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Çocuk Edebiyatıyla Bütünleştirilmiş Matematik Dersinin Problem Çözme Tutumuna, Matematiksel İlişkilendirmeye ve Matematik Özyeterliğine Etkisi[1]

The Effect of Integrated Maths Lessons with Children's Literature on Problem Solving Attitudes and Self-Efficacy

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Özet

Bu araştırmanın amacı, çocuk edebiyatıyla bütünleştirilmiş matematik derslerinin 8. sınıf öğrencilerinin matematik problemi çözmeye yönelik tutumlarına, problem çözme becerilerine ve stratejilerine, matematiksel ilişkilendirme özyeterlikleri ile matematiksel özyeterlik düzeylerine etkisini incelemektir. Araştırmada deneysel araştırma yöntemlerinden öntest-sontest kontrol gruplu yarı deneysel desen kullanılmıştır. Araştırma 30 sekizinci sınıf öğrencisi ile yürütülmüştür. Araştırmanın verileri Matematik Problemi Çözmeye Yönelik Tutum Ölçeği, Problem Çözme Beceri ve Stratejileri Anketi, Matematiksel Özyeterlik Ölçeği ve Matematiksel İlişkilendirme Özyeterlik Ölçeği kullanılarak elde edilmiştir. Veriler Kolmogorov Smirnov, Shapiro Wilk, İlişkili Örneklemler T-testi, Wilcoxon İşaretli Sıralar testi, İlişkisiz Örneklemler T-testi ve Mann Whitney-U testleri kullanılarak analiz edilmiştir. Araştırmadan elde edilen bulgulara göre, çocuk edebiyatı ile bütünleştirilmiş matematik dersleri sonrası deney ve kontrol gruplarında bulunan 8. sınıf öğrencilerinin matematik problemi çözmeye yönelik tutum, matematiksel ilişkilendirme özyeterliği ve matematiksel özyeterlik düzeylerine ilişkin ön test ve son test puanları arasında istatistiksel olarak anlamlı bir fark bulunamamıştır. Ancak deney grubu öğrencilerinin puanlarında problem çözme beceri ve stratejileri anketinin "Problemin Çözümünü Değerlendirme" başlığına ilişkin olumlu yönde bir değişimin olduğu gözlemlenmiştir. Araştırmanın bu bulgusunun çocuk edebiyatı ve matematik öğretimi bütünleştirmesinin problem çözme aşamalarında önemli bir yeri olan problemin çözümünü değerlendirme aşamasına katkı sağlayabileceği düşünülmektedir.

Anahtar Kelimeler: Çocuk edebiyatı, Matematik eğitimi, Problem çözme.

Abstract

The aim of this study is to examine the effect of mathematics courses integrated with children's literature on the problem-solving skills and strategies, the attitudes towards mathematical problem solving, the mathematical connection self-efficacy and mathematical self-efficacy levels of 8th grade students. The quasi-experimental design with pretest-posttest control group was used. The research was conducted with

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30 students. The data were obtained by using the Attitude Scale towards Mathematical Problem-Solving, the Problem-Solving Skills and Strategies Questionnaire, the Mathematical Self-Efficacy Scale and the Mathematical Connection Self-Efficacy Scale. Data were analyzed using Kolmogorov Smirnov, Shapiro Wilk, related samples t-test, Wilcoxon Signed Ranks test, independent samples t-test and Mann Whitney U tests. No statistically significant difference was found between the pretest and posttest scores of the experiment and control groups. However, it was observed that there was a positive change in the scores of the experiment group in the "Assessment of the Problem Solving" sub-topic of the problem-solving skills and strategies questionnaire. This finding can contribute to the evaluation of the solution of the problem, which has an important role in the problem-solving stages. Finally, the current findings differ slightly from the literature that argues that children's literature integration has many contributions. Some suggestions for further studies and implications have been made according to the results.

Keywords: Children's literature, Mathematics education, Problem-solving.

1. Introduction

Mathematics is a vital tool in the leading the daily life and is a part of it (White, 2003). However, individuals have various difficulties in connecting mathematics with both daily life and other fields (Cooper & Haries, 2002). In this respect, problem-solving, which is the focus of mathematics education, serves as a bridge to the connection of mathematics with daily life and other fields (National Council of Mathematics Teachers [NCTM], 2000). To support mathematical connection and mathematical literacy skills, especially in recent years, the importance of interdisciplinary connections and approaching problems from different perspectives has become increasing, and the practice of integrating different disciplines in education comes to the fore (Aladağ & Şahinkaya, 2013; Crowther, 2012; Kansızoğlu, 2014; Lipszyc, 2012; Şahbaz & Çekici, 2012).

However, results from national and international exams such as the Programme for International Student Assessment (PISA) and the Monitoring and Evaluation of Academic Skills (ABIDE), in which these skills are assessed, show that the reading and mathematics skills of students in Turkey remain well below the average of the Organization for Economic Co-operation and Development (OECD) countries (Özmusul & Kaya, 2014). The researchers note that one of the reasons for the poor performance, especially aligned with mathematics, is related to the number of books found at home and that there is a positive relationship between the number of books and math performance (Kahraman & Çelik, 2017; Türkan et al., 2015).

In parallel, it is suggested that an integrated teaching approach by combining the fields of reading and mathematics can be a good starting point for learning mathematical concepts and a tool to attract children's interests (Boavida et al., 2008). Mathematics teaching and children's literature integration, where language-related skills such as reading are employed, are one of the approaches that can be used for this purpose. Because research shows that integrated mathematics courses have a positive effect on mathematics success (Boebinger, 2015; Durmaz & Miçooğulları, 2021; Green, 2013; Lemonidis & Kaiafa, 2019; Munro, 2013; Stone, 2016; Thomas & Feng, 2015), literary success (Boebinger, 2015), geometry success/skills (Capraro & Capraro, 2006; Hong, 1996), interest/motivation in mathematics (Hong, 1996; Jennings et al., 1992; Mink & Fraser, 2005), attitude towards mathematics (Munro, 2013), problem-solving (Cankoy, 2011; Lynch, 2006), critical thinking, procedural-conceptual knowledge (Huffman, 2012), using mathematics in daily life (Moore, 2008; Munro, 2013; Young, 2001), behavioral problems (Whitney, 2011), and reducing mathematical anxiety (Green, 2013). However, some studies have also found that such integration has no effect on some issues such as attitudes towards problems (White, 2003), mathematical success (Hassinger-Das et al., 2015), attitude towards mathematics (Stone, 2016), and reducing of behavioral disorders (Whitney et

al., 2017). Thus, it can be said that the research findings on the effect of integrated mathematics lessons with children's literature are complicated.

It has been known that children's literary products have been integrated with mathematics courses for a very long time (Braddon, Hall & Taylor, 1993). This is because when mathematics is integrated with other disciplines, students realize how necessary and important mathematics is, and how it is used in fields and disciplines other than itself (Sarpkaya Aktaş, 2020). However, it is known that studies aimed at integrating children's literature and mathematics teaching in both national and international literature have been conducted mostly with preschool students and the number of experimental studies is quite small (Edelman et al., 2019; Van den Heuvel Panhuizen & Elia, 2012). Therefore, research on the integration of children's literature and mathematics teaching remains important (White, 2003).

It is thought that the current study will contribute to the literature in various aspects, because it is an experimental study conducted with students at the middle school level. In addition, the fact that similar studies were not found in the context of attitudes towards problem-solving, problem-solving skills and strategies, mathematical self-efficacy, and mathematical connection self-efficacy variables examined within the scope of the study is considered as one of the original aspects of the study. When we examine the results of the former research on these variables there is an effect of problem-solving instruction on the attitude of problem-solving teaching towards mathematics, attitude towards problem solving, self-efficacy, use of problem-solving strategies, and problem solving success (Durmaz, 2014; Higgins, 1997); there appears to be a strong relationship between problem solving and reading comprehension (Vilenius-Tuohimaa et al., 2008). In addition to this, mathematics self-efficacy is aligned with success and attitude (Ayan, 2014; Ayotola & Adedeji, 2009; Özüdoğru & Bümen, 2016; Öztürk & Şahin, 2015; Reçber, 2011; Usher, 2009). However, there are studies that show no meaningful relationship between problem solving success and mathematical self-efficacy (Taşkın et al., 2012). Research on mathematical connection is about the structures of teachers, preservice teachers and students, teachers' knowledge, and in-class practices (Businskas, 2008; Coşkun, 2013; Evitts, 2004; Özgen, 2013), the nature of activities for mathematical connection in the curriculum of different countries (Pepin & Haggarty, 2007), the level of mathematical connection skills of students and its relationship with different variables (Kaya, 2020; Mumcu & Aktaş, 2019; Trihatun, 2019).

