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Enhancing Critical Thinking Skills among Students with Learning Difficulties

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Abstract

This study aimed to enhance critical thinking skills among sixth grade student with learning difficulties in mathematics in Jordan by using the CoRT programme. The pre-test-post-test control-group design was used in the study. There was one dependent variable in this study, is, the level of students' critical thinking skills. For this purpose, a critical thinking test was administered to a sample of 93 sixth grade student with learning difficulties in mathematics from schools in First Amman Educational Directorate in Jordan, before and after a three-month training program. The participants of the sample were distributed into two groups. After that, one group was randomly chosen to be the experimental group, and the other one to be the control group. Results showed that the training programme had a very large -sized effect on the participants' critical thinking.

Keywords: Thinking, critical thinking skills, CORT programme, learning difficulties, teaching thinking for students with learning difficulties.

Introduction

The development of thinking is considered one of the main objectives that educators seek to achieve. Once these objectives are achieved, students are able to effectively address issues and crises in everyday life as well as the complications of the present and future. The process of thinking is considered similar to the human breathing apparatus because it is as indispensable as breathing. Teaching thinking skills is necessary because of the breadth of available knowledge. Thinking skills provide the necessary tools to address this avalanche of renewable knowledge that has been witnessed in our contemporary world (Jarwan., 2007).

The notion that thinking could be educated, or at least nurtured fruitfully along its way, is of the past. During the eras of Plato and Socrates, attention to improving intelligence and promoting effective thinking was a recurring educational trend (Ritchhart & Perkins, 2005). Ritchhart & Perkins (2005) reported that:

> Early in the twentieth century, Dewey (1933) again focused North American's attention on the importance of thinking as an educational aim. At the same time, Selz (1935) was advocating the idea of learnable intelligence in Europe. In the 1970s and 1980s, specific programmes designed to teach thinking took shape, many of which continue in schools today. Efforts to teach thinking have proliferated in the new millennium, often becoming less programmatic in nature and more integrated within the fabric of schools. (pp. 775)

Most countries today are interested in increasing educational standards and emphasizing on teaching basic skills. However, basic skills are not sufficient to meet market needs, leading to the urgent need to focus on higher-order thinking skills because individuals are unable to retain the tremendous amounts of information in their memory for use and retrieval in the future. The vast breadth of knowledge available and the need for modern society to meet the needs of effective citizens also raises the urgency for teaching thinking skills.

The new challenge for the development of educational and pedagogical curricula is that it needs to provide programme s on teaching thinking processes to all individuals and not just for an elite group (Larsen, 2002). Therefore, the supreme objective of education in the twenty-first century is the development of thinking in all its forms for all individuals. Thus, the role of the educational institution has grown to prepare and enable individuals to solve unexpected problems. That is, schools must provide students with the proper tools and proper thinking process that they can use to deal with multiple and diverse situations that they may encounter. Consequently, serious decisions on current affairs issues is an enormous responsibility to bear (Cotton, 1991).

Nurturing Thinking in Students with LDs

The great developments and evolution that the world is witnessing in the educational field have also posed new challenges, including teaching students with LDs. Observers of this enormous evolution have noted that teaching thinking and solving problems has concentrated mainly on ordinary students, where students have become the axis of the educational process, and traditional education became something of the past because it failed to keep pace with the requirements of the modern age. Despite the importance of thinking skills to aid individuals in adjusting to society's requirements, realizing self-esteem levels and motivation, teaching thinking to students with LDs has been grossly neglected in several programmes, with plans for implementation failing to continue ((Agran, Blanchard, Wehmeyer, & Hughes, 2002).

Recent times has witnessed the publication of several studies in the field of education that address teaching thinking and solving problems in addition to cognitive strategies and their effect in improving several aspects of education for talented students in general, and for ordinary students in particular. Nevertheless, only a few of these studies have addressed teaching of thinking to students with LDs because of the prevalent belief in the field of special education that students with LDs have a more urgent need to master basic skills, such

as learning to read and write. Thus, teaching thinking skills is not considered a priority in the field of special education (LaFrance, 1995; Leshowitz, Jenkens, Heaton, & Bough, 1993; Rottman & Cross, 1990).

