the availability of the truthful content of the test, and also in a study of Torrance and Gupta in (1964).

Using the test of teachers' estimates to demonstrate the complementary truthfulness of peripheral categories, the scale was found to have a high ability to distinguish between the upper and lower categories in the test dimensions. (Fluency, flexibility, originality), and in (1972) Torrance began studying his followers to complete a sample of students that reached (236) students over 12 years, and when their achievements were linked to Torrance's test results, they were reported to males. (0.59) and for females (0.49), also in the (1974) Kruble study, when a sample of students was traced for five years and the correlation between their achievements and their connections in the Torrance test was found to have reached. (0,514) with an indicative level (0,01) is evidence of the predictive honesty of the test.

Psychometric properties of the test on the Kuwaiti environment

(Al-Tabikh, 2015) verified the validity and reliability of the Torrance test to measure creative thinking on a sample of the Kuwaiti environment, where the sample consisted of (45) male and female students, including (22) male students, and (23) female students from the class. The reliability coefficient values among the correctors were very high, indicating that the Torrance test had very high stability following the development of its correction method in 2008 AD. The coefficients of the reliability coefficient value between the correctors ranged between (0.941-1,000).

10.2 TRIZ Theory-Based Enrichment Training Program to Develop Creative Thinking Skills

Caring for the educated student with intellectual disability requires him to acquire the knowledge and skills that form the necessary scientific background for him, which interact in himself and lead him to search for other information further and deeper, using his experiences and skills, interacting with his environment with all its variables, generating new knowledge, which appears in various forms. It expresses creativity, such as generating a large number of ideas, solving

problems, or creating new ideas (Al-Mutairi, 2017).

The goal of efforts to teach thinking to students with an intellectual disability is to improve their skills in creative thinking, and thus train their students to take responsibility for integrating thinking skills into their daily practices, not only in the usual classes at school but in the various aspects of their life activities (Nawfal and Seifan, 2011).

TRIZ theory of innovative solutions to problems included a group of (40) strategies that can be used to find some unusual solutions to educational problems. These principles have demonstrated their effectiveness in solving many engineering, technological and scientific problems and have also led to the emergence of a large number of inventions in these areas. It is assumed that the application of such strategies in the field of education and education of children with intellectual disability may help to solve their problems inappropriate ways and lead to the acquisition, development and improvement of their many abilities, skills and strengths (Al-Mawla, 2016).

11. Program Overall Objective

The overall objective of the program is to develop creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure) for students with a mild intellectual disability based on (TRIZ) strategies: (Segmentation, Combining / Merging, Inversion)

12. Nature of the Program

This program develops creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure), by integrating some of (TRIZ) strategies into the science curriculum for sixth grade in schools of intellectual education. The program includes the application of three TRIZ strategies (TRIZ) which is (Segmentation, Combining / Merging, Inversion).

The program consists of (48) training sessions held at a rate of (10) sessions per week, where the duration of the session is divided into two lessons (35) minutes to explain the daily lesson, and (35) minutes to solve the problem in a creative way using the principles of (TRIZ) theory. The program includes several educational activities and activities to solve different problems of daily life situations that the student is exposed, experiencing a problem in our lives and working to produce a creative solution by applying the creative strategy used in the course through dialogue and discussion, brainstorming, teamwork and feedback among students to develop creative thinking skills.

This program will be applied within the educational units of science for the sixth grade in schools of intellectual education, namely: Light and Sound - Human and the universe - Human and Oil.

This program is based on training students to solve problems in creative ways through sessions that include several diverse activities. Each session includes the following:

12.1 Preparation:

Students are welcomed, asked about their conditions, and given an alert before the beginning of the lesson as an activity or game that is related to the session, within 5 minutes of each session.

12.2 Presentation:

In which the daily lesson is explained and a group discussion is held with the students and some questions are asked

about the topic of the lesson within (10) minutes, and thus the students are distributed to their selected groups to start presenting the creative strategy, explaining it and giving some examples around it, and thus the problem is presented to be solved using the creative strategy, explaining and highlighting its aspects within (15) minutes, and therefore the students engage in dialogue and discussion to formulate and identify the problem within (5) minutes, and therefore the teacher asks the student groups for cooperation and discussion to develop an ideal solution to the problem within (5) minutes, Then each group proposes several suitable solutions to the problem using the creative strategy within (10) minutes. At the end of the presentation, all the solutions proposed by the student groups are displayed on the smartboard using the iPad to evaluate them and make a vote based on several criteria to choose the best one, within (10) minutes.