In the scope of the current study, the effect of the integrated mathematics lessons with children's literature on the attitudes towards mathematical problem solving, the problem solving and strategies, the mathematical self-efficacy, and the mathematical connection self-efficacy were investigated. In the literature the studies on the attitudes towards mathematical problem solving are about gifted students' (Doğan & Çetin, 2018); the relation between the problem-solving attitude and other variables such as success (Kaba, 2017), and epistemological beliefs (Özgen et al., 2019) etc. It can be inferred from thw studies that students are generally in trouble with understanding the problem (Ertane Baş & Özturan Sağırlı, 2021). This difficulty may affect the attitudes of the students towards problem-solving in a negative way and vice versa (Güven & Çabakçor, 2013; İlhan et al., 2021). In addition to this it is known that middle school students face difficulty to solve story problems according to number problems (Ev Çimen & Kartal, 2021). For this reason, it is thought that presenting the problems in a context as in children's literary products may have various gains for students.

Self-efficacy for mathematical connection is about the ability of aligning the mathematical concepts with each other, building connections between mathematics and different fields, and looking the world with mathematical eyes. The power of seeing the mathematical patterns of the world, is linked between mathematics success and mathematical self-efficacy (Kaya, 2020). One of the ways of

strengthening the mathematical connection self-efficacy is to integrate mathematics with children's literature (Whitin & Wilde, 1992). From this point of view, the fact that an experimental study examining the effect of middle school-level mathematics courses integrated with children's literature on the attitudes towards mathematical problem-solving, problem-solving and strategies, mathematical self-efficacy, and mathematical connection self-efficacy has not been carried out is one of the motivations for carrying out this study. Therefore, the aim of the research was determined as to demonstrate the effect of mathematics courses integrated with children's literature on the problem-solving skills and strategies, attitudes towards problem solving, mathematical connection self-efficacy, and mathematical self-efficacy of 8th grade students. The problem of the research is "Is there a statistically significant difference between the experiment and control groups' pre-test and post-test scores in terms of the attitudes towards mathematical problem-solving, mathematical self-efficacy, problem-solving skills and strategies, and mathematical connection self-efficacy?"

2. Methodology

This section provides details about the design of the study, study group, data collection tools, data collection process, data analysis, validity, reliability and ethics.

2.1. The Design of The Study

In this study, the effect of mathematics courses integrated with children's literature on various variables was examined one of the pre-experimental designs as a pre-test post-test unequal control group model (Özmen, 2019) was used. While a mathematics course integrated with children's literature was applied in the experimental group, the mathematics courses were applied according to the curriculum without any intervention to the control group. The dependent variables of the study are attitude towards problem solving, mathematical self-efficacy, mathematical connection self-efficacy, and problem-solving skills and strategies.

2.2. Study Group

The study group consists of 30 eighth graders studying in the 2021-2022 academic year autumn term of a public school in a province in the Black Sea Region. There are 4 classes at the eighth-grade level in this school, but due to the global pandemic, the classes are made up of 15 students each. For this reason, 15 students took part in the experimental and control groups. In the study, the mathematics course grades of the students from the previous academic year were taken into consideration when determining the experiment and control groups. Accordingly, the two classes closest to each other in terms of their grades were selected for research. After obtaining the necessary legal permissions prior to the research, the scope of the research was shared with the school administration and their support was provided in this regard.

2.3. Data Collection Tools

In the research, data collection tools are Attitude Towards Mathematics Problem Solving Scale (Çanakçı, 2008), Problem-Solving Skills and Strategies Questionnaire (Çömlekoğlu, 2001), Mathematical Self-efficacy Scale (Umay, 2001), and Mathematical Connection Self-efficacy Scale (Özgen & Bindak, 2018). The properties of these data collection tools are described in order.

2.3.1. Attitudes Towards Mathematical Problem-Solving Scale

It was developed by Çanakçı (2008) to determine the attitudes of elementary school students towards solving the math problem. This scale was used for examining 5-8th grades students' attitudes in the literature (Özgen et al. ,2017). The scale consists of 19 5-point Likert-type items in two factors: the liking (1, 4, 7, 10, 12, 13, 14, 16, 17, 18), and teaching factors (2, 3, 5, 6, 8, 9, 11, 15, 19). Items 1, 7, 10, 12, 13, 14, 16 and 18 of the scale are negative. The internal coefficient of consistency for the entire scale is .848; the factor of liking is .869; the factor of teaching is .777. The appropriateness of this scale (namely items) to 8th graders are asked middle school mathematics teachers and then it was used for this study. One of items of this scale is "There is more than one way for solving a problem".

2.3.2. Problem Solving and Strategies Scale

It was developed by Çömlekoğlu (2001) to express opinions on the problem-solving steps of students based on Polya's problem solving stages. It consists of 21 items. The four sub-topics of the questionnaire are respectively understanding the problem (1, 2, 3, 4, 5, 6, 8, 10 and 12); plan for solving the problem (5, 9, 17 and 21); the implementation of the solution of the problem (7, 13 and 20), and the evaluation of the solution of the problem (11, 14, 15, 16, 18 and 19). The internal coefficient of consistency for the entire questionnaire is .78; .69 for the sub-topic of understanding the problem; .77 for the sub-topic of plan for the solution; .22 for the sub-topic of the implementation of the solution; .64 for the sub-topic of evaluating the solution of the problem. Items 1, 6, 8, 12, 14, 19 and 20 of the questions are negative. The appropriateness of this questionnaire to 8th graders were asked middle school mathematics teachers and then it was decided to use for this study by the researchers. One of items of this questionnaire is "I do not need to understand the question to solve the problem".

2.3.3. Mathematical Self-Efficacy Scale

The scale developed by Umay (2001) consists of 14 items. This scale was used for the middle school students in the literature (Öztürk & Kurtuluş, 2017). Scale consists of three factors: mathematics self-perception (5, 10, 11, 12, 13), awareness of behaviors in mathematics subjects (4, 5, 6, 7, 8, 9) and the ability to transform mathematics into life skills (1, 2, 14). Eight of the items that make up the scale are positive (1, 2, 4, 5, 8, 9, 13 and 14), while 6 (3, 6,7, 10, 11 and 12) are negative. The validity coefficient for the entire scale is .88. The appropriateness of this scale (namely items) to 8th graders are asked middle school mathematics teachers and then it was used for this study. One of items of this scale is "I think that I am able to use mathematics actively in my daily life"

2.3.4. Mathematical Connection Self-Efficacy Scale

The scale developed by Özgen and Bindak (2018) consists of 22 items. This scale was used for the middle school students in the literature (Kaya, 2020). The scale consists of five factors which are respectively difficulty (6, 7, 11, 13, 16, 21), using mathematics (4, 5, 8, 10, 12), connecting mathematics in itself (17, 18, 19, 20, 22), connecting with daily life (1, 2, 3) and connecting with different disciplines (9, 14, 15). 6 of the items (6, 7, 11, 13, 16, 21) are negative, and 18 are positive. The internal coefficient of the scale is .85. The appropriateness of this scale (namely items) to 8th graders are asked middle school mathematics teachers and then it was used for this study. One of items of this scale is "I know the usage areas of mathematical concepts in daily life."

2.4. Data Collection Process

The data collection tools were applied to 30 students in the experimental and control groups at the beginning and the end of the experiment. The necessary permissions and documents for the implementation of the data collection tools have been obtained from the relevant institutions. One lesson hour was given at both times to apply the data collections tools and it was observed that the given time was sufficient for both groups. In the process of determining the experimental group to be applied in the school, which has four classes at the eighth-grade level, and the control group the end-of-term mathematics grades were obtained through the E-School system from the school administration and the two classes with the closest grades were selected for the study.

2.5. Implementation Process

During the application process, mathematics courses integrated with children's literature were conducted with the experimental group for five weeks, one day a week and two lesson hours per week. The problems used in the experimental group were obtained from the children's book "Shehrazad's 101 Play, Volume 1" (Yalman & Demirkol, 2012) and the necessary permissions were obtained from the publishers and the authors. Eight problems which were suitable for the 8th grade level were selected based on pilot study and expert opinions in determining the problems to be used in the research. For the problems selected for the implementation process, a five-week mathematics lesson plans integrated with children's literature have been prepared by the author/s regarding the integrated lesson planning frameworks and read aloud technic in the literature (see del Prado Hill et al., 2016; Luedkte & Sorvaag, 2018; Trelease, 2006).

In "Shehrazad's 101 Play, Volume 1" (Yalman & Demirkol, 2012) book the author/s picked non-routine problems which are apart from the 8^{th} grade mathematics curriculum. That is, all problems can be solved with basic operations. While the experimental group students worked on non-routine problems and followed the current mathematics curriculum the control group only followed the current mathematics curriculum. One the author/s was the teacher of both groups. So, the author/s could control the researcher effect. In the implementation process, the experimental group students worked on these problems in order: 29^{th} problem for the 1^{st} week; 33^{rd} and 43^{rd} problems for 2^{nd} week; 14^{th} and 45^{th} problems for 3^{rd} week; 26^{th} and 34^{th} problems for 4^{th} week and 35^{th} problem for the 5^{th} week. The author/s thought that these problems are more convenient for 8^{th} grade students. A sample lesson structure which is integrated with the book given in the Table 1.