The challenge that faces the field of special education today requires insertion of higher-order thinking skills within the curriculum for students with special needs, a challenge that has been met with an outcry from special education teachers because they believe their students are still struggling to pass the regular curriculum (Carnine, 1991). While, students with LDs are considered to need to learn thinking strategies the most because their difficulties inhibit them from using effective thinking strategies as compared with ordinary students (Swanon & Stomel, 2012). In this regard, Rottman and Cross (1990) and Swanon and Stomel (2012) pointed out that students with LDs are unable to use thinking strategies spontaneously because they are unable to adapt to their behaviour in the same way as ordinary students can because they possess the skill of self-control, and thus, they need to learn to use thinking strategies to facilitate their comprehension as well as working on how to utilize their training to deal with sudden crises.

The different programmes have been offered to improve learning of students with LDs on an international level and these programmes have continued to evolve through the years. These programmes currently concentrate on training students with LDs on basic academic skills, but recent changes have shifted the focus on teaching higher thinking skills as specialists in the field of special education have begun to search for possibilities of training several special education categories on different kinds of thinking as shown by the current crop of studies on the area (Carnine, 1991; Mastropieri et al., 1996). Indeed, although educational thinking programmes have increasingly focused on gifted and ordinary students, some attention has also been given to teaching of thinking in general to students with special needs, particularly students with LDs (LaFrance, 1995; Leshowitz et al., 1993; Rottman & Cross, 1990).

Studies have found remarkable success in training students with LDs on specific cognitive strategies. For instance, Ellis inserted four thinking strategies into curriculum of student with LDs, including Orienting Process, Framing Process, Applying Process, and Generalization Process (Scruggs & Mastropieri, 1993). Shondrick, Serafica, Clark, and Miller (1992) conducted a study on a sample of ordinary students and students with LDs from the third and fourth grades and found that the performance in creative testing and ability to solve problems of those students with LDs were less than that of ordinary students, highlighting the need for students with LDs to be taught thinking skills to upgrade and improve their academic levels and consequently their lives.

Relevant literature was reviewed (Al-Khatib., 2001; Carnine, 1991; Grossen, 1991; LaFrance, 1995; Lerner, 2003; Leshowitz et al., 1993; Montague, Warger, & Morgan, 2000; Scruggs & Mastropieri, 1993; Shondrick et al., 1992; Swanon & Stomel, 2012; Swartz, Kiser, & Reagan, 1999). The literature review emphasized the importance of teaching thinking skills and strategies for students with LDs to facilitate their understanding for academic subjects and meet the issues they face in their daily lives. In this regard, Lerner (2003) indicated that students with LDs enjoy normal mental abilities. Therefore, no impediments exist to train

them on thinking skills, particularly for students who have a pressing need to learn strategies of thinking to help them face life problems.

Research efforts by the Jordanian Ministry of Education clearly showed that Jordanian students with LDs also need to develop their thinking skills and strategies in the same manner as ordinary students (Centre, 1987) in the result that are supported by many research studies (Alqemish, Aladialeh, & Alturkey, 2007; Amro, 2002; Farhan, 2002; Larsen, 2002; Monahan, 2000). Results from these studies revealed a weakness in thinking skills and strategies in students with LDs.

The increase in knowledge has led to the cognitive theory which focuses on teaching thinking skills in general, enabling students with LDs to learn them along with students who enjoy ordinary mental capabilities (Montague et al., 2000). Based on previous studies and these issues, this study aims to train on the CoRT programme that teaches learning thinking skills for the development of critical thinking skills among students with LDs.

