European Journal of Education Studies
ISSN: 2501 - 1111
ISSN-L: 2501 - 1111
Available on-line at: www.oapub.org/edu

doi: 10.5281/zenodo.1328249 Volume 4 | Issue 11 | 2018

INVESTIGATION OF THE EFFECT OF ENHANCED EDUCATION PROGRAMMES ON MATHEMATICS ANXIETY OF STUDENTS

Salim Şahin[i]
Dumlupınar University,
Turkey

Abstract:
The aim of this study is to determine whether mathematics anxiety levels of fourth grade primary school students differs between EEP (Enriched Education Program) implemented class and unapplied class. This study was conducted with totally 30 students who were randomly selected among 4th grade primary school students studying in two private schools depending on the Ministry of Education in Kutahya city centre in 2014-2015 academic years. While EEP (Enriched Education Program) is applied to the experimental group, there has been no application to control group. In the study 2x3 (experimental / control group X pre-test / post-test / screening test) split-plot design was used. In the study in order to collect data, Mathematics Anxiety Scale was applied three times (At different time intervals including when the session began, when completed, and three months after termination) to students in the experimental and control groups. According to the results, children subjected to the EEP program carry a lower mathematics anxiety compared to unapplied peers.

Keywords: mathematics anxiety, enhanced education program

1. Introduction

To uncover and develop potential possessed by each individual always has been among the main targets. To achieve this determination of student characteristics was effective on training programs to be developed. Enrichment model to use in the education of gifted children starting from 1970 under the leadership of Joseph S. Renzulli & Reis, Sally M. (The School wide Enrichment Model) is developed. It can be expressed as enhance the capabilities of all children and provide a wide range of advanced enrichment experiences for students generally targeted in this model (Renzulli &Smith, 1978). This model (The Enrichment Triad Model) configured based on mostly primary students is one of the most well-known and applied models for wunderkind / gifted students (Renzulli & Reis, 1985).

[i] Correspondence: email salimsahin2003@hotmail.com

Enrichment generally is changes are made the content and implementation of the program by keeping gifted students in regular classes and among their own age group. Enrichment can be horizontally and vertically. It is added new courses to the program in horizontal enrichment. It is not additional to courses and activities in the vertical enrichment however; courses are handled in more depth (Renzulli & Reis, 1997). This model prepared for gifted at first spread all over the world in a short time. This model was made applicable to all students not only on gifted students with the work done in the following process (Burris, 2011).

1.1 Enriched Education Program (EEP)

The School wide Enrichment Model (SEM) developed by Renzulli has been implemented in some private educational institutions with the name of EEP (Enriched Education Program) in our country. The purpose in Enriched Education Program (EEP) is to gain new knowledge and skills that they cannot gain in existing curriculum also to improve their available skills of all classes without doing any distinction among students. Directing students at an early age by detecting their talents and skills is located the aim of EEP course. It was determined learning areas as visual perception, productivity and thought skills in the course of EEP processed as two hours a week. In the field of visual perception learning analytical thinking, be able to differentiate similarity and differences in a whole, be able to mapping and doing classification, developing logic and reasoning by using image of the students is targeted. The purpose in productivity learning area is different thinking, developing of different perspectives in the solution of problems faced, be aware error and the lack with attention to detail producing new ideas and the original works of the students. The purpose in the areas of thinking skills learning is to gain versatile thinking to students, ensuring they can make logical inferences, to uncover relationships between objects with the unique method and developing of visual reasoning. Those are prepared private classes equipped with a variety training materials for EEP course. Curriculum has been prepared according to each grade level will include the learning areas with visual perception, productivity and thought skills.

1.2 Mathematics anxiety

Firstly, Dreger & Aiken investigated the mathematics and concern together. Mathematics anxiety (Baloğlu, 2001) who have escaped the attention of educational researchers until 1970s was expressed emotional response syndrome exhibited against the mathematics and arithmetic field (Dreger & Aiken, 1957). Richardson & Suinn (1972) defined mathematics anxiety as feelings of anxiety and tensions that using the number and hinder the solution of mathematical problems (Akt: Baloğlu, 2001). Fennema & Sherman (1976) defined as anxiety, fear and a sense of frustration about dealing with mathematics with their results related body symptoms. Tobias (1978) expressed mathematics anxiety as fear, concern, panic, despair, tension and the rise of mental confusion upon request a solution of a mathematical problem. According to Şahin, mathematics anxiety (2000) expresses tension, fear and concern towards

mathematics of individuals. Usually thought of failure on mathematics from their childhood reveals the mathematics anxiety in students. It is known that this concern is an important factor in the low academic achievement (Suinn, Taylor & Edwards, 1988) and fear of the students against the course (Baykul, 2003). Moreover the students have a negative attitude for this course, the activities done in the classroom and the method used (He, 2007) and they show reluctance in choosing a career related to mathematics is stated (Ashcraft, 2002; Viator, 2007). However, mathematics anxiety should not be considered as entirely negative factor (Arem, 2003). Mathematics anxiety can have a positive impact for success increasing motivation in some cases (Wigfield & Meece, 1988).

Arem (2003) demonstrated in Figure 1 the relationship between mathematics anxiety levels and performance.

