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The Effect of Teaching Math's through Storytelling on Students' Math's Achievement

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Abstract

The purpose of this research is to determine whether the use of the narrative (storyline) method in middle school 5th grade mathematics class is effective for students' mathematics achievement and mathematics anxiety. The study is a quasi-experimental study with a pretest-posttest design. During the course of the application, decimal numbers were presented in the mathematics lesson using the narrative method in the experimental group whereas the traditional presentation method was used in the control group. The study was carried out with a total of 64 students who attended the 5th grade of a middle school selected by the purposeful sampling method in Bornova district of İzmir province. The mathematical achievement test and mathematics anxiety scale were used for data collection. The collected data were scored and analyzed according to the scale previously prepared by the researcher. According to the analysis; teaching decimal numbers using the narrative method resulted in increased mathematics success and decreased mathematical anxiety when compared to the traditional teaching method.

Keywords: Narrative Method, Mathematics Teaching, Mathematics Achievement, Mathematics Anxiety

Introduction

Education, in its most basic definition, is the process of creating behavioral change in an individual. This change should be compatible with the expectations of society, norms, and moral background. In addition, it is important that the new behavior acquired is permanent and sustainable, and that it develops and occurs regularly with successive changes in a process. The period in which we live, in which a rapid change occurs on a global scale, is called the information age. Rapid developments in information technologies cause social structures to change and reshape. This rapid process has made it necessary to discover new approaches in education systems (Çalık and Sezgin, 2005).

Education should be done in a planned, programmed and systematic way. This plan and program should be developed by taking into account each country's own history, culture, geopolitical position, economic and social structure. It is unlikely for education to remain stagnant, especially in this age where changes in social life are experienced rapidly. Catching up with the age through the changes to be made in the education system is also important for the interests of the country. Planning of education has been seen as one of the tools of general economic and social change, as well as being a solution to educational problems. In Turkey, after the 1960s, the tendency to solve the problems of the education system through planning has become stronger. During the planned period, "failure to implement policies and decisions in accordance with the plan" and "failure to reach the plan goals" were frequently mentioned among the reasons for not solving education problems (Adem, 1995: 152; Kurtkan, 1977: 267; Küçüker, 2010).

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Until the last quarter of the 20th century, the basic principles of behaviorist learning theory were mostly taken as the basis throughout the planning and implementation of educational processes. However, the fact that this theory keeps mental processes out of the cluster and associates' learning with conditioning has left unanswered a number of questions that emerged with the developing technology and the change experienced (Gardner, 2004). As a result, theories focusing on cognitivism such as constructivism, discovery learning, meaningful learning, and brain-based learning have come to light. These theories argue that each student has a specific life, and their experiences appear as an important factor in learning, rather than just giving pure knowledge to students (Özmen, 2004).

One of the subjects that need cognitive theories to be used in the classroom is mathematics. According to Altun (2001), the main purpose of teaching mathematics is; to teach the person the mathematical skills required in daily life, to teach problem solving, and to provide a way of thinking that handles facts in a problem solving approach. Although mathematics is used in all areas of social life, it is considered "difficult" all over the world. The difficulty of mathematics arises not only from its own structure but also from prejudice and fear developed against it (Umay, 1996). Unfortunately, in our country, we see that there is a prejudice against mathematics lessons from an early age .It will be insufficient to explain the reason for this with the intricate structure of mathematics itself. Along with the difficulty inherent in mathematics, variables such as the mathematics teaching, the teaching methods and techniques used, the lack of facilities and infrastructure, the readiness levels of the students, environmental factors, etc. are effective in prejudice developed against mathematics (Boz, 2008).

Yılmaz ve Yenilmez's (2008), study suggested that there are some misconceptions in students as follows : Inability to grasp the meaning of decimals, thinking that multi-digit decimal numbers are smaller, thinking that multi-digit decimal numbers are larger, not being able to see zero as a place value, thinking that zero has no meaning, not being able to name the digits in the fraction part of the decimal number correctly, assuming that zero makes the numbers smaller, ignoring the comma of a decimal number, perceiving the decimal comma as a separator between two different numbers, and not being able to grasp the relationship between fractions and decimals. (Altıparmak and Palabıyık, 2017).