Critical Thinking

In the late of past decade, there were invitations significantly to focus on teaching students to think critically. Even those educational experts have emphasised on importance of critical thinking skills and integrate them within curriculum (De Bono, 1998; Leshowitz et al., 1993; Moseley, Elliott, Gregson, & Higgins, 2005; Paul, 1984; Qatami., 2005). It is worth mentioning, teaching thinking skills have been started in public education towards gifted students particularly. At the same time, less attention was paid especially towards students with learning difficulties, and students with special needs in general, as mentioned early of this article(Leshowitz et al., 1993; Scruggs & Mastropieri, 1993). In this regard, Larsen (2002) indicated that new challenge to curriculum development and educational programmes aims at providing teaching thinking for all individuals, not only for the elite. In the same context, Griffin (1995) reported that educators now recognize that thinking skills that will improve critical thinking can be taught to most students and that most are capable of thinking at abstract levels.

However, critical thinking in its most wide meaning, is not just only judgement, evaluation, decision-making, deduction, and problem-solving. critical thinking in this meaning engenders the range from recognising a need to an alteration in the conditions; it also necessitates alteration not just in thoughts and convictions, but also in procedures. It necessitates a practical application of alternating thinking and work. It is considered a way in which individuals could be moulded to make preferences in their academic and professional lives, and the community as a whole (Griffin, 1995).

Critical thinking is considered an important educational concept. Modern educational systems seek to activate their role in the educational process, as a skill of higher-order thinking skills, in order for the student to create an efficient interaction with the environment surrounding him. This will enable him to acquire the ability to rapidly adapt with the technological changes and

their impact on the individual and society (Facione, 2006; Jarwan., 2007; Paul, 1984). Gough Gough (1991) goes on to say that:

> Perhaps most importantly in today's information age, thinking skills are viewed as crucial for educated persons to cope with a rapidly changing world. Many educators believe that specific knowledge will not be as important to tomorrow's workers and citizens as the ability to learn and make sense of new information p: 3.

Programme of Thinking CoRT

The CoRT programme is considered the most famous among the thinking programmes across the world. **(CoRT)** stands for **(Cognitive Research Trust)** meaning an institution of cognitive research which was established by De Bono, a theorist, at Cambridge. The CoRT programme features ways to help students with different abilities to use them effectively in academic and personal situations. In other words, The programme helps all students including students with special needs and at-risk students (De Bono, 1998). After over 38 years of widespread use, the CoRT programme is now considered a universal tool that is widely used in different cultures, situations, ages, and abilities. This programme is being used in Australia, USA, Singapore, South Africa, UK, Ireland, Italy, Japan, Malaysia, Brazil, Canada, France, India, Malta, New Zealand, Philippines, Russia, and Venezuela. The CoRT programme was recently used in some Arab countries such as Jordan, Kingdom of Saudi Arabia, United Arab Emirates, and Palestine. CoRT consists of 60 lessons divided into six parts. Each part comprises 10 lessons (Al Zyoudi, 2009; Jarwan., 2007).

However, in the CoRT programme the focus is on evolving the easy use of thinking skills by frequent exercise; thus, argumentation does not seem to be a major issue for evolving thinking skills. Therefore it is shortened (Moseley, Elliott, et al., 2005). Moreover, (De Bono, 1999) believes that perception means looking at the wide range of things, the enrichment of possibilities and looking forward to the future. He also attributes 90% of the thinking errors to being perception errors.

Nevertheless, Dingli (2001) pointed out that learning the CoRT skills helps students with different abilities to learn in order to gain suitable principles for long term education and also to deal with rapid changes in the twenty-first century. The CoRT programme helps students to collect, select and evaluate information. later, Moseley, Elliott, et al. (2005) reported that the CoRT programme teaches a set of thinking “processes” defined by abbreviations for "creative and critical thinking"; processes that target the breadth in knowledge, organising thinking and addressing them with proper knowledge. In same context, Dingli has recommended introducing the first part of the CoRT (the breadth) in the education curriculum at the elementary level. Dingli concluded:

> That the CoRT 1 thinking skills programme instills pupils with mental attitudes and principles towards lifelong education as well as the ability to adapt to

circumstances that will be shifting and changing rapidly in the 21st century (Dingli, 2001).