Table 1. *A Sample Lesson Structure (60 mins)*

Time	*Teacher Actions*
10m	Since the whole book cannot be read during the lesson and the students had not read the book before, the introduction part of the book was distributed in order to draw the attention of the students to the book and the lesson. Students were given time to read the relevant pages (pages 1-3). After the reading time was over, the teacher read aloud the story and then the students were asked the following questions: "What do you remember from this story? What could be the reason Scheherazade asks Shahriar about mathematics problems?" After the students' answers, they are informed about the learning goal by telling them "Today we will work on one of the mathematics problems that Shahrazad asked Shahriar".
15m	Since the students had an idea about the context of the book, the teacher made the students work on the 29th problem. The relevant pages (page 78) handed out to the students where "Four Consecutive Numbers" titled problem and the story

Time	*Teacher Actions*
	(see following photo, the author/s could not share the whole pages which were used in this study because of the copyright issues about the publishers and the book's authors'). The problem is "The product of four consecutive numbers is either 0 or 4. Is it right?"
	When the reading time was over, the teacher read aloud the story and then the following questions were asked to the students in order: "What do we need to focus on in order to reach the solution of this problem? In order to find the ones digit of the product in a multiplication, which digits of the factors do we need to examine?" Students were given time to understand the problem and plan for solution (Polya's first and second stages). 
10m	The following questions were discussed in order to contribute to the students' planning for the solution: "How can we solve the problem? For example, can you solve this problem by drawing a diagram?"
5m	After the students' solutions were examined, the pages containing the solution in the book were handed out to the students (pages 79). Then a whole class discussion was conducted on the solution in the book. The questions directed to the students were as follows: "What kind of method was used in this solution? Can anyone summarize this solution? Is it possible to mention a trick for solving the problem? Why?" After discussing these questions, the solutions offered by the students and the solution in the book were evaluated. Then the class was moved on to the second problem.
20m	The second problem was read aloud by the teacher. This problem is "The product of four consecutive numbers is always a multiple of 24. Is it correct?" Students were given time to think in groups. After the time is over, students wre asked to share their solutions for the problem with the class. Then, related with the problem, the following questions were asked to the students in order: "Is there always a multiple of 2 in four consecutive numbers? Is there always a multiple of 3 in four consecutive numbers? Is there always a multiple of 4 in four consecutive numbers? Is there always a multiple of 5 in four consecutive numbers? Why?" After discussing the answers to these questions, the students were asked for their ideas about the way to be followed to solve the relevant problem. Then the solution in the book was shared with the students. Before discussing the solution given in the book, students were asked to explain why the solution in the book is correct and summarize the solution. They are asked to evaluate the similarities and differences between their own solutions and the solution in the book. After the discussions within the scope of the execute the plan phase, which is the third of the problem-solving stages of Polya, and the look back phase, which is the last phase, were over, a similar problem was posed in the last phase. "If you were asked to multiply five consecutive numbers, which number would always be a multiple of the product?" problem was given to the students as homework.

As seen in Table 1. author/s shaped the integrated mathematics lessons mainly on read aloud method. In this process, the teacher firstly asked students to read the story and then posed questions about the problem-solving process and made them to think about their problem solution stages. All lessons were conducted in a similar structure in the experimental group.

2.6. Data Analysis

To decide on the statistical test that is appropriate in the analysis process of the data, hypothetical tests were performed first. In the process of testing the assumptions, normalization tests were carried out on the pre-test, post-test, and pre-posttest difference scores of the groups. Kolmogorov Smirnov and Shapiro Wilk tests were used to test normality. In line with the results of the analysis to test the normality, it was decided which of the parametric or non-parametric tests would be applied. After examining the assumptions, descriptive statistics on the sub-dimensions of the scales and the questionnaire used in line with the sub-problems of the study were calculated. Negative expressions that should be counter-rated on the scales before this is performed are recoded in accordance with the scale usage reverse-encoded to be 1>5>4>4, 3>3, 4>2 and 5>1. Then, for each sub-factors of all scales, participant scores are divided by the number of items in the sub-factors. Finally, mean, median and mode calculations were performed. In addition, standard deviations have been determined for each score type. After descriptive statistical calculations were made, hypothesis tests were performed to answer research problems by examining assumptions. For this purpose, the scores obtained from the scales and questionnaire were compared with the experimental and control group according to the pre-test, post-test, and pre-posttest difference scores of these groups. To compare the two measurements on the same group, related samples t-test from preferred parametric tests and Wilcoxon Signed Ranks test from non-parametric tests were used. The difference data between the participants' pre-test, post-test and pre-posttest scores were analyzed using the Independent Samples t-test from parametric tests and the Mann Whitney-U test from non-parametric tests.

2.7. Validity and Reliability

The measures taken to ensure the validity and reliability of the research are as follows: The research data were obtained simultaneously from the experimental group and control groups at two different times, before (pre-test) and after the experimental intervention (post-test). Information on the reliability of the scales and the questionnaire used in the research is given in the topics where the scales and the questionnaire are introduced.

To prevent the instruction/trainer effect, experimental instruction was carried out by the teacher who is already conducting the mathematics courses of the experimental and control groups both. The trainer of this study was one the researchers and s/he taught both experimental and control groups both, because s/he was their mathematics teacher at the school. In this way, the researchers could control the process by means of the research. To prevent the time and maturation effect that threatens internal validity, the instruction is limited to 5 weeks and encoded by two researchers independent of pre-tests and post-tests to prevent the effect of data collection tools (Özmen, 2019).

2.8. Ethics, Acknowledgements, Conflicts of Interest and Authorship Contribution Statement

The first of the measures taken to carry out the research within an ethical framework is that ethics committee approval and legal permission have been obtained from the necessary institutions. This research has the permission of the ethics committee issued by Bolu Abant İzzet Baysal University Human Research in Social Sciences Ethics Committee on 09.24.2021 with the decision no 2021/04 (Protocol No: 2021/194). Throughout the process from planning, implementation, data collection to analysis of data, all the rules specified to be followed within the scope of "Scientific Research and Publication Ethics Directive of Higher Education Institutions" were complied with. None of the actions

specified under the second part of the directive, "Actions Contrary to Scientific Research and Publication Ethics", have been carried out. Scientific, ethical and quotation rules were observed in the writing process of this research; no falsification has been made to the collected data. In addition to the approval of the ethics committee, voluntary consent forms of the participants in the study group were provided.

The data of this research was obtained from Meltem Yalçın's master thesis "The Effect of Mathematics Integrated with Children's Literature on 8th Grade Students' Problem Solving Skills, Mathematical Connection and Self-Efficacy Levels" which was presented to Bolu Abant İzzet Baysal University Graduate Education Institute Mathematics and Science Education/Mathematics Education Graduate Program and supervised by Assoc. Prof. Dr. Recai AKKAYA and Assist. Prof. Dr. Burcu DURMAZ.

The contribution rates of the authors to the research are 50% for the first author and 25% for the second and third authors. While the first author contributed to all phases of the research, the second and third authors contributed and made revisions in the methods, findings, and conclusion sections. There are no conflicts of interest in this study.

3. Findings

The findings of the study are discussed in subheadings of each data collection tool.

3.1. Findings from The Attitude Towards Mathematics Problem Solving Scale (ATMPSS)

The normality of the distribution of scores was first examined in comparison of the students in the experimental and control group in terms of pre-test, post-test and pre-posttest difference scores obtained from the scale. Accordingly, in the analysis of the scores, the Mann Whitney U test was used to compare the post-test scores obtained only from the liking sub-dimension of the scale and the pretest-posttest difference scores obtained from the teaching sub-dimension, while comparisons of other data were made with the Independent Samples t-test. The results of the analysis are given in Table 2.

Table 2. *The Comparison of ATMPSS Pre-Test, Post-Test and Pre-PostTest Difference Scores (independent samples t-test)*

Sub-dimension/Factor	*Measure*	*Group*	*n*	*Ort.*	*S*	*SD*	*t*	*p*
Liking	Pre-test	Experiment	15	3.06	0.80	28	-1.882	0.070
		Control	15	3.64	0.86			
Teaching		Experiment	15	4.10	0.42	28	-0.878	0.388
		Control	15	4.23	0.40			
ATMPSS		Experiment	15	3.55	0.51	28	-1.891	0.069
		Control	15	3.92	0.54			
Teaching	Post-test	Experiment	15	4.18	0.29	28	-0.358	0.723
		Control	15	4.22	0.37			
ATMPSS		Experiment	15	3.79	0.54	28	-0.389	0.701
		Control	15	3.86	0.49			
Liking	Difference Scores	Experiment	15	0.37	0.99	28	1.504	0.144
		Control	15	-0.10	0.71			
ATMPSS		Experiment	15	0.23	0.68	28	1.299	0.205
		Control	15	-0.05	0.53			

When Table 2 is examined, it is seen that the ATMPSS scale (excluding the scores obtained by the experiment and control groups from the post-test of the liking sub-dimension and the difference scores obtained from the teaching sub-dimension) did not differ statistically significantly in terms of the experimental and control groups of the pre-test, post-test and difference scores obtained for normal distribution and teaching sub-dimensions (Can, 2020). Mann Whitney U test was used for other scores obtained from the ATMPSS scale that did not show normal distribution and the analysis results were given in Table 3.