Unfortunately, large number of students, the lack of sufficient teachers, the inflexibility of the curriculum, and the idea of getting the subjects ready at the end of the year forces teachers to teach in a traditional way and obstruct the transition to a constructivist approach in many schools today. When social life problems and other topics are added to these problems, the quality of education decreases and schools become insufficient in teaching. In their study, Aslanargun and Bozkurt (2012) identified the problems experienced in the schools with the help of school principals. According to the study, the problems faced are related to the issues such as lack of parents' interest, lack of communication, lack of auxiliary staff, cleaning, warming, lack of teachers and equipment, insufficient planning regarding education, inadequate work of school family unions and insufficient school budgets. Ogder (2019) categorized the above general problems by dividing them into the many subheadings.

Problems Experienced in terms of School

The problems faced regarding the school can be listed as follows:

- Physical problems of schools scarcity of information technology classes,
- Insufficiency of libraries, laboratories, and multi-purpose halls,
- Inability to use social reinforcement areas actively,
- Combined classroom practices
- Having dual education in some schools due to physical impossibilities and insufficient number of classrooms,
- Not having enough branch teachers in schools,
- Adaptation problems of teachers coming with assignment and high number of students per school.

Problems Experienced in Students

Besides the problems related to schools, there are various student-related problems as follows:

- Lack of purpose and mission found in most of the students,
- Insufficient awareness and guidance of students about reading, research, thinking, practice,
- Students' lack of nutritional habits at a sufficient level,
- Students transported within the scope of bussed education practice,
- Level differences between boarding students and central school students, and transportation problems,
- The fact that students are held responsible for subjects other than their interests,
- Having a high level of examination anxiety and its negative effect on student achievement,
- Insufficient learning of the lessons in the course,
- Inability to use resources, tools and equipment adequately,
- Inability to plan the duration of study, extracurricular activity and social environment times.

Problems Experienced in Families

The problems related to student's family as follows:

- The insensitivity of the parents of the students and their inability to follow their students,
- The absence and negativity of the students' working environment at home,
- The lack of nutrition,
- The calculation of the student's contribution to the workforce by the family,
- The employment of students in different sectors as a source of income,
- Domestic problems, violence, crowded family environments affecting student success,
- The lack of education of families.

Problems Experienced in Teachers

In addition to school, there are some problems related to teachers as follows:

- Education policies that disrupt teachers' morale

and motivation,
- Motivation disturbance caused by the fact that two spouses working in different provinces and districts,
- Appointment of those who do not have sufficient motivation as teachers,
- Teachers not being able to renew themselves,
- The thought of retiring with the knowledge they graduated, keeping away from innovations,
- Deficiencies in presenting information,
- Insufficient attention to in-service training activities and inefficiency of the trainings,
- The elimination of teacher staff deficiencies with substitute and inexperienced teachers.

Other Problems

Lack of time and the effort to finish their course subjects by the end of the year, the system of passing classes in primary schools (encouraging each student to move to the higher grade), not knowing effective study methods and not being able to teach this behavior to the student, the fact that exam anxiety is very high, having fewer connections and not paying enough attention to literacy problems are among the other problems related to education in Turkey.

If we consider international exams such as PISA and TİMSS that measure country achievements, the problems mentioned above are extremely important and must be solved, especially in terms of mathematics education. The fact that our country ranks among the bottom countries in these exams clearly shows that the problems to be overcome are not limited to these. Considering the 2018 PISA mathematics results, while the average mathematics score was 489, Turkey's average mathematics score was 454 points. Thus, Turkey ranked 33rd among 37 OECD countries in this field. In addition, when OECD partners are included in the ranking, Turkey ranked 42nd in the field of mathematics (OECD, 2018).

How the student receives information and how he or she creates a schema in her mind about that information is very important in the learning process. The preparation of a rich and attention-grabbing learning environment in terms of the materials to be used in the teaching of the lesson, the integration of teaching with daily life accelerates and facilitates the systematic processing of information in the student's mind and makes this process more enjoyable for the learner. Addressing more than one sense of the learner, which is a prerequisite of a contemporary learning environment, makes teaching more attractive and easier (Koğ & Başer, 2011).