Several global studies and researches, including several Arab studies supported the theoretical framework of the CoRT programme through the positive results that appeared in the individuals who have trained on the programme (Al-Khatib, 1995; al-Manea, 1996; al-Najjar, 1994; Cotton, 1991; Dingli, 2001; Jarwan., 2007; Kessel, 2008; Satabuha, 2001; Shabib, 2001). In this regard, Dingli (2001) conducted a study on the effects of thinking skills programmes, the results of which were affirmative for the CoRT programme. Also, (Edwards, 1994) concluded when 12-year-old students taught all the 60 lessons of the CoRT programme that led to improve their scores in all measures.

In the context of LDs, teaching students with LDs requires opportunities to enhance thinking skills to realise the accelerated academic competency expected from normal students. Moseley, Elliott, et al. (2005) referred that an early assessment of CoRT presents substantial usefulness for students with special educational needs; also, the programme showed improvement in enrolment and attention. DeBono proposed that this may be due to the fact that special educational needs students do not depend on knowledge, but on information processing (Kessel, 2008; Moseley, Baumfield, et al., 2005).

However, in the first attempt in learning thinking for students with LDs, Ritchie and Ritchie and Edwards (1996) found evidence in improving the area of creative thinking by using the CoRT programme. In a study by Brody and Mills (1997), it was pointed out that those students with LDs should develop creative thinking to be able to overcome and contend with all the difficulties that they face during attainment of education. Recently, many studies have shown an improvement in the thinking abilities with others variables among students with difficulties (Al Zyoudi, 2009; Alqemish et al., 2007; Kattab & Al Hadid, 2008; Leshowitz et al., 1993; Monahan, 2000).

Research hypotheses

The CoRT programme has no significant main effect in enhancing critical thinking among students with LDs when the effect of the pre-test results of the critical thinking test of the students is controlled.

METHODS

Research Design

For the purpose of this study, a pre-test-post-test experimental design for an experimental and control groups was employed because its goal to the effect of the CoRT programme in enhancing critical thinking among students with learning difficulties. The Independent Variable in this study was the CoRT programme. The Dependent Variable is the level of students' critical thinking skills.

Participants

Participants in this investigation included (93) students identified by their school as having learning difficulty in mathematics and were attending sixth grade from schools in First Amman Educational Directorate in Jordan. They were randomly assigned to an experimental (43) and control group (50).

Instruments

Critical thinking test

The Critical thinking test was adopted from a test originally developed by Dardour (2001) which is critical thinking test. It consists of 85 items distributed into 7 dimensions about critical thinking. He developed a test to measure the level of critical thinking skills of elementary sixth grade students enrolled in regular schools. Dardour's test underwent several stages of development to assure its validity and reliability. This test was administered in the initial draft to a group of university professors who specialized in the curriculum, teaching methods, and the foundations of education who worked in Jordanian universities. Table 1 shows that the items were narrowed down to 85 items with seven dimensions as shown after the exclusion and amendment of some items within the test.

In this context, Satabuha (2001) conducted a pilot study using Dardour's test to verify the suitability of Dardour's test in order to use it in her study. She confirmed the significantly high levels of validity and reliability of Dardour's test. However the researcher conducted a pilot study for critical thinking test to examine its validity. The critical thinking test was administered to 30 sixth grade students with learning difficulties in mathematics, which was computed using Pearson's formula. The correlation coefficient of each item was calculated using SPSS, which was statistically significant at levels 0.01 and 0.05. Thus, the test is highly consistent and valid as a tool for the study. The pilot sample was similar to those of the real sample but was not included in the main study.

Table 2 shows that the values of the correlation coefficients of the critical thinking test dimensions ranged from 0.403 to 0.768. These values were statistically significant at 0.01 and 0.05 levels, which imply consistency between the test dimensions. The values of the correlation coefficients between each dimension within the entire test ranged from 0.717 to 0.848. These values are statistically significant at 0.01level, which indicates high internal consistency and validity.