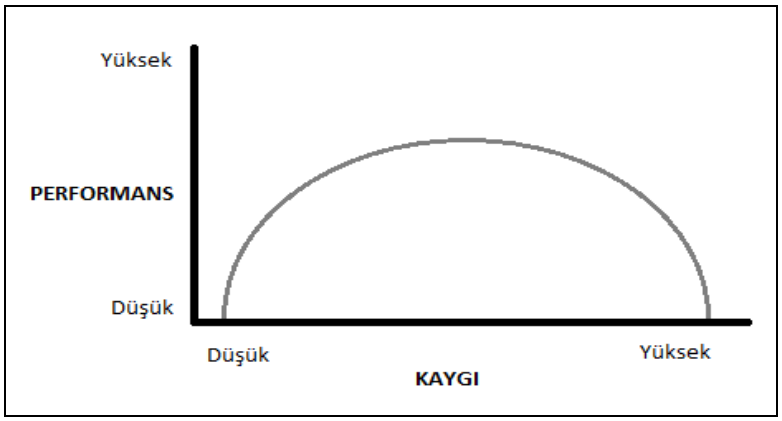

Figure 1: Anxiety-performance graphics

Arem (2003) represents that students who are worried at the low level are indifferent about the course, they do not give importance to the course and their performance are low. It seems to be the ideal relationship between mathematics anxiety and mathematics performance in peak point of graph. Measured anxiety can perform functions as a factor motivating students. Excessive concern will impede success with adverse effect (Gürel, 2011). The high level of anxiety will negatively affect academic achievement of students and attitude towards the future of mathematics (Baloğlu, 2001; Suinn & others, 1988).

1.3 Causes of mathematics anxiety

Studies today suggest that mathematics anxiety with parents, attitudes of teachers, the teaching methods of implementation, basic skills in mathematics, insufficient achievement in mathematics, student attitudes toward mathematics, the personal characteristics of the individual and faith of fail are effective (Me & Xu, 2004).

Uusimaki & Nason (2004) argued that mathematics anxiety of people based on the experience gained previously. While exemplary parents for their children are expressing the mathematics is not easy, people scare the mathematics, as well as they inform that mathematics skills are vital to be successful in the future of people (Thomas,

1998). Thought of not being successful at the desired rate in math is one of the leading causes of mathematics anxiety seen in students. Student concerns that he will decrease his value in the eyes of those around in case of failure. Student thinks that it would be scale of acceptability among people with achievement levels in math courses. This will cause an increase in anxiety levels of students (Ergenç, 2011). Üldaş (2005) expresses the factors that lead to mathematics anxiety as indifference of students towards mathematics, inadequate capacity digital thinking and having negative attitudes toward mathematics.

1.4 The purpose and importance of research

There are also short-term effects such as avoidance, decreasing of self-reliance, shame, helplessness and compulsive behaviours as well as long-term effects such as lowness of success in mathematics courses of mathematics anxiety (Aydın, Delice, Dilmaç & Ertekin, 2009; Baloğlu, 2001). Mathematics anxiety may lead to option restrictions in such a way that reduces living standards of individuals even if it is not determine in areas that do not need mathematics (Baloğlu, 2001). Mathematics anxiety may even because physiological disorders such as increasing in heart rate, rapid breathing, and tremors in some individuals as well as it have affect choice of profession (Ertekin, Dönmez & Özel, 2006).

It is possible to find studies showing that students have high math achievement have less than mathematics anxiety compared to students have low math achievement and has direct relationship between mathematics achievement and mathematics anxiety (Akgül, 2008; Arıkan, 2004; Nazlıçiçek, 2007; Eldemir, 2006; Şentürk, 2010; Yenilmez & Özbey, 2006). It has been identified that math classes success is falling increasingly in next years after the students start school especially from fourth grade they have been faced serious problems (Hart, 1992). In parallel to this, it is stated that increasing over time starting from primary school of mathematics anxiety of students (Betz, 1978; Richardson & Suinn, 1972).

Turkish students in area of mathematics ranked as 44th with an average 448 points in 65 countries according to results of 2012 year of PISA (Programme for International Student Assessment), the average score of Turkish students in 2009 was calculated as 445. It is defined that OECD average was 22% (URL-1) while the percentage of Turkish students was 42% the Level 1 and below the Level 1 covering simple/basic mathematical operations and interrogations in the data on 2012. It generally seems to be much lower of desired level of achievements in field of mathematics of students at primary education level although the results are relatively better according to the 2009 year results of PISA. It is stated that the mathematics anxiety is at the beginning of the underlying causes of mathematics failure observed in students (URL-2).

It has emerged activities and programs requirements to reduce especially mathematics anxiety in primary school based on the above studies. It has been claimed that it will be an alternative program can reduce mathematics anxiety of EEP in our country in this study. From this point of view, the main hypothesis of the study is in the

form; "It will be a significant reduction in mathematics anxiety levels of students participating EEP according to the students in the control group and this reduction will not change in end of monitoring measurement."

1.5 Sub hypotheses

H1: Pre-test score averages of mathematics anxiety of EEP applied students and unapplied students will not become different in a statistically significant way.

H2: Pre-test score averages of mathematics anxiety of students participating EEP will be significantly higher than score averages of final test.

H3: Pre-test score averages of mathematics anxiety of students participating EEP will be significantly higher than score averages of monitoring test.

H4: It will no significant difference between post-test score averages and monitoring test score averages of mathematics anxiety of students participating EEP.

H5: Final test score averages of mathematics anxiety of students participating EEP will be significantly lower than compared to the average of final-test score of individuals in the control group.

H6: Monitoring test score averages of mathematics anxiety of students participating EEP will be significantly lower than compared to the score average of monitoring test of individuals in the control group.