Table 3. *ATMPSS Comparison of Post-Test and Difference Scores (Mann Whitney U test)*

Dimension/ Factor	*Measure*	*Group*	*n*	*Rank Mean*	*SS*	*U*	*p*
Liking	Post-test	Experiment	15	14.77	0.93	101.500	0.647
		Control	15	16.23	0.82		
Teaching	Diff.	Experiment	15	16.43	0.53	98.500	0.559
		Control	15	14.57	0.41		

There is no statistically significant difference in terms of the scores examined according to Table 3. Based on these findings, it can be inferenced that mathematics courses integrated with children's literature have no statistically significant effect on the attitudes of 8th grade students towards solving the mathematics problem.

3.2. Findings from the Problem-Solving Skills and Strategies Questionnaire (PSSSQ)

The normality of the distribution of scores was first looked at in comparison of the students in the experimental and control group in terms of pre-test, post-test and pre-posttest difference scores obtained from the questionnaire. Since all the data obtained from the questionnaire showed normal distribution, the independent samples t-test was used. The results of the analysis are given to Table 4.

Table 4. *PSSSQ Pre-Test Post-Test and Comparison of Difference Scores*

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean*	*SS*	*SD*	*t*	*p*
Understanding the Problem	Pre-test	Experiment	15	3.80	0.47	28	0.179	0.859
		Control	15	3.76	0.66			
Planning for the Solution		Experiment	15	3.48	0.68	28	0.176	0.862
		Control	15	3.44	0.69			
Applying the Solution		Experiment	15	3.68	0.61	28	-0.828	0.415
		Control	15	3.84	0.39			
Evaluation of the Solution		Experiment	15	3.27	0.55	28	-0.924	0.363
		Control	15	3.46	0.56			
PSSSQ		Experiment	15	3.59	0.33	28	-0.378	0.709
		Control	15	3.64	0.43			
Understanding the Problem	Post-test	Experiment	15	3.79	0.48	28	0.240	0.812
		Control	15	3.74	0.53			

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean*	*SS*	*SD*	*t*	*p*
Planning for the Solution		Experiment	15	3.20	0.63	28	-1.589	0.123
		Control	15	3.53	0.50			
Applying the Solution		Experiment	15	3.68	0.44	28	-0.841	0.407
		Control	15	3.84	0.56			
Evaluation of the Solution		Experiment	15	3.82	0.65	28	1.487	0.149
		Control	15	3.50	0.52			
PSSSQ		Experiment	15	3.70	0.36	28	0.302	0.765
		Control	15	3.66	0.38			
Understanding the Problem	Diff.	Experiment	15	-0.00	0.35	28	0.036	0.972
		Control	15	-0.01	0.64			
Planning for the Solution		Experiment	15	-0.28	0.91	28	-1.272	0.214
		Control	15	0.08	0.69			
Applying the Solution		Experiment	15	0.00	0.70	28	0.000	1.000
		Control	15	0.00	0.45			
Evaluation of the Solution		Experiment	15	0.54	0.94	28	1.720	0.098
		Control	15	0.03	0.66			
PSSSQ		Experiment	15	0.11	0.40	28	0.618	0.542
		Control	15	0.01	0.43			

When Table 4 is examined, it is seen that the pre-test, post-test, and difference scores obtained from all sub-topics of the PSSS questionnaire do not differ statistically significantly in terms of experiment and control groups (Can, 2020). Accordingly, it can be inferred that the intervention has no meaningful effect on the problem-solving skills and strategies of 8th grade students.

3.3. Findings from the Mathematical Connection Self-Efficacy Scale (MCSS)

The normality of the distribution of scores was examined firstly in comparison of the students in the experimental and control groups in terms of pre-test, post-test and pre-posttest difference scores obtained from the scale. In the comparison of pre-test, posttest, and difference scores in terms of experiment and control groups, Mann Whitney U test for post-test scores of the scale only "Connection with Daily Life" dimension and independent samples t-test for other scores were used. The results of the analysis are given in Table 5 and Table 6 respectively.

Table 5. *MCSS Pre-Test-Post-test and Comparison of Difference Scores (independent samples t-test)*

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean*	*SS*	*SD*	*t*	*p*
Difficulty	Pre-test	Experiment	15	3.34	0.59	28	0.511	0.613
		Control	15	3.21	0.73			
Using Mathematics		Experiment	15	3.34	0.45	28	0.035	0.157
		Control	15	3.65	0.69			
Connection Mathematics with itself		Experiment	15	3.60	0.52	28	0.214	0.384
		Control	15	3.81	0.76			
Connection Mathematics with Daily Life		Experiment	15	3.37	0.53	28	0.061	0.271
		Control	15	3.64	0.75			
Connection Mathematics with Other Fields		Experiment	15	3.02	0.83	28	0.701	0.332
		Control	15	3.35	1.01			
MCSS		Experiment	15	3.36	0.43	28	-0.836	0.410
		Control	15	3.53	0.63			
Difficulty	Post-test	Experiment	15	3.53	0.54	28	0.150	0.882
		Control	15	3.50	0.66			
Using Mathematics		Experiment	15	3.53	0.32	28	0.230	0.653
		Control	15	3.61	0.59			
Connection Mathematics with itself		Experiment	15	3.46	0.64	28	0.317	0.338
		Control	15	3.73	0.84			
Connection Mathematics with Daily Life		Experiment	15	3.04	0.87	28	0.828	0.149
		Control	15	3.48	0.76			
Difficulty	Diff.	Experiment	15	0.18	0.53	28	-0.485	0.632
		Control	15	0.28	0.50			
Using Mathematics		Experiment	15	0.18	0.62	28	1.088	0.286
		Control	15	-0.04	0.53			
Connection Mathematics with itself		Experiment	15	-0.13	0.70	28	-0.197	0.845
		Control	15	-0.11	0.77			
Connection Mathematics with Daily Life		Experiment	15	0.13	0.57	28	0.096	0.924
		Control	15	0.11	0.68			
Mathematics with Other Fields		Experiment	15	0.02	0.73	28	-0.318	0.753
		Control	15	0.13	1.13			
MCSS		Experiment	15	0.08	0.42	28	0.021	0.983
		Control	15	0.08	0.40			

Based on Table 5, it can be inferred that the pre-test, post-test, and difference scores obtained from the scale's sub-dimensions and itself (excluding the connection with daily life sub-dimension and the post-test scores for the entire scale) do not differ statistically significantly in terms of experiment and control groups. Analysis results on the sub-dimension of connection with daily life and the post-test scores for the entire scale are given in Table 6.

Table 6. *MCSS Comparison of Post-test Scores (Mann Whitney U test)*

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean Rank*	*SS*	*U*	*p*
Connection Mathematics with Daily Life	Post-test	Experiment	15	13.97	0.48	89.500	0.331
		Control	15	17.03	0.68		
MCSS	Post-test	Experiment	15	13.70	0.41	85.500	0.262
		Control	15	17.30	0.50		

According to Table 6, the post-test scores of students in the MCSS total post-test score (U(28)=85.500) and the scale's Connection with Daily Life (U(28)=89.500) sub-dimension do not differ statistically significantly in terms of experiment and control groups. Accordingly, it can be inferred that the intervention has no meaningful effect on the mathematical connection self-efficacy of 8th grade students.

3.4. Findings from the Mathematical Self-Efficacy Scale (MSS)

The normality of the distribution of scores was examined firstly in comparison of the experimental and control groups in terms of pre-test, post-test and pre-posttest difference scores obtained from the scale. Accordingly, the Mann Whitney U test was used to compare the "awareness in behaviors in mathematics subjects" dimension with the post-test score obtained from the entire scale and the difference scores in terms of groups. In all other scores, independent samples t-test was used. The results of the analysis are given in Table 7 and Table 8, respectively.