12.3 Final steps:

in which activity related to today's session is done, such as a stereoscopic design, a booklet, an awareness brochure, a guide board, a brainstorming for creative solutions, feedback on what has been discussed, and homework is given to students related to the content of the session. within (10) minutes.

For more details, a detailed explanation of the session has been provided (Fig. 1a, 1b, and 1c.).

13. Study Results

13.1 The results of the first hypothesis

The results related to the first hypothesis, which states that "there are statistically significant differences at the level (0.05) between the mean ranks of the experimental group's scores in the pre and post-tests on the Torrance test of creative thinking in the formal image (B) in favour of the post-test".

To verify the validity of the first hypothesis, the arithmetic averages and standard deviations of the scores of the experimental group on the Torrance test for creative thinking were calculated in the pre and post-tests, as shown in Table No. (2)

Lesson Model

Session 11 Eleven
How do we hear sounds?

Educational methods and techniques used:
I pad
plastic cups
wooden box
Plastic Colored Balls
Pens
Animal pictures

Teaching methods
Dialogue and discussion
ask questions
Brainstorming
Teamwork

General Objective	Learn how to hear sounds
Special Objective	The student knows how to hear sounds
Strategy Objective	That the students understand the strategy of merging / linking
Thinking Skills	Fluency, originality
Social Skills	Communication, teamwork
Day and Date	

Fig. 1a Lesson model

Session steps and time	Behavioral Goals	Activities and Procedures	Skill	Teaching Methods	Calendar
preparation **5 Mins**	the students be able to determine the correct number through hearing.	A circular circle is made with the students and the teacher greets them and asks them about their conditions and how their day was. The session begins with a game that knows the number by listening only where the teacher puts several balls in a wooden box and makes a sound for the balls to fall inside the box and ask the students to close their eyes and focus by hearing how many balls are in the box, the group that guesses the most correct number is the winner. (11-1)		Play Team-work	Students' interaction with the game and the accuracy of their focus in knowing the correct number
Presentation 10 Mins	the student recognizes how to hear sounds. the student knows how to maintain the integrity of his ears.	● The teacher displays a group of pictures on the smart board about the five senses of the human being, in addition to a picture of a child next to him an alarm clock, and then a discussion is held with the students as follows: (11-2) ● What made the child wake up for school? ● Which member of the head heard the alarm? ● How do we preserve this member so that he does not get sick?		Dialogue and discussion Ask questions	Students' interaction with the questions asked
Presentation 15 Mins	• the students be able to understand the strategy of merging/linking.	Problem: mocking people who can't hear (deaf). The strategy used: the merge/link strategy. The teacher explains the strategy of merging/linking, giving several examples about it in our lives, through a set of illustrations that are displayed on the smartboard. (11-3)		Dialogue and discussion	Students' understanding of the merging/linking strategy.
5 Mins	• At the end of the activity, the student should be able to derive some creative solutions to the problem using the merging/linking strategy.	Defining the problem: The students sit in their predetermined groups, then the teacher tells them a situation that happened when he visited a school and saw a group of students laughing at one of the students and the student feels upset and ashamed of the students' attitude to him and has an inquiry with the specialist about the condition of this student, he said that he is a deaf person He takes his lessons in a special class inside the school (11-4) Problem formulation: (11-5)	.	Dialogue and discussion Teamwork	Enable students to identify the problem.

			Making fun of people who can't hear (deaf).		
recess **5 Mins**			The teacher allows the students to take a short break of 5 minutes to drink water and move around a bit in the classroom .		