The data collected using the test from the pilot sample of 30 participants was also used to calculate the reliability of the test using the Cronbach's alpha method. The Cronbach's alpha values in table 3 indicate a high level of reliability. The Cronbach's alpha of the test was .942, which indicates that the test is appropriate for the present study because a 60% increase signifies the possibility of adopting the test results. This finding also indicates the reliability of the test of achieving the objectives of the study.

The CoRT Thinking Program

This study employed the CoRT thinking lessons De Bono (1998) as the training programme. Edward De Bono is the principal developer of the CoRT programme, which was established in Cambridge, England. CoRT is an abbreviation of Cognitive Research Trust, which was first published in 1973. However, CoRT consists of 60 lessons divided into six parts. Each part comprises 10 lessons. The present study the first part was used, which is: Breadth; the specific purpose of this part is to broaden perception so that in any thinking situation we can see beyond the obvious, immediate and egocentric. Experience has shown that students who have been thorough the lesson develop a much broader view of situations. A brief description of the first part is presented in Appendix 1.

Additionally, the first part was considered is the main part of the CoRT programme on one hand. The researcher also found a support in the previous literature to use this part with students with learning difficulties on the other hand (Al Zyoudi, 2009; Alkahtani, 2009; Monahan, 2000; Ritchie & Edwards, 1996). De Bono (1998) indicated that the first part is the most essential component of the CoRT programme, which starts with its application. The remaining five parts allow the researcher to choose the most suitable component for the students.

The implementation of the entire programme lasted for a full semester or a period of four and a half months, starting from September 1, 2012 to January 15, 2013. The programme was presented in 32 periods for two periods a week for 16 weeks for the experimental group. The control group attends their regular classes in the sources rooms while participating in this present study. The researcher met the teachers collectively to introduce the rationale, purposes, activities, and procedures for implementing the training program (CoRT). All participating teachers were trained and provided with guide which contain all CoRT lessons, instructions, as well as worksheets for their students. The researcher supervised on both groups and met with teachers every 2 weeks to make sure that the training program was being conducted as programmed. Post-test measure was conducted for both groups after the training program was finished.

Data Collection

The level of critical thinking of 93 sixth grade student with learning difficulties in mathematics was examined using the critical thinking test before and after a three-month training program (CoRT).

DATA ANALYSIS

The level of critical thinking of 93 sixth grade student with learning difficulties in mathematics was examined using the critical thinking test before and after a three-month training program (CoRT). The data collected by the critical thinking test was analysed using SPSS. Descriptive statistics of means and standard deviations were used to describe the collected data. One-way

ANCOVA was used to test the null hypothesis that The CoRT programme has no significant main effect in enhancing critical thinking among students with LDs when the effect of the pre-test results of the critical thinking test of the students is controlled. One-way ANCOVA was used to prove the level of enhancing critical thinking for students who received the training program (CoRT).

RESULTS

Table 4 shows that there are virtual differences in the overall mean pre-test scores on critical thinking between students who underwent the CoRT programme is 62.58, with SD=6.45 and those who trained under the regular programme is 54.78, with SD=6.80 (Figure 1). This means that there is a virtual difference in the overall mean pre-test scores on critical thinking between students is 7.80. These differences were adjusted statistically using one-way ANCOVA.