Table 7. *MSS Pre-Test-Post-test and Comparison of Difference Scores (independent samples t-test)*

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean*	*SS*	*SD*	*t*	*p*
Self-Perception	Pre-test	Experiment	15	3.49	0.77	28	-0.554	0.584
		Control	15	3.66	0.93			
Awareness in Behaviors in Mathematics Subjects		Experiment	15	2.65	0.58	28	-1.449	0.158
		Control	15	2.95	0.54			
Transforming Mathematics into Life Skills		Experiment	15	3.20	0.61	28	-1.919	0.065
		Control	15	3.73	0.88			
MSS		Experiment	15	3.07	0.55	28	-1.334	0.190
		Control	15	3.37	0.67			
Self-Perception	Post-test	Experiment	15	3.73	0.67	28	0.815	0.422
		Control	15	3.48	0.99			
Awareness in Behaviors in Mathematics Subjects		Experiment	15	15	3.24	28	-1.727	0.095
		Control	15	15	3.66			
Transforming Mathematics into Life Skills	Diff.	Experiment	15	0.24	0.78	28	1.403	0.172
		Control	15	-0.18	0.87			
Self-Perception		Experiment	15	0.41	0.80	28	1.378	0.179
		Control	15	0.08	0.42			
		Experiment	15	0.04	0.68	28	0.444	0.660

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean*	*SS*	*SD*	*t*	*p*
Awareness in Behaviors in Mathematics Subjects		Control	15	0.06	0.68			

According to Table 7, it can be inferred that the pre-test, post-test and difference scores obtained from the scale and itself (except for the post-test scores of the awareness sub-dimension in the behaviors in mathematics subjects and the post-test and difference scores obtained from the entire scale) did not differ statistically significantly in terms of the experiment and control groups. The analysis results of the post-test scores of the sub-dimension of awareness in behaviors in mathematics subjects are given in Table 8.

Table 8. *MSS Post-test and Comparison of Difference Scores (Mann Whitney U test)*

Dimension/ Factor	*Measure*	*Group*	*n*	*Mean Rank*	*SS*	*U*	*p*
Awareness in Behaviors in Mathematics Subjects	Post-test	Experiment	15	14.87	0.50	103.000	0.691
		Control	15	16.13	0.54		
MSS	Post-test	Experiment	15	14.87	0.44	103.000	0.693
		Control	15	16.13	0.51		
MSS	Diff.	Experiment	15	17.43	0.63	83.500	0.226
		Control	15	13.57	0.41		

When Table 8 is examined, MSS posttest total score (U(28)=103,000) and difference (U(28)=83,500) scores, awareness in behaviors in mathematics subjects (U(28)=103,000) sub-dimension post-test scores there is no statistically significant difference between the experiment and the control group. Accordingly, it can be inferred that the intervention has no meaningful effect on the mathematical self-efficacy of 8th grade students.

4. Conclusion, Discussion, and Recommendations

In this study, the effect of the mathematics courses which were integrated with children's literature on the 8th grade students' attitudes towards problem-solving, problem-solving skills and strategies, mathematical connection self-efficacy and mathematical self-efficacy was examined. Within the scope of the research, while an instruction was applied that integrated mathematics courses with children's literature for five weeks in the experimental group, no intervention was made in the control group. After the instruction, it was examined whether there was a statistically significant difference between the problem-solving attitude, mathematical self-efficacy, problem-solving skills and strategies, mathematical connection self-efficacy pre-test and post-test scores of the students in the experimental and control groups.

According to the findings of the study, there was no statistically significant difference between experiment and control groups in terms of pre-test posttest difference scores obtained from all sub-dimensions of the attitudes towards solving mathematics problems. This finding of the study also coincides with White's (2003) finding. White (2003) also examined the impact of mathematics teaching through children's literature on students' attitudes towards solving mathematics problems and

conducted a seven-week experimental study with 90 second grade elementary school students. As a result of the research, it was determined that the use of children's literature had no effect on students' attitudes towards solving the mathematics problems. However, Lynch (2006) and Cankoy (2011) found that the effect of mathematics teaching integrated with children's literature on attitudes towards solving the mathematical problem was effective. Lynch (2006) worked with second grade students, and Cankoy (2011) worked with third grade students within a 10-week experimental study, and they determined that the use of children's literature had a positive effect on problem-solving attitudes. In addition to these studies, some findings from different research are remarkable, too. Dayo et al. (2021) found out that digital game-based learning, Tüm and Kutluca (2021) investigated that rich learning environments and, Şanlıdağ and Aykaç (2021) clarified that mind games has a positive impact on attitudes towards problem solving. All these environments have common factors such as learner centered teaching and rich contexts for mathematics. Mathematics teaching and children's literature integration has these features too but after the implementation there is no a meaningful effect. The differences in the findings may be related to the grade levels studied or the duration of the experimental intervention.

When the data obtained from the questionnaire of problem-solving skills and strategies were examined, it was determined that there was no statistically significant difference between experiment and control groups in terms of differential scores obtained from all sub-topics of the questionnaire. However, it was determined that there was a statistically significant difference between the pre-test and post-test scores of the experimental group in the sub-topic of the questionnaire which is "evaluating the solution of the problem". The effect size of the difference is calculated as 0.85, which is considered by Cohen (1992) to be the size of the wide impact (Field, 2009, s. 57). This finding indicates that the behavior of the experimental group participants in "Evaluating the Solution of the Problem" was positively affected because of the integrated instruction. In the evaluation of the solution, which is the final stage of problem solving, efforts are made to establish problems that can be solved with a similar strategy. The fact that there are problems with context in the book used in the instruction process may have caused this finding to occur.

There is no statistically significant difference in terms of experiment and control groups according to the difference scores obtained from all sub-dimensions of the mathematical connection self-efficacy scale. This finding of the study does not coincide with the findings of many studies in the literature (Altıntaş, 2018; Huffman, 2012; Moore, 2008; Munro, 2013; Young, 2001). According to these studies, mathematics courses integrated with children's literature have had an impact on the awareness of elementary school students to connect mathematics with daily life (Moore, 2008; Munro, 2013; Young, 2001). Altıntaş (2018) found that the third-year pre-service teachers gained a positive attitude of connection between daily life and mathematics by integrating children's literature with mathematics teaching. There are lots of studies which are focused on mathematical connection skills and its development. For example, Rohmah et al.'s (2020) findings are alike this study. They found that their instruction has no effect on the eighth-grade students mathematical connection skills. In addition to this study's findings Maulidawati et al.'s (2020) and Zengin's (2019) results are also interesting because they found that in a cooperative learning environment, students' mathematical connection skills have developed. It can be claimed that in group works which are needed the students' communication and collaboration skills rather than isolated learning climate because of the pandemic restrictions, students' gains may be much more. This study's one of the biggest limitations is minimum teacher-student and student-student connection because of the isolated learning environments and

this situation can be thought it's a paradox of mathematics teaching and children's literature integration.

According to the data obtained from the mathematical self-efficacy scale, there is no statistically significant difference between the difference scores of the experimental and control groups. There was no study where this finding of the study could be discussed. Because an experimental study examining the effect of mathematics courses integrated with children's literature on mathematical self-efficacy could not be found. But there some studies which were investigated the effect of different kinds of instruction on mathematical self-efficacy. Some of the researchers were examined the effect of STEM, history of mathematics and realistic mathematics education integrated courses on students' self-efficacy and did not find a statistical meaningful difference between experiment and control groups like this study (Albayrak, 2011; Demir, 2017; Koçyiğit, 2019). But Zetriuslita et al. (2021) found out that Geogebra based instruction and Ulandari et al. (2019) realistic mathematics education (RME) approach has a positive effect on self-efficacy. Both Geogebra and RME are well-known for priotizing the active participation of students in the teaching processes. In this study, students were deprived of more face-to-face training than usual due to pandemic conditions, so they were not able to participate actively. Therefore, even if it is a new style of teaching for students, mathematics teaching and integration of children's literature may not have had the expected effect on mathematical self-efficacy.

In sum, in this study it was reported that mathematics courses integrated with children's literary products had no statistically significant effect on the problem-solving attitudes, problem solving skills and strategies, mathematical connection self-efficacy, and mathematical self-efficacy of 8th grade students. These findings of the study are important for teachers who would like to take this approach to their classrooms in terms of an approach where experimental studies are relatively scarce, teacher educators who conduct pre-service and in-service trainings about the approach, and policy makers who are considering various planning in this regard.

It is seen that various discussions are held on issues such as which degree and how the integration of mathematics and children's literature is conducted in experimental studies, where more practice-based activity examples and lesson plans are shared in the literature generally, experimental studies are mostly limited to younger students (Edelman et al., 2019). It is also known that there are some prominent issues such as how integration is done, teacher's education on the subject, teacher's beliefs, and the quality of the books to be used in the integration play a key role in the products that arise because of integration (Edelman, 2017; Flevares & Schiff, 2014, Nurnberger-Haag, 2017). The teacher (one of the researchers) who conducted this study continued a week of in-service training on the subject. However, the fact that measures arising from the global pandemic effect were carried out at the time of implementation may have had an impact on the findings of the study. Because the experimental intervention is limited to a certain period and course hours, and the class sizes are reduced. Fluctuations in students' motivation to learn due to the epidemic may also have reduced the effect of experimental intervention. Because the use of children's literature products in teaching transforms students from passive receivers to active participants in lessons and creates a high level of interaction in student-teacher communication that is not reached in courses carried out by traditional methods (Kaya & Haydar, 2020). In the courses where children's literature and problem-solving skills are integrated, the character in the story is discussed on how the character can solve the problem when faced with the problem, students are expected to solve this problem, students are asked to explain their solutions by asking their thoughts on solutions and how the character in the story reaches the solution is discussed together. The global pandemic conditions may have taken this opportunity

away from the students. Therefore, since an integrated course conducted in epidemic conditions limits in-class interaction, the experimental application may not have had the expected effect. This demonstrates the importance of in-class interaction in the integration of children's literature and mathematics teaching.