H7: It will no significant difference between scores averages of pre-test, post-test and monitoring test of mathematics anxiety of students situated in the control group.

2. Method

2.1. Workgroup

Workgroup of the study constitute totally 30 students attending primary school 4th Grade in the education year of 2014-2015 in two private schools located in centre of Kütahya. It is randomly selected a class through 4th grade in school firstly applied EEP when a working group is creating. Then the control group was determined through 4th in schools do not apply EEP. It has been noted to resemble as much as possible as the nature and number for experiments group when control group is determining.

2.2 Data collection tools

2.2.1 Mathematics anxiety inventory (MAI)

Quintet likert-type scale developed by Bindak (2005) consists of 10 items that are 9 positive and 1 negative. The highest score that can be taken on the scale is 50, the lowest score is 10. All item-total correlations except article 6 and 8, extracted from scale were significant at the 0.01 level. Factor analysis was conducted in order to determine the construct validity; in the first analysis performed with fourteen articles except of article 6 and 8 was observed ranged from minimum 0.431 and 0.763 maximum. The final scale consists of 10 items and a single factor as a result of exploratory factor analysis made; this single factor explains 51.7% of the total variance. Cronbach Alfa internal consistency reliability coefficient has emerged as 0.84 the calculated reliability

coefficient was found to be 0.83 by Spearman-Brown correction by using the split test method.

2.3 Operation

In this quasi-experimental study to determine the effect of "Enriched Education Program (EEP) on mathematics anxiety "Pre-test / post-test / monitoring test mixed pattern" is used. It is examined effect on the dependent variable of two or more independent variable in crazy quilt. Mixed patterns also stated as split-plot factorial designs (split-plot factorial design) (Büyüköztürk, 2011).

Mathematics Anxiety Inventory (MCM) was applied as a pre-test to experimental and control groups initially in the frame pattern of research. Later EEP training was carried out for 12 weeks to be 2 hours per week in total of 24 hours to students in the experimental group by researchers. Ministry of Education curriculum has been implemented to control group. MCM has been applied as post-test to experimental and control groups at training result. 3 months later the post-test application these measures once more applied to experimental and control groups as a follow up test. 2x3 split-plot (mixed patterns) was used in the study. The first factor in the pattern shows the control group studying Ministry of Education curriculum and the second factor in the pattern shows EEP applied experimental group. The repeated measures (pre-test, post-test, follow-up) made at different times in the study are evaluated by looking at the EEP scores. Research design is shown in Table 1.

Table 1: Research Design

	Preliminary-test	**Application**	**Final-test**	**Monitoring test**
Experimental group	x	EEP	x	x
Control group	x	-	x	x

In the EEP program;

- First week product development activity and Tomtect activity,
- Second week Sudoku activity and finding positive, negative, interesting aspects of ideas activity,
- Third week pairing - grouping activity and number-word jigsaw puzzle activity,
- Fourth week number of ways matchmaking event and symmetry activity,
- Fifth week creating quality table activity and six hat thinking activity,
- Sixth week newspaper article preparation activity and title of image activity,
- Seventh week typos activity and the difference puzzle activity,
- Eight weeks paradoxes activity and inferences activity,
- Ninth week the story of multiple termination activity and design making activity,
- Tenth week which one is different activity and word hunt activity,
- Eleventh week regular exploratory activity and imagine activity,
- Twelfth week sentence construction activity and from letters to sentence activity was applied.

In analysing the data, in order to decide which tests to use firstly mathematics anxiety scale of the students in the experimental and control groups pre-test value from their applications whether meet the basic assumptions of parametric tests was investigated. For this purpose, whether data showing normal distribution and it was examined homogeneity of the data. Based on the results of the operation due to a violation of the normality assumption non-parametric Mann-Whitney U-test and Wilcoxon tests, two-factor ANOVA was used factor analysis. In ANOVA test in order to compare strength of the relationship between variables eta-squared (effect size) value was evaluated. Eta-square indicates independent variable explains how much of the total variance of the dependent variable and takes values between 0.00 and 1.00 (Büyüköztürk, 2011). When calculating the effect size for ANOVA sum of squares between groups by dividing the total sum of squares, the square root of the results is taken. Result shows effect variances percentage and failure described by impact (Çepni, 2012). If eta-square value is .20 small effect size, .50 medium effect size, .80 large effect size (Cohen, 1988) is interpreted. Computer statistical analysis program in statistical calculations concerning analysis was used. Statistical analysis of the findings in the study was conducted to base on the 05 level of significance.

3. Fındıngs

Mann-Whitney U-test analysis in order to test whether a significant difference between the averages of the scores obtained from the pre-test measurement of mathematics anxiety prior to application of experimental process of students located in the experimental and control groups was conducted. Findings obtained are shown in Table 2.

Table 2: Mann Whitney U-Test Analysis Concerning Pre-test score of the Mathematics Anxiety of Experimental and Control Groups

Score	**Groups**	N	$\overline{x}_{sira}$	$\sum_{sira}$	U	p
Preliminary test	Test	15	15.57	233.50	111,500	.09
	Control	15	15.43	231.50		
	Total	30				

*p<.05

There was no significant difference in the table between pre-test values of experimental and control groups. According to this it can be said that math anxiety levels of the students in the experimental and control groups are equal before the EEP application. For the implementation of parametric tests, it must be fulfilled homogeneity of variance and the conditions of normal distribution of data (Ergun, 1995). To determine whether these conditions provided by, firstly participants in both the control and experiment group, to determine whether they are equal to each other In terms of math anxiety, the homogeneity of variance was examined. The results obtained from the homogeneity

test showed that group variance is identical for each other in terms of math anxiety. The findings concerning the homogeneity test are given in Table 3.