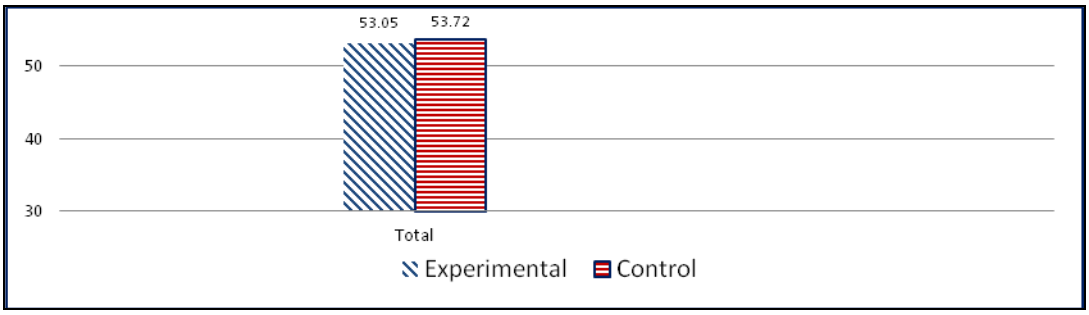

Figure 1 the means and standard deviations for Overall students' scores of Pre-test on Critical Thinking

One-way ANCOVA was used in order to determine if the difference in the overall means of the students' scores from the experimental and control groups of the post-test on critical thinking are statistically significant $p \geqslant 0.05$, and in order to statistically isolate the differences between two groups of the pre-test on critical thinking. The results are shown in Table 5.

Table 6 shows that there are statistically significant differences between the mean students' scores of the control and the experimental groups on the critical thinking test. The calculated value (F) is 68.210, and this value is statistically significant at $p \geqslant 0.05$. Therefore, the CoRT Programme has statistically significant difference in enhancing the level of critical thinking skills, in favour of the students subjected to the CoRT Programme.

In order to identify the effect size of the CoRT programme in enhancing the level of students' critical thinking skills, the researcher used eta-squared, where the total eta-squared on the critical thinking test reaches 0.431, with a very large effect size "0.01= small effect, 0.06= moderate effect, and .14= large effect" (Cohen, 1988). Accordingly, 43.1% of the variance in critical thinking skills among students who subjected to the CoRT programme, and students who subjected to regular programme is due to the CoRT programme.

In order to determine the value of the differences in the overall means of the students' scores in both groups in terms of post-test on critical thinking, the estimated marginal means of the post-test scores were calculated to statistically remove the effect of the covariate. As a result, the adjusted means of the post-test scores for the students who followed the CoRT programme is 62.80, whereas that for the students who followed regular programme is 54.59 (Table 6).

Figure 2 shows the results of estimated marginal means of students' scores in both groups in the total post-test on critical thinking. After isolating the effect of pre-test, results reveal that the difference is in favour of the students who subjected to CoRT programme, whose adjusted means are relatively higher than those students who subjected to regular programme.

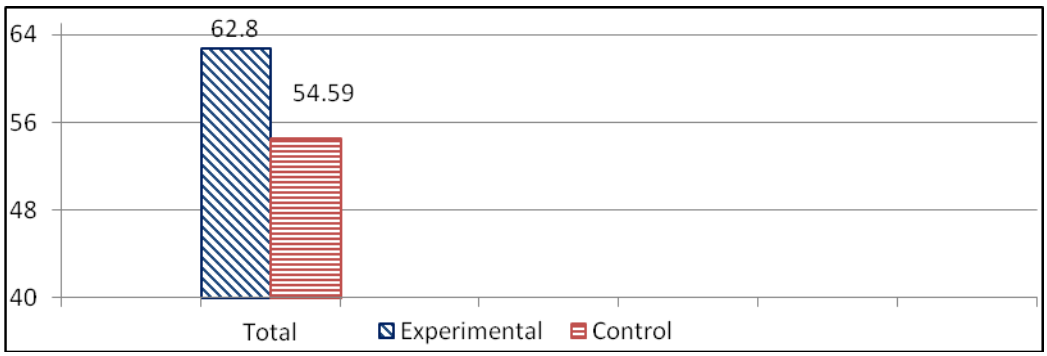

Figure 2 The Estimate Marginal Means of overall students' scores of the post-test on the Critical Thinking, after isolating the effect of pre-test

Therefore, the null statistical hypothesis is rejected, which states the CoRT programme has no significant main effect in enhancing critical thinking among students with LDs when the effect of the pre-test results of the critical thinking test of the students is controlled. That is to say, the CoRT programme has a positive effect on enhancing the critical thinking skills of students with LDs in mathematics, as compared with the regular programme.