Fig. 1b Lesson model (continued)

Continued: Session Eleven (How do we hear sounds):

Session steps and time	**Behavioral goals**	**Skill**	**Activities and Procedures**	**Teaching Methods**	**Calendar**
5 Mins			The ideal solution to the problem: The teacher engages and discusses with the students to develop an ideal solution to the problem by using the merging/connecting strategy. Link the classes of all students in the classroom and their collective participation in activities.	Discussion Teamwork	Students are able to find an ideal solution to a problem.
10 Mins		fluency	Suggest appropriate solutions to the problem of mocking people who cannot hear (deaf people) using the merging/associating strategy: Meanwhile, the teacher moves between groups of students to motivate and encourage them to suggest appropriate solutions. : Solutions that students can suggest: • Integrate students with each other in the classroom and sports activities. • Connecting (deaf) students with normal students in friendship with the aim of helping them, getting to know them closely and supporting them. • Putting (deaf) students in one place and a specific period when providing counselling services and helping them to solve their problems. • Presenting the solutions reached by the student groups under the name of each group and writing down these solutions using the iPad on the smartboard.	Dialogue and discussion Brainstorming Teamwork	Enable students to generate as many creative solutions to the problem as possible using the merge/connect strategy.

Final steps **mines**	Design a speaker out of plastic cups and a small open tube and ask the students to distinguish the voices of their peers without seeing them by speaking through them. (11-7)	Teamwork

Fig. 1c Lesson model (continued)

Table 2. Arithmetic averages and standard deviations of the scores

	Pre-test		**test Post**	
creative skills	**Arithmetic average**	**standard deviation**	**Arithmetic average**	**standard deviation**
fluency	12.14	3.93	20.28	3.30
originality	6.57	3.77	10.00	2.70
Elaboration	3.28	487.	4.00	1.00
address abstraction (Abstractness of Titles)	2.71	1.38	5.28	2.13
Early closing resistance	4.28	3.25	7.57	3.55
Total	29.00	10.34	47.14	8.82

The Table shows that the arithmetic means in all creative thinking skills in the post-test exceeds the arithmetic mean in all creative thinking skills in the pre-test

To verify the significance of the differences between the mean ranks of the pre and post-tests, the Wilcoxon test was used for the linked samples as shown in Table No. (3)

Table 3. The results of the Wilcoxon test for correlated samples for the differences between the mean ranks of the pre-and post-test scores on the Torrance test. Figure (B)

creative skills	**ranks**	**Number**	**Mean Rank**	**Total Rank**	**Z value**	**significance level**	**effect size**
fluency	Negative*	0	00.	00.	-2.37	0.018	**0.63**
	Positive**	7	4.00	28.00			
	Equal**	0					
originality	Negative*	0	00.	00.	-2.38	.017	**0.64**
	Positive**	7	4.00	28.00			
	Equal***	0					
Elaboration	Negative*	0	00.	00.	-1.89	.059	**0.50**
	Positive**	4	2.50	10.00			
	Equal***	3					
address abstraction (Abstractness of Titles)	Negative*	0	00.	00.	-1.84	.066	**0.49**
	Positive**	4	2.50	10.00			
	Equal***	3					

Early closing resistance	Negative*	1	2.50	2.50	-1.68	.093	**0.44**
	Positive**	5	3.70	18.50			
	Equal***	1					
Total	Negative*	0	00	00	-2.36	.018	**0.63**
	Positive**	7	4.00	28.00			
	Equal***	0					

*post > pre **post < pre ***post = pre

	post-test			Follow-up test
creative skills	**Arithmetic mean**	**standard deviation**	**Arithmetic average**	**standard deviation**
fluency	20.28	3.30	22.00	3.05
originality	10.00	2.70	12.42	3.10
Elaboration	4.00	1.00	4.85	377.
Abstractness of Titles	5.28	2.13	5.57	2.29
Early closing resistance	7.57	3.55	8.85	4.01
Total Scores	47.14	8.82	53.71	9.48

The results are shown in Table (3) showed that all the students with intellectual disability in the experimental group had higher scores in the post-test, fluency and originality than the pre-test, where the value of the significance level of the degree was less than (0.05). The results also showed that the difference between the group averages in skill (Elaboration) and skill (Abstractness of Titles) between the pre and post-tests was not statistically significant.

The effect size of the training was calculated through the Z-value of the total score (-2.36), where the effect size value, which represents the percentage of variance in the creative thinking skills of students with mild intellectual disability, can be explained through the impact of the application of the program. By calculating the effect size extracted from the previous equation, showed that the program had an impact on all creative thinking skills, as the effect size was medium, which indicates that the program affected the experimental sample in all creative thinking skills.