Based on the findings of the research, the following recommendations can be made for future research and implementation: The relevant research was conducted with students at the 8th grade level. Further research can be conducted with models closer to experimental, covering more students and at different grade levels. In this study, quasi-experimental intervention was limited to 5 weeks. Since all the variables examined within the scope of the study are affective variables and the change of affective variables such as attitudes requires more time, longer-term applications can be performed. Last but not least, it is common knowledge that there is a strong link between mathematics and reading and, it is shown with in some studies (Cascella, 2020) but in this study researchers did not examine this link. So, they don't know anything about the students' attitudes towards reading or their reading skills. Maybe these two factors played a vital role in this study. In future studies, the researchers may investigate the implementation effect by considering these causal connections with measuring other scales which are about reading.

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Geniş Özet

Matematik, günlük hayatın devamında önemli bir araç olup onun bir parçasıdır (White, 2003). Ancak buna rağmen bireyler, matematiği hem günlük hayatla hem de diğer alanlarla ilişkilendirmekte çeşitli zorluklar yaşamaktadırlar (Cooper ve Haries, 2002). Matematiksel ilişkilendirme ve matematiksel okuryazarlık becerilerini desteklemek amacıyla özellikle son yıllarda eğitimde farklı disiplinleri bütünleştirme uygulamaları ön plana çıkmaktadır (Aladağ ve Şahinkaya, 2013). Okuma gibi dile ilişkin becerilerin işe koşulduğu matematik öğretimi ve çocuk edebiyatı bütünleştirmesi bu amaçla kullanılabilecek yaklaşımlardan biridir. Ancak hem ulusal hem de uluslararası alanyazında çocuk edebiyatı ve matematik öğretimi bütünleştirmesine yönelik çalışmaların daha çok okul öncesi düzeydeki öğrencilerle yürütüldüğü ve deneysel çalışmaların sayısının oldukça az olduğu bilinmektedir (Edelman vd., 2019). Buradan hareketle araştırmanın problemi "Deney ve kontrol gruplarında yer alan öğrencilerin matematiksel problem çözmeye yönelik tutum, matematiksel özyeterlik, problem çözme beceri ve stratejileri, matematiksel ilişkilendirme özyeterlik ön test ve son test puanları açısından hem kendi grupları içerisinde hem de gruplar arasında istatistiksel olarak anlamlı bir farklılık var mıdır?" şeklinde belirlenmiştir.

2. Yöntem

2.1. Araştırmanın Deseni

Bu araştırmada yarı deneysel desenlerden ön test son test eşitlenmemiş kontrol gruplu model kullanılmıştır (Özmen, 2019).

2.2. Çalışma Grubu

Araştırmanın çalışma grubunu 30 sekizinci sınıf öğrencisi oluşturmaktadır. Çalışmada deney ve kontrol grubu olacak şekilde (15'er öğrenci) şubeler belirlenirken bir önceki döneme ait matematik dersi notları değerlendirilmiştir.

2.3. Veri Toplama Araçları

2.3.1. Matematik Problemi Çözmeye Yönelik Tutum Ölçeği. Çanakçı (2008) tarafından geliştirilmiştir. Ölçek 19 maddeden oluşmakta olup 5'li likert tipindedir.

2.3.2. Problem Çözme Beceri ve Stratejileri Anketi. Çömlekoğlu (2001) tarafından geliştirilmiştir. 21 maddeden ve 4 alt başlıktan oluşmaktadır.

2.3.3. Matematiksel Özyeterlik Ölçeği. Umay (2001) tarafından geliştirilen ölçek 14 maddeden ve 3 faktörden oluşmaktadır.

2.3.4. Matematiksel İlişkilendirme Özyeterlik Ölçeği. Özgen ve Bindak (2018) tarafından geliştirilen ölçek 22 maddeden ve 5 faktörden oluşmaktadır.

2.4. Veri Toplama Süreci

Araştırma için belirlenen üç ölçek ve bir anket, beş haftalık çocuk edebiyatıyla bütünleştirilmiş matematik öğretimi derslerinin başlangıcında ve bitiminde uygulanmıştır. Deney grubunda kullanılan problemler "Şehrazad'ın 101 Oyunu, Cilt 1" (Yalman ve Demirkol, 2012) adlı kitaptan alınmıştır.

2.5. Verilerin Analizi

Verilerin analiz sürecinde öncelikle varsayımların test edilmesi sürecinde grupların ön-test, son-test ve ön-son test fark puanlarına ilişkin normallik testleri yapılmıştır. Normalliğin sınanması için Kolmogorov Smirnov ve Shapiro Wilk testlerinden faydalanılmıştır. Normalliğin sınanması için yapılan analiz sonuçları doğrultusunda parametrik olan veya olmayan testlerden hangisinin uygulanacağına karar verilmiştir.

2.6. Geçerlik, Güvenirlik ve Etik

Araştırma verileri deney grubu ile ve kontrol gruplarından, deneysel müdahale öncesi (ön test) ve sonrası (son test) olmak üzere iki farklı zamanda ancak her iki gruptan eş zamanlı olarak elde edilmiştir. Uygulama/uygulayıcı etkisinin önüne geçebilmek amacıyla, deney ve kontrol gruplarının matematik derslerini hâlihazırda yürütmekte olan öğretmen tarafından deneysel öğretim gerçekleştirilmiştir. İç geçerliği tehdit eden zaman ve olgunlaşma etkisinin önüne geçebilmek amacıyla deneysel uygulama 5 hafta ile sınırlandırılmış, veri toplama araçları etkisinin önüne geçebilmek amacıyla ön test ve son testlerden birbirinden bağımsız iki araştırmacı tarafından kodlanmıştır (Özmen, 2019).

3. Bulgular

3.1. Matematik Problemi Çözmeye Yönelik Tutum Ölçeğinden (MPÇYTÖ) Elde Edilen Bulgular

Puanların analizinde ölçeğin yalnızca hoşlanma alt boyutundan elde edilen son test puanları ile öğretim alt boyutundan elde edilen ön-son test fark puanlarının karşılaştırılmasında Mann Whitney-U testine başvurulurken, diğer verilere ilişkin karşılaştırmalar İlişkisiz Örneklemler T-testi ile yapılmıştır. Analiz sonuçları Tablo 1'de verilmiştir.

Tablo 1. *MPÇYTÖ Ön Test-Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*N*	*Ort.*	*SS*	*SD*	*t*	*p*
Hoşlanma	Ön-test	Deney	15	3,06	0,80	28	-1,882	0,070
		Kontrol	15	3,64	0,86			
Öğretim		Deney	15	4,10	0,42	28	-0,878	0,388
		Kontrol	15	4,23	0,40			
MPÇYTÖ		Deney	15	3,55	0,51	28	-1,891	0,069
		Kontrol	15	3,92	0,54			
Öğretim	Son-test	Deney	15	4,18	0,29	28	-0,358	0,723
		Kontrol	15	4,22	0,37			
MPÇYTÖ		Deney	15	3,79	0,54	28	-0,389	0,701
		Kontrol	15	3,86	0,49			
Hoşlanma	Fark	Deney	15	0,37	0,99	28	1,504	0,144
		Kontrol	15	-0,10	0,71			
MPÇYTÖ		Deney	15	0,23	0,68	28	1,299	0,205
		Kontrol	15	-0,05	0,53			

Tablo 1 incelendiğinde MPÇYT ölçeğinin normal dağılım gösteren hoşlanma ve öğretim alt boyutları için elde edilen ön test, son test ve fark puanlarının deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir şekilde farklılaşmadığı görülmektedir (Can, 2020). MPÇYT ölçeğinden elde edilen ve normal dağılım göstermeyen diğer puanlar için Mann Whitney-U testi kullanılmış olup analiz sonuçları Tablo 2'de verilmiştir.

Tablo 2. *MPÇYTÖ Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*n*	*Sıra Ort.*	*SS*	*U*	*p*
Hoşlanma	Son-test	Deney	15	14,77	0,93	101,500	0,647
		Kontrol	15	16,23	0,82		
Öğretim	Fark	Deney	15	16,43	0,53	98,500	0,559
		Kontrol	15	14,57	0,41		

Tablo 2'ye göre incelenen puanlar açısından istatistiksel olarak anlamlı bir farkın olmadığı söylenebilir.

3.2. Problem Çözme Beceri ve Stratejileri Anketinden (PÇBSA) Elde Edilen Bulgular

Bu ölçekten elde edilen verilerin tamamı normal dağılım gösterdiği için verilerin analizin İlişkisiz Örneklemler T-testi kullanılmıştır. Analiz sonuçları Tablo 3'te verilmiştir.