One of the contemporary teaching methods is the narration (storytelling) method. Storytelling is a learning and teaching method developed in Scotland. It is based on the core principle that what is learned is made meaningful and easily remembered by the student (Hein, 1991). Students are included in the story with the perspectives of the characters in the stories developed and play a role by creating a line between imagination and reality in order to give meaning to the subject (Yiğit, 2007). Narration is a teaching and learning method developed in Scotland. It is based on the idea that the information is made meaningful by the student and can be easily remembered. Because the story is a basic meaning-making activity that begins in the first childhood and continues throughout human life, it is mostly benefited from the willingness of students of all ages to create a story in the narration method (Fusai, Saudelli, Marti, Decortis, & Rizzo, 2003).

This method is known as its original name in various countries, especially in Scotland, but an equivalent was tried to be found in Turkish, and in the previous studies, Güney (2003) used the title "Story Based Learning", while Coşkun (2013) used the title "Narration Method".

"Story is a type of short writing that contains episodes from human life, moving as place and time. According to another definition, it is a short literary work that tells about the events that happened or could happen. In each story, it is possible to mention three main elements: persons, place and action. Stories are based on an action or situation. One of the main elements of the stories is the human being, and they usually include certain sections of their lives without going into much detail. Each story has a message. Like messages, narration methods are also a basic element in stories. Generally, there are two types of narration methods. The person tells what happened, or one of the assistants can narrate it, or the event is narrated from the third person. In this case, a narrator intervenes between the reader and the story (Kavcar & Oğuzhan, 2002, as cited in Coşkun, 2013). "

It is simpler for students to learn what they like. Therefore, a positive attitude towards mathematics is very important in mathematics teaching (Nazlıçiçek&Erktin, 2002). In the narration method, students' comprehension of the lesson with the characters they like may be effective in their positive attitude towards mathematics. Using a story that is intertwined with daily life and with characters known to the majority of students in mathematics teaching can reduce students' anxiety towards the subject of mathematics and also make them love it (Coşkun, 2013). Learning by doing and experiencing is the basis of the narration method. In this method, which is based on constructivism, the main objective is that students learn better and the learning is more permanent (Coşkun, 2013). In addition, this method, which is based on storytelling and being in the story, initiates the learning process with a story in general and it involves being taught in a gradual set of topics after strengthening with time, space, and character connections (Yiğit, 2007).

Considering this positive contribution of the teaching through storytelling, the aim of the research was determined to analyze the effect of storytelling teaching in mathematics on 5th grade students' mathematics achievement. The reason for choosing the 5th grade is to ensure that the concept of decimals is handled in all aspects while moving on to the second level education. In this context, decimals unit was chosen. For this purpose, answers will be sought for the questions to what degree the teaching to be done affects students' math achievement scores and math anxiety scores. In addition, the study was limited to the subject of the decimals, and during the study, students in the experimental and control group understood the questions posed to them correctly and answered them realistically and sincerely without any pressure.

Method

Research Model

The research model is the arrangement of the necessary conditions for the collection and analysis of data economically and in accordance with the research purpose (Karasar, 2009). Pretest-posttest quasi-experimental design with control and experimental groups was used in the study. Quasi-experimental designs come after real experimental designs in terms of scientific value. Semi-experimental designs are regarded as the best possible and evaluated in this way (Karasar, 2014). In the pre-test-post-test design model, the experimental group is exposed to the independent variable; however, the control group is not affected by the independent variable. Subjects are not randomly assigned. If there is no significant difference between the pre-test scores of the groups, it can be said that the groups are equivalent. In testing the assumptions, the scores of both groups that change from pre-test to post-test are compared to determine whether there is a significant difference (Bulduk, 2003; Kıncal, 2010; Karasar, 2009; Balcı, 2004).

In this study, which was prepared to determine the effect of mathematics teaching through storytelling, a quantitative research method was used. In addition, a survey method was used to gather students' opinions about storytelling. Pretest-posttest quasi-experimental design with control and experimental groups was used in the study. Quasi-experimental models are posterior to real experimental designs. Quasi-experimental designs are regarded as the best possible designs and they are evaluated in this way (Karasar, 2014).In this study, the 5th grade mathematics curriculum was taken into consideration. 5 separate classes were selected from the school where the implementation was performed, and according to the level determination study, 2 equal classes were assigned as experimental and control groups.