13.2 The results of the second hypothesis

The results related to the second hypothesis, which states that "there are statistically significant differences at the level (0.05) between the mean ranks of the experimental group's scores in the post and Follow-up test on the Torrance test of creative thinking (Figure. B) in favour of the Follow-up test).

To verify the validity of the second hypothesis, the arithmetic averages and standard deviations of the scores of the experimental group on the Torrance Test for Creative Thinking were calculated (formal form (B) in the post and follow-up test, as shown in Table 4.

Table 4. Arithmetic averages and standard deviations of the scores

Table No. (4) shows that the arithmetic means of the scores of the experimental group in the post-test of the total score equals (47.14) with a standard deviation (8.82), while it reached in the Follow-up test (53.71) with a standard deviation of (9.48), where it turns out that the arithmetic averages in all creative thinking skills in the follow-up measurement, the arithmetic mean exceeded in all creative thinking skills in the post-test.

To verify the significance of the differences between the mean ranks of the post and Follow-up test, the Wilcoxon test was used for the linked samples as shown in Table 5.

Table 5. The results of the Wilcoxon test for correlated samples for the differences between the mean ranks of the post- and Follow-up test scores on the Torrance test. Figure (B)

creative skills	ranks	Number	Mean Rank	Total Rank	Z value	significance level
fluency	Negative*	0	00.	00.	2.401-	**016.**
	Positive**	7	4.00	28.00		
	Equal**	0				
originality	Negative*	0	00.	00.	2.388-	**017.**
	Positive**	7	4.00	28.00		
	Equal***	0				
Elaboration	Negative*	1	3.50	3.50	1.897-	**058.**
	Positive**	6	4.08	24.50		
	Equal***	0				
Abstractness of Title	Negative*	2	2.75	5.50	552.-	**581.**
	Positive**	3	3.17	9.50		
	Equal***	2				
Early closing resistance	Negative*	1	1.00	1.00	1.786-	**074.**
	Positive**	4	3.50	14.00		
	Equal***	2				
Total Scores	Negative*	0	00	00	2.371-	**018.**
	Positive**	7	4.00	28.00		
	Equal***	0				

* Follow-up > post ** Follow-up< post *** Follow-up = post

The results shown in Table No. (5) showed that all students with intellectual disability in the experimental group had higher scores in the Follow-up test than the post-test, where the significance level value of the total score was (018.), and it is clear that the difference between the group averages in the skill (fluency) and (originality) between the post and Follow-up tests, it was statistically significant in favor of the Follow-up test, where the significance level of the skill (Fluency) was equal to (016.), which is less than (0.05), and the significance level of the skill (originality) equaled (017.), which is less than (0.05), while it was found through the results that the difference between the group averages in the skill (Elaboration) and the skill (Abstractness of Titles) between the Sequential and post-tests was not statistically significant, as the value of the significance level of the skill (Elaboration) was (058.), which is higher than (0.05) and the value of the significance level of the skill (Abstractness of Titles) is equal to (581.), which is higher than (0.05), and it was also shown through the results that the difference between the group averages in the skill (early closure) between the Sequential and post-tests was not statistically significant, as The significance level value was (074.), which is higher than (0.05).

14. Discussion & Interpretation of Results

The results of the first hypothesis indicated that there are statistically significant differences between the mean scores of the research sample members in the pre and post-tests on the Torrance test of creative thinking, the formal image (B) in favour of the post-test as shown in Table No. (5), and according to the data recorded in the table, it is clear The performance of the group improved on the post-test over the pre-test, and the reason for this is due to the existence of the effect of (TRIZ) program on the sample members and the development of their creative thinking skills than they were before the start of the program.

The strategies used in the (TRIZ) program had a clear role in improving students' level of creative thinking and problem-solving skills, which are (Segmentation, Combining / Merging, Inversion), as these strategies changed the students' thinking pattern and their interaction in creatively solving daily life problems, developing this thinking and motivating them to be creative and discover their latent abilities, and this was also shown by increasing the level of self-confidence among these students that they are individuals capable of facing and solving problems in creative ways, as various teaching methods were applied to work on extracting these creative ideas represented in dialogue, discussion, asking questions, brainstorming, and posing problems to develop creative thinking, teamwork, play, feedback, and homework.