DISCUSSIONS

Although the fact that critical thinking skills are researched topics deeply with normal students of across different ages, there were less attention paid towards critical thinking skills of students with learning difficulties in an integrated conceptualization. In this regard then, the purpose of this study was to the effect of the CoRT program in enhancing critical thinking skills among students with learning difficulties. Results from this study will be discussed in reference to the research hypothesis stated and the literature reviewed.

The findings of the One-way ANCOVA showed that there were differences between the experimental and control samples regarding critical thinking skills. Thus, the CoRT Programme has statistically significant difference in enhancing the level of critical thinking skills, in favour of the students subjected to the CoRT Programme. These findings confirm the idea that a training program on thinking skills enhances students' critical skills, which several researchers supported the CoRT programme and the training programmes for thinking because

of the positive results obtained by individuals (with and without LDs) from these programmes (Al-Khatib, 1995; al-Manea, 1996; al-Najjar, 1994; Al Zyoudi, 2009; Alqemish et al., 2007; Cotton, 1991; Dingli, 2001; Jarwan., 2007; Kattab & Al Hadid, 2008; Kessel, 2008; Leshowitz et al., 1993; Monahan, 2000; Satabuha, 2001; Shabib, 2001). The result is attributed to the fact that the CoRT programme was based on the CoRT programme , which focuses on teaching thinking skills to students such as problem-solving, decision-making, creative thinking, and critical thinking.

The important factors that contributed to the improvement of thinking among students with LDs involved are openness and tolerance, which characterized the classroom atmosphere of the training process. For example, encouraging the students; understanding his or her feelings; making them feel that they can achieve success; appreciating their efforts; providing assurance of the importance of their experiences and current situation; and providing them with a safe environment. Related literature helps utilize the thinking capacities of students, provide them with the opportunity to show their emotions and feelings; and help them develop their personalities (Alsroor, 2002; Beyer, 1988; Cropley, 2001; Jarwan., 2007; Kessel, 2008; Qatami., 2005; Satabuha, 2001).

In addition, the learning procedure employed in this study contributed to the positive results observed among the students. First, the method ensured that the student understands the training. Second, the student is provided with the opportunity to look for all possible answers without fear of committing mistakes. Third, the student is asked to provide other alternatives and is encouraged to introduce new or unusual answers. Finally, the student is trained to select the best answer (Swartz & Parks, 1994). The training programme is not restricted to giving exercises. The students are not asked to answer the questions directly.

Conclusion

In conclusion, the findings of this study suggest that training on the CoRT programme can enhance critical thinking skills among students with learning difficulties. Additionally, a nourishing classroom environment seems to play a role in the process of enhancing critical thinking skills among student. The findings indicate that students with learning difficulties can and do benefit from thinking skills instruction and should, therefore, be actively involved in programme designed to develop and enhance critical thinking.

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Table 1
The seven dimensions of Dardour's test

No.	Dimension	Item
1	Accuracy in examining of facts	15
2	Inference	**20**
3	Evaluation of arguments	**10**
4	Deductive	15
5	Differentiate between opinion and fact	**8**
6	The classification	**7**
7	The personal aspects	**10**
	Total	85

Table 2
Pearson Correlation between Domains and the Overall Construct of Critical Thinking

	Dimension one	Dimension two	Dimension three	Dimension four	Dimension five	Dimension six	Dimension seven	Total test
Dimension one	-	.669**	.530**	.413*	.458**	.475**	.541**	.783**
Dimension two	-	-	.461**	.469**	.681**	.578**	.644**	.848**
Dimension three	-	-	-	.488**	.559**	.593**	.403*	.717**
Dimension four	-	-	-	-	.768**	.425*	.579**	.754**
Dimension five	-	-	-	-	-	.636**	.620**	.843**
Dimension six	-	-	-	-	-	-	.472**	.727**
Dimension	-	-	-	-	-	-	-	.779

seven	**

*Correlation is significant at the .05 level.
**Correlation is significant at the 0.01 level.

