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Impact of a counseling program based on social emotional learning toward reducing math anxiety in middle school students

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Abstract

This study investigated the impact of a counseling program based on social emotional learning in reducing math anxiety in middle school students. The sample consisted of 207 males and females from 7th and 8th grade students deliberately selected from Jordanian private schools, and randomly distributed equally into two groups: the experimental group (which was taught by the counseling program) and the control group (which was taught by the traditional method). To achieve the goals of the study, the researchers prepared math anxiety tests that had been verified for validity and reliability. The results of the study showed the superiority of the experimental group in reducing math anxiety, and that there were no differences between average scales of males and females in math anxiety. In light of the results of the study, the researchers recommend the use of a counseling program based on social emotional learning, to reduce math anxiety among middle school students.

Keywords: Math Anxiety**,** Social Emotional Learning**,** Counseling Program.

1. Introduction

International perspectives are constantly emphasizing the importance of mathematical thinking, proofing, critical thinking, problem solving, and the application of mathematics in life, so the learners will be able to acquire 21st century skills (Deshler & Fuller, 2016). Worldwide, educational organizations emphasize that teaching and learning mathematics are cores in skill building and acquisition, and key to the instilling positive values in students (Mohameda & Tarmiziab, 2010). Mathematics curriculum is considered one of the topics of general education, and the importance of this science is evident in providing educational experiences to other branches of science, as well as helping to develop thinking and developing problem-solving skills (Smail, 2017).

There are many challenges facing mathematics education, such as low achievement, low attitudes towards learning mathematics, and low motivation, which causes anxiety when studying mathematics (Obaid, 2004). Today, alarming numbers of math anxiety are increasingly recorded among students, which necessitate raising the awareness of

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educators and parents on mathematics anxiety, as it has affected all aspects of mathematics teaching and learning, directly or indirectly, and it has probably led to complex learning situations (Post, 2012).

Math anxiety is a global problem, and it is certainly prevalent in Arab countries as numerous studies indicate that only 34% of Arab students passed mathematics in primary school (Abuashoor, 2019). Several studies in Jordan have emphasized that math anxiety begins in primary school and generally increases when students reach middle and high school, affecting several aspects of their learning; the reasons for anxiety in mathematics are related to factors related to community culture, and parents' expectations of their children (Ayasra & Banyhamady, 2018).

A study by Harari, Vukovic & Bailey (2013) points out that math anxiety develops as a result of students' prior negative experiences with teachers and parents (Shamoon, 2014). Math anxiety is classified as a psychophysiological problem associated with different noticeable phobia signs such worry, frustration, agitation, phobia, increased heart rate, stomach discomfort, sweating, trembling, and weakness in the body, blamed on the panic and fear of failure when it comes to taking a math class or test (Dobson, 2012; Post, 2012).

On the other hand, several studies have shown a clear correlation between emotions and math anxiety, a study by Wondimu, Werf, Kuyper & Minnaert (2013) discussed the changes in academic emotions (anxiety, boredom, enjoyment, and pride) associated with changes in self-regulations and achievements in mathematics. Additionally, it focused on students as young as first grade experiencing math anxiety, where math is usually taught as subject with correct and incorrect answers, and that working out the right answer is paramount.

A study by Chang & Beilock (2016) points out that the link between math anxiety and math performance is related to both individual (cognitive, affective/physiological, motivational) and environmental (social/contextual) factors. In addition, scholars confirmed that the anticipation or the thought of solving math actually causes math anxiety (Hill, Mammarella, Devine, Passolunghic, & Denes, 2016).

Furthermore, after using brain scans, scholars claimed that math anxiety has an adverse effect on attention, memory, decision making, and social functioning, which are all controlled by emotions. Therefore, people whose emotional brain centers are damaged cannot make rational decisions (Post, 2012). In many countries, social–emotional learning (SEL) programs have been deployed to reduce learning anxiety problems such as mathematics anxiety (Durlak & Wells, 1997; Greenberg et al., 2003), also SEL programs aim to foster student emotional intelligence (or no cognitive skills).

Many studies are interested in developing social emotional programs to reduce math anxiety: for example, the study of Durlak et al. (2011) and Elias et al. (1997). In fact, these studies have been shown to improve more dismal outcomes such as academic performance, drug use, and disciplinary problems. Social emotional learning (SEL) is

defined as a process for developing social and emotional skills – also called emotional intelligence, and students become smarter with feelings, which include social, specific, learnable, and measurable skills (Stephanie, 2014). And to train students in the SEL program, students are required to set and achieve positive goals, feel, and show empathy for others, establish and maintain positive relationships, and make responsible decisions (Eliase, Harriett, & Hussey, 2004; Freedman, 2016).