Tablo 3. *PÇBSA Ön Test-Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*n*	*Ort.*	*SS*	*SD*	*t*	*p*
Problemi Anlama	Ön-test	Deney	15	3,80	0,47	28	0,179	0,859
		Kontrol	15	3,76	0,66			
Çözüm için Plan Yapma		Deney	15	3,48	0,68	28	0,176	0,862
		Kontrol	15	3,44	0,69			
Çözümü Uygulama		Deney	15	3,68	0,61	28	-0,828	0,415
		Kontrol	15	3,84	0,39			
Çözümü Değerlendirme		Deney	15	3,27	0,55	28	-0,924	0,363
		Kontrol	15	3,46	0,56			
PÇBSA		Deney	15	3,59	0,33	28	-0,378	0,709
		Kontrol	15	3,64	0,43			
Problemi Anlama	Son-test	Deney	15	3,79	0,48	28	0,240	0,812
		Kontrol	15	3,74	0,53			
Çözüm için Plan Yapma		Deney	15	3,20	0,63	28	-1,589	0,123
		Kontrol	15	3,53	0,50			
Çözümü Uygulama		Deney	15	3,68	0,44	28	-0,841	0,407
		Kontrol	15	3,84	0,56			
Çözümü Değerlendirme		Deney	15	3,82	0,65	28	1,487	0,149
		Kontrol	15	3,50	0,52			
PÇBSA		Deney	15	3,70	0,36	28	0,302	0,765
		Kontrol	15	3,66	0,38			
Problemi Anlama	Fark	Deney	15	-0,00	0,35	28	0,036	0,972
		Kontrol	15	-0,01	0,64			
Çözüm için Plan Yapma		Deney	15	-0,28	0,91	28	-1,272	0,214
		Kontrol	15	0,08	0,69			
Çözümü Uygulama		Deney	15	0,00	0,70	28	0,000	1,000
		Kontrol	15	0,00	0,45			
Çözümü Değerlendirme		Deney	15	0,54	0,94	28	1,720	0,098
		Kontrol	15	0,03	0,66			
PÇBSA		Deney	15	0,11	0,40	28	0,618	0,542
		Kontrol	15	0,01	0,43			

Tablo 3 incelendiğinde PÇBS ölçeğinin tüm alt boyutlarından elde edilen ön test, son test ve fark puanlarının deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir şekilde farklılaşmadığı görülmektedir (Can, 2020).

3.3. Matematiksel İlişkilendirme Özyeterlik Ölçeği'nden (MİÖÖ) Elde Edilen Bulgular

Ön test, son test ve fark puanlarının deney ve kontrol grupları açısından karşılaştırılmasında ölçeğin sadece "Günlük Yaşamla İlişkilendirme" boyutuna ait son test puanları için Mann Whitney-U testi, diğer puanlar için İlişkisiz Örneklemler T-testi kullanılmıştır. Analiz sonuçları sırasıyla Tablo 4 ve Tablo 5'te verilmiştir.

Tablo 4. *MİÖÖ Ön Test-Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*n*	*Ort.*	*SS*	*SD*	*t*	*p*
Zorluk	Ön-test	Deney	15	3,34	0,59	28	0,511	0,613
		Kontrol	15	3,21	0,73			
Matematiği Kullanma		Deney	15	3,34	0,45	28	0,035	0,157
		Kontrol	15	3,65	0,69			
Kendi İçinde İlişkilendirme		Deney	15	3,60	0,52	28	0,214	0,384
		Kontrol	15	3,81	0,76			
Günlük Yaşamla İlişkilendirme		Deney	15	3,37	0,53	28	0,061	0,271
		Kontrol	15	3,64	0,75			
Farklı Disiplinlerle İlişkilendirme		Deney	15	3,02	0,83	28	0,701	0,332
		Kontrol	15	3,35	1,01			
MİÖÖ		Deney	15	3,36	0,43	28	-0,836	0,410
		Kontrol	15	3,53	0,63			
Zorluk	Son-test	Deney	15	3,53	0,54	28	0,150	0,882
		Kontrol	15	3,50	0,66			
Matematiği Kullanma		Deney	15	3,53	0,32	28	0,230	0,653
		Kontrol	15	3,61	0,59			
Kendi İçinde İlişkilendirme		Deney	15	3,46	0,64	28	0,317	0,338
		Kontrol	15	3,73	0,84			
Günlük Yaşamla İlişkilendirme		Deney	15	3,04	0,87	28	0,828	0,149
		Kontrol	15	3,48	0,76			
Zorluk	Fark	Deney	15	0,18	0,53	28	-0,485	0,632
		Kontrol	15	0,28	0,50			
Matematiği Kullanma		Deney	15	0,18	0,62	28	1,088	0,286
		Kontrol	15	-0,04	0,53			
Kendi İçinde İlişkilendirme		Deney	15	-0,13	0,70	28	-0,197	0,845
		Kontrol	15	-0,11	0,77			
Günlük Yaşamla İlişkilendirme		Deney	15	0,13	0,57	28	0,096	0,924
		Kontrol	15	0,11	0,68			
Farklı Disiplinlerle İlişkilendirme		Deney	15	0,02	0,73	28	-0,318	0,753
		Kontrol	15	0,13	1,13			
MİÖÖ		Deney	15	0,08	0,42	28	0,021	0,983
		Kontrol	15	0,08	0,40			

Tablo 4'ten yola çıkılarak ölçeğin alt boyutlarından ve kendisinden elde edilen ön test, son test ve fark puanlarının deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir şekilde farklılaşmadığı yorumu yapılabilir. Günlük yaşamla ilişkilendirme alt boyutunun ve ölçeğin tamamına ait son test puanlarına ilişkin analiz sonuçları Tablo 5'te verilmiştir.

Tablo 5. *MİÖÖ Son Test Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*n*	*Sıra Ort.*	*SS*	*U*	*p*
Günlük Yaşamla İlişkilendirme	Son-test	Deney	15	13,97	0,48	89,500	0,331
		Kontrol	15	17,03	0,68		
MİÖÖ	Son-test	Deney	15	13,70	0,41	85,500	0,262
		Kontrol	15	17,30	0,50		

Tablo 5'e göre MİÖÖ toplam son test puanında ($U_{(28)}$=85,500) ve ölçeğin Günlük Yaşamla İlişkilendirme ($U_{(28)}$=89,500) alt boyutunda öğrencilerin elde ettikleri son-test puanları deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir şekilde farklılaşmamaktadır.

3.4. Matematiksel Özyeterlik Ölçeği'nden (MÖÖ) Elde Edilen Bulgular

"Matematik konularında davranışlardaki farkındalık" boyutunun son test puanı ile ölçeğin tamamından elde edilen son test ile fark puanlarının gruplar açısından karşılaştırılmasında Mann Whitney-U testine başvurulmuştur. Diğer puanların tamamında ise İlişkisiz Örneklemler T-testi kullanılmıştır. Analiz sonuçları sırasıyla Tablo 6 ve Tablo 7'de verilmiştir.

Tablo 6. *MÖÖ Ön Test-Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	*Ölçüm*	*Grup*	*n*	*Ort.*	*SS*	*SD*	*t*	*p*
Benlik Algısı	Ön-test	Deney	15	3,49	0,77	28	-0,554	0,584
		Kontrol	15	3,66	0,93			
Matematik Konularındaki Davranışlardaki Farkındalık		Deney	15	2,65	0,58	28	-1,449	0,158
		Kontrol	15	2,95	0,54			
Matematiği Yaşam Becerilerine Dönüştürebilme		Deney	15	3,20	0,61	28	-1,919	0,065
		Kontrol	15	3,73	0,88			
MÖÖ		Deney	15	3,07	0,55	28	-1,334	0,190
		Kontrol	15	3,37	0,67			
Benlik Algısı	Son-test	Deney	15	3,73	0,67	28	0,815	0,422
		Kontrol	15	3,48	0,99			
Matematik Konularındaki Davranışlardaki Farkındalık		Deney	15	15	3,24	28	-1,727	0,095
		Kontrol	15	15	3,66			
Matematiği Yaşam Becerilerine Dönüştürebilme		Deney	15	0,24	0,78	28	1,403	0,172
		Kontrol	15	-0,18	0,87			
Benlik Algısı	Fark	Deney	15	0,41	0,80	28	1,378	0,179
		Kontrol	15	0,08	0,42			
Matematik Konularındaki Davranışlardaki Farkındalık		Deney	15	0,04	0,68	28	0,444	0,660
		Kontrol	15	0,06	0,68			

Tablo 6'ya göre ölçeğin alt boyutlarından ve kendisinden elde edilen ön test, son test ve fark puanlarının deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir şekilde farklılaşmadığı yorumu yapılabilir. Matematik konularında davranışlardaki farkındalık alt boyutunun son test puanlarına ilişkin analiz sonuçları Tablo 7'de verilmiştir.