While the mathematics lesson in the experimental group was taught by adopting a constructivist approach and integrating the storytelling method into the presentation method, the lesson in the control group was taught with the traditional presentation method. Mathematics achievement test and mathematics anxiety scale were applied to the experimental and control group students at the beginning and at the end of the study. In addition, the students in the experimental group were asked about their opinions about storytelling with an open-ended question, and the effects of teaching on them were tried to be determined.

Math Achievement Test

In this study, a math achievement test consisting of 20 multiple-choice questions prepared to measure the math achievement levels of the students was applied before and after the research. 5th grade achievements were taken into account in the development of the math achievement test. The questions in the test consist of the acquisition comprehension tests published by the Ministry of National Education and the questions that came out in previous exams prepared by the Ministry (MoNE, 2019). Content validity of the achievement test was provided by consulting to expert academicians. Some questions have been eliminated by the experts. The reliability study of the test was conducted with 51 6th grade students selected from the secondary school where the application was performed. As a result of the reliability study, the final version of the 20-question math achievement test was created by removing 1 question from the test, which reduced the reliability of the test, and the Cronbach Alpha reliability coefficient was found to be .81 as a result of the calculation made through the statistical package program.

Math Anxiety Scale

In this study, Mathematics Anxiety Scale developed by Recep Bindak (2005) was used. Math anxiety scale includes 10 question items consisting of positive and negative expressions including whether students like the subject of Math, whether they like the activities related to this lesson, and fear of math. The anxiety scale was formed as a Likert-type, 5-grade scale. In the items in the anxiety scale, it is coded as Never (1), Sometimes (2), Often (3), Always (4). Reliability and validity analyzes were made with data collected from the middle school students. The scale consists of a single factor and the explained variance rate is 51.7%. The Cronbach Alpha internal consistency reliability coefficient of the scale was 0.84. Out of 10 items on the scale, the ninth item is negative for anxiety and the others are positive.

Study Group

Probabilistic sampling is one of the methods used in quantitative studies. Probabilistic sampling methods are generally used to increase the representation power of studies. One of the methods used in this context is the simple random sampling method. In simple random sampling, the participants to be included in the study are selected by random method. In this method, in addition to the equal probability of participants to participate in the research process, the population of the study is also homogeneous. The population of the study consists of all students of a secondary school in Izmir province, and the sample consists of a total of 64 students from two 5th grade classes of the same school. In order to determine the experimental and control groups, the math achievement scores of the previous term of five 5th grade classes of the school were compared, and one of the two 5th grade classes with the closest averages was randomly selected as the experimental and one as the control group.

Data Collection Process

The application was took place in the second semester of the 2018-2019 academic year. The researcher has developed the stories used for the application by making use of historical, cultural figures and stories in the literature. The opinions of the faculty members of the Department of Educational Sciences and the Department of Mathematics Education were taken that the stories developed were useful for the study and suitable for the development levels of the students. Before the application, the hours allocated to the subjects in the 5th grade mathematics lesson program were taken into consideration and the 6-week application process was planned. The course hours of these learning outcomes are as in the table.

While writing the stories, the book "Mathematics World through Stories with Questions" written by Aydoğan (2018)

Table 1. *Course Hour Periods of Learning Outcomes*

Learning Outcomes	Course Hours
Determines that when a whole is divided into 10, 100, or 1000 identical parts, the units of the resulting fraction can be expressed in decimal notation.	5
Expresses a fraction with a denominator of 10, 100, or 1000 in decimal notation.	5
Understands the relationship between the whole part in decimal notation and the value of the decimal digit.	5
Writes and reads the decimal notation of fractions that can be expanded or simplified to a denominator of 10, 100, or 1000.	5
Decimal representations show and rank the given numbers on the number line.	5
Performs addition and subtraction operations with given numbers with decimal representations.	5

was used. While developing the stories, the learning outcomes in the Ministry of Education's student textbook were taken into account. The final version of the stories was completed by the 2nd author. The stories were written in electronic form and turned into worksheets. The worksheets were reproduced in color before being distributed to the students in the experimental group. At least one story was prepared for each outcome and reproduced so that each student could work individually. In addition, the smart board was used while lecturing, and the stories were presented by the teacher through the smart board. All the stories are pasted into their notebooks for students to repeat, and are also displayed on the activity board in the classroom. The stories used in the study are given below:

Stories of the Land of Mathematics

Yusuf and his classmate Mine, living in the same apartment, came back from school one day and saw a yellow necklace with very bright stones in a garden close to their home. When they got closer, they heard some sounds coming from the shiny stone of the necklace. They were very scared at first, but then they wondered. They were very surprised when they took the necklace in their hands. Because the necklace was magical and could speak. "I am a magic necklace. If you put me around your neck, I will take you to the Land of Mathematics." the necklace said. Yusuf and Mine looked at each other in surprise and smiled. "I'll wear the necklace first." said Mine immediately. Meanwhile, they heard a voice coming out of the necklace again "Whoever wears the necklace can take a friend to the Land of Mathematics with him." The two friends were very happy about this. The necklace continued to speak and said: "There are some conditions to wandering around the Land of Mathematics alone. In order to move forward and return home, you have to answer the questions you are asked correctly and not tell anyone about this necklace." Hearing this, the two friends were a little nervous at first, but then they built up their courage and accepted this condition. Mine, who took the necklace, put it on her neck and held her friend's hand. Suddenly, colorful lights started to come out from the necklace. Looking at the surrounding lights, a huge door suddenly appeared in front of them with the words "Welcome to the Land of Mathematics". As soon as they stepped through this door, Yusuf and Mine's journey to the Land of Mathematics began.

Nasreddin Hodja and the Land of Mathematics

While Yusuf and Mine were walking in the Land of Mathematics with curiosity, they ended up by a river. Looking around, they saw a white-bearded man with a turban on a donkey from afar. "Yusuf! The man on that donkey looks like Nasreddin Hodja right?" Mine said. "Yes Mine. He rides the donkey backwards as we were told" Yusuf replied. Moreover, he has a turban on his head." he said. The man came close enough to hear them and said, "Stop Karakaçan!". He looked at them without the need to dismount his donkey and smiled sweetly: "Hello, Yusuf and Mine. You were not mistaken, I am Nasreddin Hodja. I came to ask you some math questions." he said. "Nasreddin Hodja, we know you well. You lived in Akşehir and became famous for your funny and thought-provoking stories." Yusuf said. Nasreddin Hodja bowed his head as if to approve and smiled, "Yes, children, now it is time for the questions." he said. Yusuf and Mine were curious and started to wait for the questions Nasreddin Hodja would ask, "I am asking my first question, children. Listen carefully" Hodja said.

We can write fractions with denominators 10, 100, 1000 in another way. How do we write it? "Yusuf and Mine smiled, probably because of the simplicity of the question. " I want to answer." Mine said," We write fractions with 10, 100, 1000 denominators with Decimal Notation." she continued. Well done, you got it right. "Hodja said, and moved on to the second question: "Okay; how do we show fractions 1/10, 1/100, 1/1000 in decimal notation?" This time, Yusuf wanted to answer the question and took his notebook and pencil out of his bag and said, "I'm writing it immediately. "Since these are proper fractions which means they don't have a whole part, in decimal notation, 0 is written in the whole part. "he added. After writing the answer, he showed it to Hodja.

Looking at the paper "Well done, Yusuf, you got it right, too." Nasreddin Hodja said. The children were relieved to get the questions right. "I'm asking the last question, children. If you get this question right, you can move forward in the Land of Mathematics " he added. Yusuf and Mine were eagerly

awaiting the last question. Nasreddin Hodja asked the last question:

$\frac{1}{10} = 0,1$

$\frac{1}{100} = 0,01$

$\frac{1}{1000} = 0,001$

"How to calculate the number of digits after the comma in the decimal representation of fractions with denominator 10, 100, 1000?" Hodja asked. "2 digits after the comma in decimal representation of fractions with a denominator of 100; There are 3 digits after the comma in the decimal representation of fractions with a denominator of 1000." Yusuf and Mine replied. Nasreddin Hodja grimacing:" Unfortunately, it's not correct. "he said. While thinking that they got it wrong, "Nasreddin Hodja said: "Children, I'm just kidding, your answer is correct." The children got relieved and started laughing after Nasreddin Hodja's joke. Later, they said goodbye to Nasreddin Hodja and continued down the road.