Table 3: Analysis Results of Homogeneity Test Belonging to Pre-test score of the Mathematics Anxiety of Experimental and Control Groups

Variable	Levene Statistic	sd1	sd2	p
Pre-test mathematics anxiety	.556	1	30	.46

*p<.05

The average, distortion, stickiness and Shapiro-Wilks normality test levels of scores obtained from pre-test measurements relates to MCM of Experimental and control groups was examined. Findings are given in Table 4. The columns in the table shows respectively number of observations, minimum value, maximum value, average value and standard deviation of the average in parenthesis, skewness and standard deviation in parentheses, kurtosis and standard deviation in parentheses, Shapiro-Wilks normality test and value expressing the significance of these test results statistically.

Table 4: Pre-test values belonging to MCN

	N	Min	Max	$\overline{X}$ (ss)	Skewness (S. Error)	Kurtosis (S. Error)	S-W Normality Test (p)
Preliminary test	30	24	48	41.6 (6.44)	-1.87 (.43)	2.78 (.83)	.727*** (.000)

*p<.05

When the figures in Table 4 are examined it is seen that minimum and maximum values in limits that should be (between 10-50), average and the standard deviation values appear to be normal. However preliminary test values of Index of math anxiety were determined normality problem from both kurtosis and distortion values must be greater than absolute value 1 and Shapiro-Wilks test of normality is significant (Büyüköztürk, 2011).

Before hypotheses being tested arithmetic average and standard deviation of the scores obtained in Mathematics Anxiety Scale of students in the experimental and control groups was calculated prior to application, after application and three months after the application Findings are given in Table 5.

Table 5: Arithmetical average and Standard Deviation Values Concerning Score of the Pre-test and Post-test and Monitoring Test of the Mathematics Anxiety of Experimental and Control Groups

Measurements	Preliminary test		Final test		Monitoring	
Groups	$\overline{X}$	Ss	$\overline{X}$	Ss	$\overline{X}$	Ss
Test N=15	42.1	5.9	26.80	6.16	26.73	5.37
Control N=15	41.1	7.1	33.93	5.79	31.86	4.96

*p<.05

Arithmetical average and Standard Deviation Values Concerning Score of the Pre-test and Post-test and Monitoring Test of the Mathematics Anxiety of Experimental and Control Groups are shown in table 5. Mathematics Anxiety Scale of individuals located in the experimental and control groups whether there is a significant difference statistically between mean scores gained from pre-test, post-test and monitoring measurements on one factor for repeated measures two-factor analysis of variance (ANOVA) was examined. Findings are shown in Table 6.

Table 6: Two-Factor Variance Analysis Results Concerning Score of the Pre-test and Post-test and Monitoring Test of the Mathematics Anxiety of Experimental and Control Groups

Resource	**Sum of squares**	***Sd***	**Average of squares**	***F***	***p***	**Partial Eta square**
Intergroup	104652.900	29				
Group (D/K)	214,678	1	214.678	1135.142	.138	.976
Error	2581.422	28	92,194	2.329		
Intragroup		60				
Measurement (pre-post-monitoring)	2281.667	2	2281.667	245.466	.000	.898
Group*measurement	141,067	2	141.067	15.176	.000	.351
Error	260,267	56	9.295			

*p<.05

When Table 6 examined it was found that there was no significant effect of group of students in experiments and the control group as a result of analysis of variance performed on average of the scores they receive from Math Anxiety Scale, pre-test, post-test and monitoring measurements (F(1-28)= 1135,142; p>.05). According to this it cannot be said that there is a significant difference the average of the scores obtained in Mathematics Anxiety Scale indiscriminately pre-test, post-test and monitoring measurements of experimental and control groups.

Without distinction of group it was found to be significant that the difference between the average of the scores obtained from pre-test, final test and measurement and monitoring of participants (F(2-60)= 245,466; p<.05). These findings group sizing is not done shows that mathematics anxiety of participants change depending on the experimental treatment. Further the joint effect which is important for this study (Measuring the effects of group *), it was found to be significant to the values obtained result of the examination (F(2-56)= 15,176; p<.05). These findings show in pre-test, final test and follow-up test of participants in the experimental and control groups change the scores obtained from the Mathematics Anxiety Scale.

During the measurements between the two groups 35% of change seen in the level of mathematics anxiety can be explained by the experimental procedure. According to this result, it can be said the effect size is small (.351). The results obtained from the analysis of variance demonstrated that there is a significant difference depending on the extent between groups (F(2-56) = 15,176; p<.05).

Wilcoxon test results conducted to test whether there is a significant difference between pre-test- final test scores received from mathematics anxiety scale of the students in the experimental group are given in Table 7.

Table 7: Pretest-Posttest Wilcoxon results of Mathematics Anxiety of Experimental Group

Score	Groups	N	$\bar{x}_{sira}$	$\sum_{sira}$	z	p
Experiment pretest-posttest	Decreasings	15	8	120	-3,54*	.00
	Increasings	0	0	0		
	Equal	0				
	Total	15				

*p<.05

As shown in Table 7 as a result of the Wilcoxon test difference between the average was significant at the 05 level. So mathematics anxiety of students constituting the experimental group in the result of EEP application decreased significantly (p<.05). Wilcoxon test results conducted to test whether there is a significant difference between pre-test- monitoring scores received from mathematics anxiety scale of the students in the experimental group are given in Table 8.