Many educators agree that it is the responsibility of schools to prepare students to become knowledgeable, responsible, and caring adults, and they also believe that education should develop the whole child including his/her social and emotional development (Golman 2000). Therefore, research shows that students with SEL competencies do better in school and life, also SEL skills are the foundation for all levels of performance of students, classrooms, and schools (Mart, Weisberg, & Kendziora, 2015).

Numerous relevant studies emphasize that integrating SEL in classrooms ensures that students get plenty of opportunities to learn and practice these important social and emotional skills, so they are reinforced and not forgotten. Over time, SEL becomes the "lens" through which teachers understand teaching and learning, and for students, these skills are the door to becoming caring, contributing, and resilient adults (Martinez & Melnick, 2019).

Barbara & Fatum (2008) conducted a study focused on the relationship between emotional intelligence and academic achievement in elementary school children, and it showed that students who participated in high quality SEL programs were at a significantly lower risk of substance abuse, absenteeism, and other behavioral problems.

Wang, Chu, Loyalka, & Xin (2016) conducted a study to examine the impacts of providing students with a SEL program that prevents dropout and learning anxiety among students in elementary school, the study results revealed that the program reduces dropout among students at high risk of dropping out (older students and students with friends who have already dropped out), both after eight and 15 months of exposure to the SEL program.

The University of Texas at Austin Charles A. Dana Center (2016) examined a program titled "Integrating Social and Emotional Learning and Common Core State Standards for Mathematics." The Standards for Mathematical Practice (SMPs) is a set of rules that require students to solve mathematical problems by working effectively with peers: formulating, communicating, discussing, and solving problems. Teachers can practice a more comprehensive approach through a number of creative strategies that leverage students' diverse strengths (Hamedani &Hammond, 2016; Rimm & Hulleman, 2015).

In 2013, the Collaborative for Academic, Social, and Emotional Learning (CASEL) launched the SEL program, which consists of five domains of competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (CASEL, 2016). In addition, the CASEL Guide: Effective Social and Emotional Learning Programs—provide a systematic framework for evaluating the quality of classroom-based SEL programs, and the process called Self Science was developed to allow students to study themselves and develop their own skills in emotional intelligence (Goleman, 2013). Social-emotional skills improved attitudes about self, others, and school positive classroom behaviors, and this program contributed to the reduction of many academic problems such as math anxiety (Freedman, 2016).

A study by Jensen, Fieldale, & Freedman (2012) has shown that students who develop their SEL competencies will have higher scores in good health, relationship quality, personal achievement, life satisfaction, and self-efficacy. Within this field of research, awareness has been growing regarding the role of social emotional learning program to reduce mathematical anxiety (Weisberg & Luca, 2016) SEL programs aim to foster students' emotional intelligence and improve their academic performance, and increase awareness and understanding of feelings, including the ability to accurately label emotions (Freedman, 2018).

One of the most important requirements of learning is to provide a comfortable, attractive, and exciting classroom environment that provides a positive approach and a high motivation for learning. In this present study, the researcher's aims investigate the impact of using the SEL program in reducing math anxiety of middle student's schools in Jordan.

1.1. Problem of the Study:

Many studies indicate a correlation between academic anxiety and academic achievement, and in mathematics, students are affected by their peers or their parents' attitudes towards learning mathematics, and thus their achievement in mathematics is affected (Altakhayneh, 2020).

Among the important factors affecting student achievement is the variable academic anxiety. There are many studies that investigate the relationship of mathematical achievement with factors such as anxiety, motivation, and study habits (Ashcraft & Kirk, 2001).

Trends in International Mathematics and Science Study (TIMMS) indicate a low level of students in the fourth and eighth primary grades in mathematical achievement (IEA, 2012); Therefore, it is necessary to examine the factors that may be the cause of low

achievement, such as motivation, teaching methods used, and extension programs. Educational literature suggests that many factors may affect learning outcomes: emotional, mental, and physical (Afoneh & Basharat, 2018). Anxiety is considered an emotional factor and is one of the more prominently observed elements in the current era, which is why some see it as "the age of anxiety." It is, therefore, necessary to know anxiety levels in a sample of students, and to study their relationship to academic achievement.