In addition to, the use of various educational means to communicate and clarify information using the (TRIZ) program strategies to develop creative thinking, among the means that were used are the tablet (iPad), explaining the lesson and the problem through pictures, video, and the short story, conducting scientific experiments with students, and deliver all the activities, tools and projects we focus on in the daily sessions to the students' homes. To provide all the requirements of the daily session for them to interact and participate, in particular, spherical models of cork were provided for the shape of the earth and the moon, coloured clay and moulding tools for making the different faces of the moon, and coloured cardboard for the design of the traffic light, and whiteboards for the design of guiding and awareness means to save electrical energy, to raise awareness of the safety and security instructions at the petrol station, a picture booklet, a gift box for decoration, coloured beads, coloured ribbons, plastic cups for making telephone headsets, wooden sticks

for making a compass shape, pens, wooden and wax colours, glue and adhesive, and these activities and the supporting means that were provided to all The students contributed to the development of the creative thinking skills of the research sample.

And this has made the students more creative, where the teacher explains the daily lesson and asks questions, so we connect the life problem to the lesson of the day itself, and explain what creative strategy we're going to solve the problem and explain several examples of it. The teacher, therefore, asks each student to explain the examples of the strategy so that they can be recognized and understood as to how to solve the problem facing us and to come up with creative ideas by solving the problem with the strategy of the session. At the end of the session, we make a concluding activity related to the session itself to develop creative ideas, such as"(making a stereoscopic and adding Elaborations to it, developing many diverse ideas for a topic or a shape, making an awareness poster that includes various creative ideas, and developing additional diverse solutions to today's problem using the creative strategy, where These activities helped them acquire creative thinking and problem-solving skills, which increased their life knowledge and self-confidence and changed their thinking style towards looking at things.

The improvement in the level of students can also be explained by the fact that the researcher was able to have a good professional relationship based on respect, acceptance and understanding the needs of students with intellectual disability. by creating and developing good manners among the students through competition between them and helping each other in solving problems, gaining the skills of perseverance, self-initiative and developing a spirit of teamwork and cooperation among the students. This is what the researcher sought during the formation of the professional relationship with the students and even during the daily sessions, where they were encouraged to participate, initiative, cooperation and teamwork, which boosted the students' self-confidence and this was demonstrated through the subsequent sessions of good interaction and expression of themselves and breaking the barrier of shyness and fear of learning Something new in their lives leads to a high level of confidence and thinking from the beginning of solving the first problem to the end of the program sessions.

What helped the students' interaction continuously was that the researcher activated the enhancement by making a behavioural contract with the students and making an enhancement board, where the researcher indicated to the students that there is an honour for them in the morning assembly after completing the training program, and the creative student who will be honoured is the one who has proven his presence in the program through his interaction, and active participation, good behaviour and manners, respect for the laws and ethics of the classroom, and the rules of the training program. I called to them the Creator Program, and they, in turn, called it Creative Strategies. In addition to the behavioural contracting, the researcher used various enhancements methods such as the star enhancement board, where the student who interacts during the session gets a star and if he collects 5 consecutive stars he would get a token gift at the end of the week, which helped the students interact well and strengthen them morally with words of encouragement, that enhance their self-confidence. The researcher presented their achievements to their parents who had an important role in the program through cooperation and participation in preparing the student's tools such as a computer or tablet (iPad) and entering the session on the Zoom program, where the researcher trained some parents on how to log into the program and enter the daily sessions and giving instructions to parents to prepare the tools for the

session and create the appropriate place at home.

In addition, the success of the (TRIZ) program in developing the creative thinking skills of the sample members can be explained by range of topics that were presented that were raised in the training sessions and which were linked to the realities of students with intellectual disability, in how to face and solve daily life problems, through focusing on training these students to be able to identify and formulate the problem, to develop an ideal solution to the problem and to enable them to, and enable them to develop the largest number of creative solutions to the problem using the TRIZ program strategies to solve problems in creative ways, and thus choose the appropriate solution through the various solutions that they presented, and this What was shown by the high level of students in creative thinking skills in (fluency skill and originality skill) in producing creative ideas and solutions, and the high level of some students in the rest of creative thinking skills in (Elaboration skill, Abstractness of Titles skill, and early closure resistance skill), as (3) students were their scores are equal in the pre and post-tests in the skills of Elaboration and Abstractness of Titles, one student did not raise his level in the skill of resisting early closure, which led to the lack of statistical significance in this skill. The results of the current research in the total score indicate the existence of an effect of the program ((TRIZ) program), which amounted to (0.63). and indicating the existence of a mean effect of the program on the research sample are students with mild intellectual disability.