Tablo 7. *MÖÖ Son Test ve Fark Puanlarının Karşılaştırılması*

Boyut	Ölçüm	Grup	n	Sıra Ort.	SS	U	p
Matematik Konularında Davranışlardaki Farkındalık	Son-test	Deney	15	14,87	0,50	103,000	0,691
		Kontrol	15	16,13	0,54		
MÖÖ	Son-test	Deney	15	14,87	0,44	103,000	0,693
		Kontrol	15	16,13	0,51		
MÖÖ	Fark	Deney	15	17,43	0,63	83,500	0,226
		Kontrol	15	13,57	0,41		

Tablo 7 incelendiğinde MÖÖ son test toplam puanı ($U_{(28)}$=103,000) ile fark ($U_{(28)}$=83,500) puanları, matematik konularında davranışlardaki farkındalık ($U_{(28)}$=103,000) alt boyutu son test puanları bakımından deney ve kontrol grubu arasında istatistiksel olarak anlamlı bir farklılık olmadığı görülmektedir.

4. Tartışma, Sonuç ve Öneriler

Araştırmanın bulgularına göre matematik problemi çözmeye yönelik tutum ölçeğinin tüm alt boyutlarından elde edilen fark puanları açısından deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir fark ortaya çıkmamıştır. Araştırmanın bu bulgusu White'ın (2003) bulgusu ile de örtüşmektedir. Ancak Lynch (2006) ve Cankoy (2011) çocuk edebiyatıyla bütünleştirilmiş matematik öğretiminin matematik problemi çözmeye yönelik tutuma etkisinin olumlu olduğunu tespit etmişlerdir. Lynch (2006) ikinci sınıf, Cankoy (2011) da üçüncü sınıf öğrencileriyle çocuk edebiyatı kullanarak yürüttükleri 10 hafta süren deneysel çalışmaları sonucunda çocuk edebiyatı kullanımının problem çözmeye yönelik tutum üzerinde olumlu bir etkiye sahip olduğunu belirlemişlerdir. Bulgularda meydana gelen farklılıklar çalışılan sınıf düzeyleri veya deneysel müdahalenin süresiyle ilgili olabilir.

Problem çözme beceri ve stratejileri anketinden elde edilen veriler incelendiğinde de anketin tüm alt başlıklarından elde edilen fark puanları açısından deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir farkın olmadığı tespit edilmiştir. Ancak anketin "problemin çözümünü değerlendirme" alt başlığında deney grubuna ait ön test ve son test puanları arasında istatistiksel olarak anlamlı bir farkın olduğu saptanmıştır. Bu bulgu, yapılan işlem sonucunda deney grubu katılımcılarının "problemin çözümünü değerlendirme" davranışlarının olumlu yönde etkilendiğini ifade etmektedir.

Matematiksel İlişkilendirme Ölçeği'nin tüm alt boyutlarından elde edilen fark puanlarına göre deney ve kontrol grupları açısından istatistiksel olarak anlamlı bir farklılık yoktur. Araştırmanın bu bulgusu alan yazındaki birçok çalışmanın bulgusuyla örtüşmemektedir (Altıntaş, 2018; Huffman, 2012; Young, 2001). Bu çalışmalara göre çocuk edebiyatıyla bütünleştirilmiş matematik dersleri, ilkokul öğrencilerinin matematiği günlük yaşamla ilişkilendirmeye yönelik farkındalıkları üzerinde etkili olmuştur (Moore, 2008; Munro, 2013; Young, 2001).

Matematik Özyeterlik Ölçeği'nden elde edilen verilere göre de deney ve kontrol gruplarının fark puanları arasında istatistiksel olarak anlamlı bir farklılık yoktur. Araştırmanın bu bulgusunun tartışılabileceği bir çalışmayla karşılaşılmamıştır. Çünkü çocuk edebiyatıyla bütünleştirilmiş matematik derslerinin matematiksel özyeterlik üzerine etkisini inceleyen deneysel bir çalışma bulunamamıştır.

Bu araştırmada çocuk edebiyatı ürünleriyle bütünleştirilmiş matematik derslerinin 8. sınıf öğrencilerinin problem çözmeye yönelik tutumları, problem çözme beceri ve stratejileri, matematiksel ilişkilendirme ve özyeterlikleri üzerinde istatistiksel olarak anlamlı bir etkisinin olmadığı raporlanmıştır. Araştırmanın bu bulguları, yürütülen deneysel çalışmaların görece az olduğu bir yaklaşım açısından bu

yaklaşımı sınıflarına taşımak isteyen öğretmenler, yaklaşım hakkında hizmet öncesi ve hizmet içi eğitimler yürüten öğretmen eğitimcileri ve bu konuda çeşitli planlamalar yapmayı düşünen karar alıcılar için önem arz etmektedir. Alanyazında daha çok uygulamaya dönük etkinlik örnekleri ve ders planlarının paylaşıldığı, yapılan deneysel çalışmaların daha çok küçük sınıf düzeyleriyle sınırlı olması, deneysel çalışmalarda matematik ve çocuk edebiyatı bütünleştirmesinin ne derecede ve nasıl gerçekleştirildiği gibi hususlar üzerinde çeşitli tartışmaların yapıldığı görülmektedir (Edelman vd., 2019). Bütünleştirmenin nasıl yapıldığı, öğretmenin konuya ilişkin eğitimi ile inançları ve süreçte kullanılacak kitapların niteliği gibi durumların bütünleştirme sonucunda ortaya çıkan ürünler üzerinde anahtar rol oynadığı da bilinmektedir (Flevares ve Schiff, 2014; Nurnberger-Haag, 2017). Bu çalışmayı yürüten öğretmen, konuyla ilgili bir haftalık bir hizmet içi eğitim sürecinden geçmiştir. Ancak uygulamanın gerçekleştirildiği sırada küresel salgın etkisinden kaynaklanan tedbirlerin olması çalışmanın bulguları üzerinde etkili olmuş olabilir. Çünkü deneysel müdahale belirli bir hafta ve ders saatleri ile sınırlandırılmış ve sınıf mevcutları seyreltilmiştir. Öğrencilerin salgın nedeniyle öğrenmeye ilişkin motivasyonlarında meydana gelen dalgalanmalar da deneysel müdahalenin etkisini azaltmış olabilir. İlerideki araştırmalar tam deneysele daha yakın modellerle, daha fazla öğrenciyi kapsayacak şekilde, farklı sınıf seviyelerinde ve daha uzun süreli yürütülebilir.

Yayın Etiği Beyanı

Bu araştırmanın, Bolu Abant İzzet Baysal Üniversitesi Sosyal Bilimlerde İnsan Araştırmaları Etik Kurulu tarafından 24.09.2021 tarihinde 2021/04 sayılı kararıyla (Protokol No: 2021/194) verilen etik kurul izni bulunmaktadır. Bu araştırmanın planlanmasından, uygulanmasına, verilerin toplanmasından verilerin analizine kadar olan tüm süreçte "Yükseköğretim Kurumları Bilimsel Araştırma ve Yayın Etiği Yönergesi" kapsamında uyulması belirtilen tüm kurallara uyulmuştur. Yönergenin ikinci bölümü olan "Bilimsel Araştırma ve Yayın Etiğine Aykırı Eylemler" başlığı altında belirtilen eylemlerden hiçbiri gerçekleştirilmemiştir. Bu araştırmanın yazım sürecinde bilimsel, etik ve alıntı kurallarına uyulmuş; toplanan veriler üzerinde herhangi bir tahrifat yapılmamıştır. Bu çalışma herhangi başka bir akademik yayın ortamına değerlendirme için gönderilmemiştir.

Araştırmacıların Katkı Oranı Beyanı

Araştırmaya yazarların katkı oranları ilk yazar için %50, ikinci ve üçüncü yazarlar için %25'tir. İlk yazar araştırmanın tüm aşamaları için katkı sağlarken, ikinci ve üçüncü yazarlar yöntem, bulgular ve sonuç kısımlarında katkı sağlayıp revizyon yapmışlardır.

Destek/Teşekkür

Bu araştırma Bolu Abant İzzet Baysal Üniversitesi Lisansüstü Eğitim Enstitüsü tarafından Matematik ve Fen Bilimleri Eğitimi Programı Matematik Eğitimi Yüksek Lisans Programı'na Meltem YALÇIN tarafından sunulan ve danışmanlığını Doç. Dr. Recai AKKAYA ile Doç. Dr. Burcu DURMAZ'ın yaptıkları "Çocuk Edebiyatıyla Bütünleştirilmiş Matematik Dersinin 8. Sınıf Öğrencilerinin Problem Çözme Becerilerine Matematiksel İlişkilendirme ve Özyeterlik Düzeylerine Etkisi" başlıklı tezin verilerinden yola çıkılarak hazırlanmıştır.

Çatışma Beyanı

Araştırmanın yazarları olarak herhangi bir çıkar/çatışma beyanımız olmadığını ifade ederiz.