Table 8: Pre-test Monitoring Wilcoxon results of Mathematics Anxiety of Experimental Group

Score	Groups	N	$\bar{x}_{sira}$	$\sum_{sira}$	z	p
Experiment pre-test monitoring	Decreasings	15	8	120	-3,42*	.00
	Increasings	0	0	0		
	Equal	0				
	Total	15				

*p<.05

As shown in Table 8 as a result of the Wilcoxon test difference between the average it was significant at the 05 level. According to this result, pre-test average scores of mathematics anxiety of students in experimental group were found to be higher by comparison with monitoring test average scores.

Wilcoxon test results conducted to test whether there is a significant difference between final test- monitoring scores received from mathematics anxiety scale of the students in the experimental group are given in Table 9.

Table 9: Post-test Monitoring Wilcoxon Results of Mathematics Anxiety of Experiment Group

Score	Groups	N	$\bar{x}_{sira}$	$\sum_{sira}$	z	p
Experiment post-test monitoring	Decreasings	13	7	91	-3.21	.21
	Increasings	0	0	0		
	Equal	2				
	Total	15				

*p<.05

It was not observed a difference as expected between averages in the result of the Wilcoxon test in Table 9 (p>.05).

Wilcoxon test results conducted to test whether there is a significant difference between pre-test- final test scores received from mathematics anxiety scale of the students in the control group are given in Table 10.

Table 10: Pretest-Posttest Wilcoxon results of Mathematics Anxiety of Control Group

Score	**Groups**	N	$\overline{x}_{sira}$	$\sum_{sira}$	z	p
Control pretest-posttest	Decreasings	15	8	120	-3,42*	.00
	Increasings	0	0	0		
	Equal	0				
	Total	15				

*p<.05

As shown in Table 10 as a result of the Wilcoxon test difference between the average it was significant at the 05 level. Hereby, mathematics anxiety of students constituting the control group decreased significantly. In the description of the results "pre-test effect" and "maturation" concepts stands out. Preliminary testing effect, when applied pre-test in experimental studies against the test subject in question the formation of a familiarity and depending on this familiarity recovery means is independent of the intervention in the final test (Campbell & Stanley, 1963). In order to control this effect in some studies no pre-test implemented in some experiments and control group, two groups separated again in themselves and while applying a group of pre-test, it does not apply to other groups. In this study such an application could not made because of the small sample size. One reason for High-rise the effect of pre-test can be relatively scale test is short. Consists of 10 questions of math test anxiety in children being tested creating a familiarity against questions between both pre-test-post-test and the end of the test-screening test may have resulted in the enrolment development in both groups.

The maturation is in particular as in this study, experiments conducted on persons budding, the development conditions that occur independently of the intervention in subjects are experiments to influence the results (Campbell & Stanley, 1963). Thus students participating in this study while the study as long as continue continued their normal lives and school, they learned new information that students in both groups the reason for the decline in mathematics anxiety may be a natural process of learning and development. Wilcoxon test results conducted to test whether there is a significant difference between pre-test- monitoring scores received from mathematics anxiety scale of the students in the control group are given in Table 11.

Table 11: Pre-test Monitoring Wilcoxon results of Mathematics Anxiety of Control Group

Score	Groups	N	$\bar{x}_{sira}$	$\sum_{sira}$	z	p
Control pre-test monitoring	Decreasings	15	8	120	-3,41*	.00
	Increasings	0	0	0		
	Equal	0				
	Total	15				

*p<.05

As shown in Table 11 as a result of the Wilcoxon test difference between the average it was significant at the 05 level. According to this result, pre-test average scores of mathematics anxiety of students in control group was found to be higher by comparison with monitoring test average scores.

Wilcoxon test results conducted to test whether there is a significant difference between final test- monitoring scores received from mathematics anxiety scale of the students in the control group are given in Table 12.

Table 12: Post-test Monitoring Wilcoxon results of Mathematics Anxiety of Control Group

Score	**Groups**	N	$\bar{x}_{sira}$	$\sum_{sira}$	z	p
Control post-test monitoring	Decreasings	14	7.50	105	-3.36	.13
	Increasings	0	0	0		
	Equal	1				
	Total	15				

*p<.05

It was not observed significant difference as expected between averages in the result of the Wilcoxon test as shown in Table 12 (p>.05).

Table 13: Experimental Group Last Test Control Group
The Final Test Mathematics Anxiety Mann-Whitney U Results

Score	**Groups**	N	$\bar{x}_{sira}$	$\sum_{sira}$	U	p
Experiment final test-control final test	Test	15	11.70	175.50	55,50*	.01
	Control	15	19.30	289.50		
	Total	30				

*p<.05

It is observed significant difference in favour of the experimental group between last tests of the experimental and control groups according to Table 13.

Table 14: Experimental Group Monitoring Control Monitoring
The Final Test Mathematics Anxiety Mann-Whitney U Results

Score	**Groups**	N	$\bar{x}_{sira}$	$\sum_{sira}$	U	p
Experiment monitoring-control monitoring	Test	15	11.03	165.50	45,50*	.00
	Control	15	19.97	299.50		
	Total	30				

*p<.05

According to Table 14 between follow-up tests of the experimental and control groups it is observed that there are significant differences in favour of the experimental group (P <.05).