This is consistent and agrees with (Cote et al, 2010) study, which indicated that all students with mild intellectual disability learned how to identify the problem, how it can be solved and find possible solutions, in addition to generalizing and applying their skills in solving problems, as well as consistent with (Fard et al, 2014) study, The program based on solving problem led to the development of creative thinking skills in fluency, flexibility, originality and Elaboration among students with mild intellectual disability, and the results of the current research agreed with the study (Lant, 2019). Which showed the positive role of the problem-solving strategy in integrating it with the daily lessons for students with mild intellectual disability, in addition to the role of support and encouragement for students enhancing their self-confidence when facing new problems and it led to showing the creative ideas and skills of the sample members.

The results of the current research showed the positive role of the (TRIZ) program in developing creative thinking and problem-solving skills for students with mild intellectual disability, as it added the results of the current research with studies that applied the strategies of the (TRIZ) program with different age groups and different groups students with special needs, such as a study on talented children, a study on children with learning difficulties, and a study on students with hearing disability in the educational field, as these studies showed effective positive results in developing their creative skills and abilities, proving that the (TRIZ) program is not limited to a specific age or a category without another, but any individual can be trained on it to develop creative thinking skills and solve problems in creative ways, and this is done through the good use of (TRIZ) program strategies and integrating with the educational curriculum, and this is what was done by integrating some of the strategies of the (TRIZ) program with the educational curriculum for science for the sixth grade of primary school of intellectual education in the State of Kuwait.

The results of the second hypothesis also indicate that there are statistically significant differences between the mean rank scores of the research sample members in the post and follow-up test on the Torrance test of creative

thinking, the formal Figure (B), where the follow-up measurement was applied two weeks after the end of the training program for the sample members, and it determines that there are statistically significant differences between the post-test and follow-up of the Torrance test of creative thinking (formal image (B) in favour of the follow-up measurement in the skill of fluency and originality skill and the total score. on different types of problems they face, and this is agreed with the study (Karabulut & Ozmen, 2018) through the positive impact of the problem-solving program and the students' acquisition of that skill and its generalization to different types of problems they face in their lives, and this can be explained because of the continuing impact of the training program which contained 24 various training sessions in solving problems we face in our daily lives related to the science curriculum, and also as a result of using methods and different techniques and teaching methods appropriate to the research sample and the age stage, all of this led to the sample members retaining the skills they acquired after two weeks of post-test and generalizing these skills in their daily practices, as the activities used in the training program varied between fluency development and fluency development activities. The skill of originality in producing original creative ideas and solutions, activities that develop the skill of Elaboration in adding details to a problem or a specific activity, and activities that develop team and cooperative work, interaction and communication with their colleagues. People with intellectual disability are encouraged to change the programs offered to them and the importance of those training programs that develop creative thinking and problem-solving skills and integrate them into their educational curricula.

15. Conclusions

In this research aims, TRIZ is applied to develope creative thinking skills (Fluency, Originality, Elaboration, Abstractness of Titles, Resistance to Premature Closure) by integrating some of (TRIZ) strategies into the science curriculum for sixth grade in schools of intellectual education among male students with mild intellectual disability, this strategies showed that TRIZ program had a clear role in improving students level of creative thinking and problem solving skills, which are (inversion / inversion), (merging / linking) and (dividing / segmentation), as these strategies changed the pattern of thinking Students and their interaction in solving daily life problems in a creative way, developing this thinking and motivating them to be creative and discover their latent abilities, future research can also be focused and discover that the TRIZ program is not limited to a specific age or group without another, but it is possible to train any individual on it to develop creative thinking skills and solve problems in creative ways. It was implemented by integrating some of the strategies of the TRIZ program with the educational curriculum for the sixth-grade science subject for schools of intellectual education in the State of Kuwait, and that what we need for the educational field for people with intellectual disabilities to change the programs offered to them and the importance of those training programs that develop creative thinking and problem-solving skills and integrate them into their educational curricula.

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