Specifically, this study aimed to investigate the impact of using the SEL program in reducing math anxiety of middle student's schools in Jordan.

1.2. Questions of the Study:

This study attempted to answer the following questions:

What is the impact of using a counseling program based on social emotional learning in reducing mathematics anxiety in middle school students?

2) Is there a statistically significant difference between males and females in mathematics anxiety?

2. Method

The quasi experimental methodology was adopted to achieve the goals of the study, and the sample of the study was chosen intentionally and divided into two groups: experimental group (trained by SEL program) and the control group (non-trained by SEL program).

2.1. ***Subjects****:* The sample of study consisted of 207 basic 7th and 8thgrade students for the academic year 2016/2017 from Jordan schools, enrolled in the first semester in Amman, Jordan. The sample was divided into two groups: the experimental group consisted of 100 students (50 males and 50 females), and the control group consisted of 107 students (51 males and 56 females), and the following table shows the distribution of the subjects:

Table 1. *The Distribution of the Study Subjects*

Group	Gender	7th grade	8th Grade	Total
Experimental	Male	25	25	50
	Female	25	25	50
Control	Male	25	27	52
	Female	26	29	55
Total		101	106	207

2.2. Tools of the Study

Counselling program:

The program was built on the basis of social emotional learning (SEL), which is the process of developing emotional intelligence skills in the educational field, which students need to succeed in school (*Effective Social and Emotional Learning Programs*, 2013). The program consists of five main competencies which are: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (*Effective Social and Emotional Learning Programs*, 2013).

The importance of the five competencies identified by CASEL lies in helping students to "make sense of problems and solve them. Mathematically proficient students understand the approaches of others to solving complex problems and identifying correspondences between different approaches." To effectively engage in this practice, students must be able to stay calm when facing a challenging problem (*self-management*), recognize when they lack the knowledge to solve a problem (*self-awareness*), effectively solicit help from others (*relationship skills*), and learn from others how to solve problems (*social awareness*).

The main goals of the program are to help students develop social emotional learning skills: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making, and reduce the mathematics anxiety in students in the middle school. The program strategies are: information, instructions, role playing, feedback, social reinforcement, modeling of homework, strategy for dialogue and discussion, and brainstorming strategy.

To verify the validity of the SEL program, the program was offered to five specialists to validate the program's content as an effective tool in reducing math anxiety among students before applying on students.

Program components: The program consisted of (16) sessions, including the introductory session which clarifies the general goal of the program. Then, (15) sessions were distributed among the five main competencies of social emotional learning.

Math Anxiety test: The aim of this tool is to measure the level of math anxiety in a sample of seventh and eighth grade students, where the test paragraphs were prepared in light of viewing measures in math anxiety (Agail, 2015; Deniz & Uldas, 2008) as well as the review of the theoretical literature and components on anxiety, procedural definition, measurement items, and the 18-item scale. The scale was divided into (5) levels of measurement: strongly agree, agree, neutral, disagree, and strongly disagree.

To verify the validity, the scale was presented to a group of arbitrators in the field of psychology, methods of teaching math, and psychological counseling. On the one hand, some paragraphs were amended in light of observations. On the other hand, to verify the test reliability, the scale was applied to a survey sample of the seventh-grade students with a two-week difference.

2.3. Procedures of the Study

1. Preparing the training program based on anxiety relief for middle school students in mathematics and verifying its validity by presenting it to a group of specialists in the field of educational guidance.

2. Preparing a test in math anxiety and verify validity and reliability.

3. Choosing the study sample from the seventh and eighth grade students and divided them randomly into two experimental and control groups.
4. Applying the mathematical anxiety test (pretest) to the two study groups (experimental and control group).

5. Applying the training program to the experimental group.

6. Applying the mathematical anxiety test (posttest) to the two study groups.

7. Extracting the results of the study using SPSS.

8. Working out the study recommendations.

***2.4. Statistics of the Research*:** arithmetic mean, standard deviation, and three-way MANCOVA was used.

3. Results

To answer the first question, which is:

1) What is the impact of using a counseling program based on Social Emotional Learning in reducing the mathematics anxiety in middle school students?