Briefly, despite the absence of any significant differences between experimental and control groups in the pre-test in terms of math anxiety, as a result of recent tests 5.1 percentage point difference in favour of the experimental group appeared, moreover in the assessment made in terms of final tests and preliminary test in itself but due to the improvement in the experimental group is shown to be higher, it can be reached to the conclusion of EEP is an effect of reducing the mathematics anxiety.

The points of pre-test, final test and the screening test of experimental and control groups is given in figure 1 with line graphics. As shown in Figure 1, result of pre-test there is no difference between experimental and control groups in mathematics anxiety levels, result of post-test it is seen that there is reduction in the experimental and control groups and this decline continued in the results of screening test. It is observed that the reduction in the experimental group more than and this reduction is due to the program.

4. Result

It is devoted to the results achieved based on the findings in this section of the research. The main hypothesis of the study is in the form; "It will be a significant reduction in mathematics anxiety levels of students participating EEP according to the students in the control group and this reduction will not change in end of audience measurement."

The following results were obtained concerning this hypothesis.

- Mathematics anxiety of students constituting the experimental group in the result of EEP application decreased significantly.
- Pre-test average scores of mathematics anxiety of students in experimental group were found to be higher by comparison with monitoring test average scores.
- It showed no significant difference between post-test score averages and monitoring test score averages of mathematics anxiety of students participating EEP.
- Final test score averages of mathematics anxiety of students participating EEP will be significantly lower than compared to the average of final-test score of individuals in the control group.
- Monitoring test score averages of mathematics anxiety of students participating EEP will be significantly lower than compared to the score average of monitoring test of individuals in the control group.
- It showed no significant difference between pre-test, post-test and monitoring test scores averages of mathematics anxiety of students situated in the control group.

5. Dıscussıon and Recommendatıons

The main hypothesis of the study is in the form; *"It will be a significant reduction in mathematics anxiety levels of students participating EEP according to the students in the control group and this reduction will not change in end of audience measurement."* The main hypothesis was confirmed in this study.

If a general assessment to be made for students' math anxiety, for evidence of Math Anxiety Inventory (MAI); In the pre-test despite the absence of any significant differences between experimental and control groups In terms of math anxiety, as a result of recent tests significant difference emerged in favour of the experimental group and this difference showed that continued in the monitoring test. According to these results Enriched education program (EEP) reduces math anxiety levels of the students, this reduction is permanent, the determination may be made that the adverse impact of the program applied to this result.

The multivariate studies to reduce math anxiety are available in the literature. The results of the study by Arslan (2008) coincide with the results of this study. In his study which was examined the effect of the usage of web-assisted instruction and instructional material on math anxiety, attitude and success of the students he has been concluded that both media have significant and permanent effects on anxiety and success. Again, Özer (2015) has determined in his study that interactive math book developed by the ARCS motivation model reduces the students' math anxiety. The study made by Newstead (1998) supports that different teaching methods and support programs will reduce anxiety.

In the reduction of mathematics anxiety, different methods have been recommended such as develop the curriculum and support programs (Oaks, 1989; Robertson & Claesgens, 1983). Oaks (1989)'s recommendation is in direction of development of students' beliefs about mathematics by "Discovering techniques". Clute (1984) stated that while low math anxiety students are more successful in learning methods by exploring, students with high math anxiety more benefit from descriptive education. Genshaft (1982) showed in his studies that mathematics anxiety of the students can reduce by "Self-training" techniques. In order to reduce math anxiety teachers often must re-examine traditional teaching methods students' learning styles and that does not meet the skills needed in society. For example, in the reduction of mathematics anxiety teaching with the play, with activities and technology cooperation group and teaching with visual aids methods are available (URL 3).

Results of the study do not coincide with the findings of Natali (2001) and Richardson & Suinn (1972). Natali (2001) and Richardson & Suinn (1972) concluded in their research that classroom activities do not reduce anxiety. It was observed that this study that anxiety can be reduced with well-organized program and the environment. The educational methods used in mathematics education are expressed as one of the main causes of math anxiety (Bohuslav, 1980; Byrd, 1982; Greenwood, 1984; Strawderman, 1985; Williams, 1988). In EEP program activities analytical thinking, different thinking, versatile thinking, development of different perspectives for the

solution of problems faced, be aware of error and the lack with attention to detail, can be made logical inferences, learning by doing, discovering, playing of the students are targeted and liberal learning opportunities are offered. Consequently, it has been shown to decrease math anxiety.

In light of this information, following recommendations can be made:

- The effects of the program developed in this study on mathematics anxiety were examined. The study can be improved by increasing the number of dependent and independent variables.
- In this study, an experimental study was made in two different schools with limited working group. The study can be improved by increasing the number of school.
- Increasing the number of subjects in the experimental and control groups can give access to more reliable results.
- Quantitative data were evaluated in this study. Getting the teacher and student opinion about the implementation process or enrichment of the findings in different qualitative data can lead to better health outcomes of interpretation.
- The study was conducted in two private schools. When the program applied in public schools, it can be reached to different conclusions.