Table 3
Alpha Cronbach for All dimensions critical thinking of the Test

dimension	No. of Items	Cronbach's Alpha
First	15	.836
Second	20	.786
Third	10	.748
Fourth	15	.773
Fifth	8	.736
Sixth	7	.725
Seventh	10	.759
Total	**85**	**.942**

Table Error! No text of specified style in document.
The means and standard deviations for Overall students' scores of Pre-test and Post-test on Critical Thinking

	Group	N	Pre-test		Post-test	
			Mean	Std. D.	Mean	Std. D.
Total test	Experimental	43	53.05	8.36	62.58	6.45
	Control	50	53.72	7.26	54.78	6.80

Table 5
The Results of ANCOVA for the Overall Students' scores on critical thinking in the post-test

Source		Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Total	Pre-test	1816.528	1	1816.528	79.797	.000	

	Source	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
test	Group	1552.746	1	1552.746	68.210	.000*	.431
	Error	2048.790	90	22.764			
	Corrected Total	5418.065	92				

* Statically significant at the .0**5** level.

Table 6
The Estimate Marginal Means of Post-Test Results of critical thinking for Students who Followed CoRT programme and Students who Followed regular programme

Test dimensions	Group	Mean	Std. Error
Total test	Experimental	62.80	.73
	Control	54.59	.68

Appendix **1**

CoRT 1: Breadth Thinking Tools

CoRT Lesson Groups	Achievement Objective
CoRT 1 **Lessons 1-10**	**Breadth** Each of the tools encourages you to broaden your thinking. Often, we take too narrow a view when we think. We tend to *judge* rather than *explore*
Lesson 1 **PMI** **Plus, Minus, Interesting**	**PMI** How to treat ideas. The deliberate examination of an idea for good (Plus), bad (Minus) or interesting possibilities. PMI use eliminates the immediate acceptance or rejection of an idea
Lesson 2 **CAF**	**CAF** All the factors we can choose or identify that are involved **Consider All Factors** in a situation help us think more effectively about that situation. Otherwise, we tend to think only about the first factors that come to mind.
Lesson 3 **Rules**	**Rules** This lesson summarizes the first two lessons, reminding us of the important basic principles involved.
Lesson 4 C&S **Consequences** **and Sequel**	**C&S** All action has a consequence. Any action has either an immediate, short, medium or long term consequence. In some circumstances, action has all these consequences. A thinker needs to be aware of these possibilities
Lesson 5 AGO	**AGO** This lesson teaches the value of picking out and defining **Aims, Goals and Objectives**. It explains how we should be clear about our own aims. It suggests we should also try to understand the aims or intentions of others.

CoRT Lesson Groups	Achievement Objective
Lesson 6 **Planning**	**Planning** There are basic features and processes involved in planning. Lesson 6 draws together Lessons 4 and 5
Lesson 7 **First Important** **Priorities**	**FIP** When thinking, we need to choose from a number of different possibilities and alternatives. Priorities need to be put into order before effective thinking can take place
Lesson 8 APC **APC** **Alternatives, Possibilities, Choices**	**APC** A 'generative thinker' or action thinker is always interested in generating new alternatives and finding new possibilities. Most people are confined to the obvious ones
Lesson 9 **Decisions**	**Decisions** Because *de Bono Thinking* is about making decisions, this lesson draws together most of the principles already learned
Lesson 10 OPV **OPV Other** **People's View**	**OPV** We are often trapped into believing our viewpoint is right. A useful thinking skill is to move away from one's own viewpoint and consider the points of view of others. This lesson encourages us to ask the question, "Why does that person have that point of view?" This lesson does not encourage us to say, "You are wrong/stupid/a dingbat! I am right!"

This description is adapted from de Bono's CoRT thinking lessons (1998) and also available at de Bono's website: http://www.edwarddebono.com/Default.php