The arithmetic means and standard deviation were computed for both experimental group and control group as the following table shows:

Table 2. *Arithmetic Mean and Standard Deviation for Both Experimental Group and Control Group (7th grade, 8th grade) in the Post Test Math Anxiety.*

		7th grade		8th Grade		Both (7thand 8th)	
Group	Gender	Mean	SD	Mean	SD	Mean	SD
Experimental	Male	56.64	5.97	57.40	6.29	57.02	6.08
	Female	57.24	6.65	57.00	6.41	57.12	6.47
	Total	56.94	6.26	57.20	6.29	57.07	6.27
Control	Male	70.28	6.30	70.11	6.38	70.19	6.34
	Female	71.15	6.01	70.59	4.26	70.78	5.14
	Total	70.73	6.10	70.36	5.34	70.55	5.72

We notice from the above table that the arithmetic means for the experimental group was less than the control group with a difference of (13.48), while the difference for the 7th grade was (13.79), and for the 8th grade (13.6).

Table 3. *Three-way MANCOVA for Significance Differences of Arithmetic Means of Math Anxiety between Experimental and Control Groups*

Source	SUM Squares	DF	Mean Square	F	Sig.
Corrected Model	16241.13	8	2030.14	942.06	0.000
Intercept	72.86	1	72.86	33.81	0.000
Pretest	6847.75	1	6847.75	3177.63	0.000
Group	9511.15	1	9511.15	4413.56	0.000
Gender	1.34	1	1.34	0.62	0.430
Level	1.64	1	1.64	0.76	0.384
Group * Gender	0.19	1	0.19	0.09	0.763
Group * Level	0.09	1	0.09	0.04	0.838
Gender * Level	8.90	1	8.90	4.13	0.043
Group * Gender * Level	0.36	1	0.36	0.17	0.679
Error	426.68	198	2.15		
Total	865308.00	207			
Corrected Total	16667.82	206			

From Table 3, we notice that there were significant differences of arithmetic means of math anxiety between experimental and control groups in favor of experimental group with f-value of (4413.56), and significant level (0.000).

This means that the counseling program based on social emotional learning has its effects on the reduction of math anxiety in middle school students.

To answer the second question, which is:

2) Is there a statistically significant difference between males and females in mathematics anxiety?

From Table 3 we notice that there are no statistically significant (α=0.05) differences between arithmetic means of males and females. This means that the counseling program based on social emotional learning has its effects on the reduction of math anxiety in middle schools for both males and females.

4. Discussion

The results of the study showed that there were statistically significant differences between the arithmetic mean of math anxiety between experimental and control groups in favor of the experimental group, and there were no significant differences between males and females in math anxiety.

The results showed the importance of social emotional learning counseling programs, based on the Collaborative for Academic, Social, and Emotional Learning (CASEL) model. This counseling program contributed to developing the social and emotional competencies of students. The five SEL Core Competencies of the program improved the ability of students to accurately recognize one's emotions and thoughts and their influence on behavior, and the ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals, and establishing and maintaining healthy and rewarding relationships with diverse individuals and groups. This is the reason why math anxiety is reduced, and this study's conclusions consistent with what Goleman (2000) pointed out, concluding that disturbances in the educational field such as math anxiety are caused by students' lack of emotional and social competencies in schools. The results of this study were also consistent with the results of the study by Barbara Fatum (2008), which focused on the relationship between emotional intelligence and academic achievement in elementary-school children, and it showed that students who participated in high quality SEL programs were at significantly lower risk of developing diverse problems. In addition, this study agreed with the outcomes of the study by Jensen, Fieldale, & Freedman (2012)

which showed that students who develop their SEL competencies will have higher scores for good health, relationship quality, and personal achievement.

The counseling program based on Social Emotional Learning has an impact on reducing the math anxiety in middle school students for both males and females. This result is consistent with the results of the study by The University of Texas at Austin Charles A. Dana Center (2016) which proved that the program of SEL (Integrating of Social and Emotional Learning and Common Core State) has an effect in reducing math anxiety in middle schools for both males and females. On the other hand, the students demonstrated enthusiasm, collaboration, and commitment during the application of the program, which positively affected the results of the project.

5. Conclusion

The counseling program based on Social Emotional Learning has an impact on reducing the math anxiety in middle school students for both males and females.

6. Recommendations

In light of the results of the study, the researchers recommend using a counseling program based on emotional learning to reduce math anxiety in middle school students in Jordanian schools for both males and females, and to take into consideration the effects of math anxiety and try to ease it when teaching.

The standards of teaching mathematics emphasize the importance of providing a suitable environment when teaching the subject, and to motivate students to learn mathematics subjectively.

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