References

1. Akgül, S. (2008). Predictive power mathematics achievements according to the gender of the social support of perceived teacher with mathematics anxiety of 7th and 8th grade students of primary education (Master's thesis). Yıldız Teknik University Institute of Social Sciences, İstanbul.
2. Arem, C.A. (2003). *Conquering math anxiety*. USA: Brooks/Cole-Thomson Learning, Pacific Grove.
3. Arıkan, G. (2004). *Öğrencilerin matematik kaygı düzeyleri ile matematik başarı düzeyleri arasındaki ilişki ilköğretim 2. Kademe* (Yüksek lisans tezi). Gazi University Institute of Educational Sciences, Ankara.
4. Arslan, A. (2008). *Web destekli öğretimin ve öğretimsel materyal kullanımının öğrencilerin matematik kaygısına, tutumuna ve başarısına etkisi.* (Doctoral thesis. Marmara University Institute of Educational Sciences, İstanbul.
5. Ashcraft, M. H. (2002). *Math anxiety*. Pasific Grove, California: Broks/ Cole Publishing Company.
6. Aydın, E., Delice, A., Dilmaç, B. & Ertekin, E. (2009). İlköğretim öğretmen adaylarının matematik kaygı düzeylerine cinsiyet, sınıf ve kurum değişkenlerinin etkileri. *İlköğretim Online, 8*(1), 231-242.
7. Aydın, B. (2011). İlköğretim ikinci kademe düzeyinde matematik kaygısının cinsiyete göre farklılıkları üzerine bir çalışma. *Kastamonu Eğitim Dergisi, 19*(3), 1029-1036.

8. Baloğlu, M. (2001). Overcome of the fear of mathematics. *Kuram ve Uygulamada Eğitim Bilimleri Dergisi, 1*(1), 59-76.
9. Baykul, Y. (2003). Mathematics teaching in primary schools. Ankara: Pegem Publishing
10. Betz, N. E. (1978). Prevalence, distribution, and correlates of math anxiety in college students. *Journal of Consulting Psychology, 25*, 151–157.
11. Bindak, R. (2005). Mathematics anxiety scale for elementary school students. *F. Ü.* Journal of Science and Engineering Sciences, *17*(2), 442-448.
12. Bohuslav, R. V. (1980). *A method for dealing with attitudes and anxieties in mathematics* (Doctoral dissertation). Nova University.
13. Bulmahn, B. J., & Young, D. M. (1982). On the transmission of mathematics anxiety. *Arithmetic Teacher*, *30*(3), 55-56.
14. Burris, L. (2011). *The ımportance of schoolwide enrichment programs in elementary school settings* (Master dissertation). University of California.
15. Büyüköztürk, Ş. (2011). *Analysis of design and data of pretest-posttest control group of experimental designs.* Ankara: PegemA Publishing
16. Byrd, P. (1982). *A descriptive study of mathematics anxiety: Its nature and antecedents* (Doctoral dissertation). Indiana University.
17. Campbell, D. T., & Stanley, C. J. (1963). *Experimental and quasi-experimental designs for research*. Houghton Mifflin: Boston.
18. Clute, P. S. (1984). Mathematics anxiety, ınstructional method and achievement in a survey course in college mathematics. *Journal for Research in Mathematics Education, 15*, 50-58.
19. Cohen, J. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Erlbaum.
20. Çepni, S. (2012). Introduction to research and project works. Trabzon: Celepler Printing.
21. Davis, G. A., & Rimm, S. C. (1989). *Education of the gifted and talented.* New Jersey: Prentice Hall, Inc.
22. Dreger, R. M., & Aiken, L. R. (1957). The ıdentification of number anxiety in a college population. *Journal of Educational Psychology, 48*, 344-351.
23. Eldemir, H. H. (2006). *Sınıf öğretmeni adaylarının matematik kaygısının bazı psikososyal değişkenler açısından incelenmesi (Cumhuriyet üniversitesi örneği)* (Yüksek Lisans Tezi). Cumhuriyet University Institute of Social Sciences, Sivas.
24. Enç, M. (1979). Superior brain power. Ankara: Ankara University, Publications of Faculty of Education.
25. Ergenç, T. S. (2011). *İlköğretim yedinci sınıf öğrencilerinin matematik dersi bilişsel hazır bulunuşluk düzeyleri ile matematik kaygı düzeyleri arasındaki ilişkinin incelenmesi* (Yüksek lisans tezi). Osmangazi University Institute of Educational Sciences, Eskişehir.
26. Ertekin, E., Dönmez, G. & Özel, S. (2006). Psychometric properties of the Mathematics Anxiety Scale. Education and Science, *31*(140), 26-33.

27. Faust, M. W. (1992) *Analysis of physiological reactivity in mathematics anxiety*. (Doctoral dissertation). Bowling Green State University.
28. Fennema, E., & Sherman, J.A. (1976). Fennema-Sherman mathematics attitude scale: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *JAS Catalog of Selected Documents in Psychology, 6*(1). 31.
29. Fitzgerald, S. M. (1997) *The relationship between anxiety and statistics achievement: a meta–analysis* (Doctoral dissertation). University of Toledo.
30. Genshaft, J. (1982). The use of cognitive behavior therapy for reducing math anxiety. *School Psychology Review, 11,* 32-34.
31. Greenwood, J. (1984). My anxieties about math anxiety. *Mathematics Teacher, 77*, 662-663.
32. Gürel, R. (2011). *İlköğretim ikinci kademede okuyan üstün yetenekli olan ve olmayan öğrencilerin matematik kaygı düzeyleri ve bunların kaynakları* (Yüksek lisans tezi). Hacettepe University Institute of Social Sciences, Ankara.
33. Hart, L. (1992). *Anchormath: The brain-compatible approach to learning.* Village of Oa Creek, AZ Books for Educators.
34. Hartson, D. J. (1982). Cause for anxiety. *The Time Educational Supplement, 3460*, 43-44.
35. He, H. (2007). *Adolescents' perception of parental and peer mathematics anxiety and attitude toward mathematics: A comparative study of European-American and mainland-Chinese student* (Doctoral dissertation). Washington State University.
36. Hembree, R. (1990). The nature effects and relief of mathematics anxiety. *Journal of Research in Mathematics Education, 21*(1), 33-46.
37. Keçeci, T. (2011). Struggle paths with math anxiety and fear. 2nd International Conference on New Trends in Education and Their Implications. 27-29 April, 2011 Antalya-Turkey.
38. Ma, X., &, Xu, J.(2004), The causal ordering of mathematics anxiety and mathematics achievement: a longitudinal panel analysis. *Journal of Adolescence, 27*, 65-179.
39. Natali, M. (2001). *A comparative and interpretive study of the effects of traditional multiple choice assessment with generative alternative assessment on state anxiety and mathematics achievement of six grade students*. (Doctoral dissertation). St. John's University, New York.
40. Nazlıçiçek, N. (2007). A model study declatory mathematics achievements of tenth year students (Doctoral dissertation). Yıldız Teknik University Institute of Social Sciences, İstanbul.
41. Newstead, K. (1998) Aspects of children's mathematics anxiety. *Educational Studies in Mathematics, 36*(1), 53-71.
42. Oaks, A. B. (1989). A Cognitive Root to Math Anxiety, Proceedings of National Conference on Women in Mathematics and the Sciences, Cloud University.
43. Oropesa, L. M. (1993) *Mathematics anxiety and course content: ın search of a discrete correlation* (Doctoral dissertation). University of Miami.

44. Özer, S. (2015). *ARCS motivasyon modeline göre geliştirilen etkileşimli e-kitapların öğrencilerin akademik başarıları, matematik kaygıları ve motivasyonlarına etkisi* (Yüksek lisans tezi). Fırat University Institute of Educational Sciences, Elazığ.
45. Renzulli, J. S., & Smith, L. H. (1978). *The compactor*. Mansfield Center, CT: Creative Learning Press.
46. Renzulli, J. S., & Reis, S. M. (1985). *The schoolwide enrichment model: A comprehensive plan for educational excellence*. Mansfield Center, CT: Creative Learning Press.
47. Renzulli, J. S., & Reis, S. M. (1997). The schoolwide enrichment model: New directions for developing high-end learning. In N. Colangelo & G. Davis (Eds.), *Handbook of gifted education* (pp. 136-154). Mansfield Center, CT: Creative Learning Press.
48. Richardson, F. C., & Suinn, R. M. (1972). The mathematics anxiety rating scale: Psychometric data. *Journal of Counseling Psychology, 19*, 551-554.
49. Robertson, D. F., & Claesgens, J. (1983). *Math anxiety: Causes and solutions.* Paper presented at the meeting of the Minnesota Vocational Summer Conference of Area Vocational-Technical Institutes, Minneapolis, Minn.
50. Strawderman, V. W. (1985) *A description of mathematics anxiety using an ıntegrative model* (Doctoral dissertation). Georgia State University.
51. Suinn, R. M., Taylor, S., & Edwards, R. W. (1988). Suinn mathematics anxiety rating scale for elementary school students (MARS-E): Psychometric and normative data. *Educational and Psychological Measurement, 48*, 979-986.
52. Şahin, F. Y. (2000). Mathematics anxiety. Educational surveys, *2*(1), 75-79.
53. Şentürk, B. (2010). *İlköğretim beşinci sınıf öğrencilerinin genel başarıları, matematik başarıları, matematik dersine yönelik tutumları ve matematik kaygıları arasındaki ilişki* (Yüksek lisans tezi). Afyonkocatepe University Institute of Social Sciences, Afyon.
54. Thomas, R.(1998), *A comparison between male and female mathematics anxiety at community college.* (Master dissertation). Central Connecticut University.
55. Tobias, S. (1978). *Overcoming math anxiety*. New York: Norton.
56. Tobias, S. (1991). What's wrong with the process? *Change, 24*(3), 13-19.
57. Uusimaki, L., & Nason, R. (2004, July). Causes underlying pre-service teachers' negative beliefs and anxieties about mathematics. *International Group for the Psychology of Mathematics Education 4*, 369-376.
58. Üldaş, Ü. (2005). *Öğretmen ve öğretmen adaylarına yönelik matematik kaygı ölçeğinin geliştirilmesi ve matematik kaygısına ilişkin bir değerlendirme* (Yüksek lisans tezi). Marmara University, İstanbul.
59. Viator, P. D. (2007). *Identification of factors that reduce mathematics anxiety of preservice elementary teachers in mathematics content courses* (Doctoral dissertation). Southern University A & M College.
60. Wigfield, A., & Meece, J. (1988). Math anxiety in elementary and secondary school students. *Journal of Educational Psychology, 80*, 210-216.

61. Williams, W. V. (1988). Answers to questions about math anxiety. *School Science and Mathematics, 88*(2). 95-103.
62. Yenilmez, K. & Özbey, N. (2006). A study on mathematics anxiety levels of students of private school and public school. Journal of the Faculty of Education, *19*(2), 431- 448.
63. URL-1: http://www.cnnturk.com/2013/turkiye/12/04/pisa-sonuclari-aciklandi-turkiyenin-egitim-sisteminin-durumu/733167.0/index.html (Date accessed: 25 October 2014
64. URL-2: http://www.Ebuline.Com/Turkce/Arsiv/3_1.Aspx
65. URL-3: http://www.mathgoodies.com/articles/math_anxiety.html (Date accessed: 13 December 2015