Kaloghlan and the Land of Mathematics

While Yusuf and Mine were walking curiously in the Land of Mathematics, they saw a bald boy with a bindle on his back was coming up to them from afar."Mine, this must be Kaloghlan. Look, he has his clothes on his back!" Yusuf said. Mine nodded her head as if to agree with this idea. Meanwhile, the bald boy came up to them: "Hello friends, my name is Kaloghlan. I am going to collect the herbs my mother wants. "he said. While Yusuf and Mine were staring at Kaloghlan, Kaloghlan smiled: "Anyways, I don't have much time. I have questions to ask you, let me ask them and move on. My first question is to Yusuf. Can you explain the parts of decimal numbers with respect to commas?" he said. After thinking a while:" In decimal numbers, the part to the left of the comma is called the whole part, and the part to the right of the comma is called the decimal part. The digits to the left of the comma are called the ones, tens, hundreds... The digit names to the right of the comma are called tenths, hundredths, thousandths ... from left to right. Also, to find the digit value, we multiply the numbers by the number they are located." Yusuf replied.

"You got it right, can you give an example?"Kaloghlan said. Yusuf immediately took his notebook out of his bag and started writing. When he finished writing: "I took the decimal number 27.15 as an example." He said and showed Kaloghlan what he wrote in his notebook.

Tens Digit	Ones Digit	,	Tenths Digit	Hundredthes Digit
2	7	,	1	5
Step Value	Step Value		Step Value	Step Value
2 x 10	7 x 1		1 x 0,1	5 x 0,01

Kaloghlan congratulated Yusuf and quickly moved on to the second question: "Tell me Mine, we understood fractions with denominators 10, 100, 1000. Well, how do we show fractions with denominators which are not 10, 100, 1000 as decimals?" he asked Mine. Mine thought a little while, and then: "We make fractions with denominators which are not 10, 100, 1000, by expanding or simplifying their denominators into fractions with denominators 10, 100, 1000." she said. Kaloghlan also asked for an example from Mine. Mine also took Yusuf's notebook and started to write. When she finished writing, she turned to Kaloghlan: "I took the number 8/5 as an example." she said and showed Kaloghlan what she wrote in the notebook excitedly.

"The denominator of this fraction has a 5. If I expand the numerator and denominator by 2, that is, if I multiply the denominator, I can make the denominator 10. So I get the fraction 16/10. Then I count the digits from the right of the number in the numerator and put a comma," she said.

"Well done Mine, it was a good example."Kaloghlan said. While Yusuf and Mine were waiting for the third and last question , "Children, I am in a hurry, my mother is waiting for me. I am very happy to meet you, take care of yourself." Kaloghlan said and quickly continued on his way. Mine and Yusuf were baffled by the haste of Kaloghlan, then they held hands and continued on their way.

Pinocchio and the Land of Mathematics

As Yusuf and Mine were wandering around excitedly and curiously in the Land of Math , they suddenly ended up in front of a puppet shop. "Gepetto's Puppet Shop" was written on the door. Looking at each other and smiling surprisedly, "Hurray! This is the shop of the artisan who made Pinocchio!" they said and entered the shop. They were excited to see the master Gepetto in front of them. "Master Gepetto! I wonder, where is Pinocchio?" Yusuf asked Gepetto in curiosity. Without waiting for the answer of Gepetto, Pinocchio came out from under the table: "Welcome children. As you know, my name is Pinocchio. I am famous for the growth of my nose when I lie." he said.

When Yusuf and Mine saw Pinocchio, whose stories they read in the books, they hugged him with joy. "Come on guys, come on! I have questions to ask you." Pinocchio said. Yusuf and Mine started to wait impatiently for the questions Pinocchio would ask. "My first question is to Mine." said Pinocchio. "Tell me, Mine, how is the 4/10 fraction pronounced as decimal?" Mine calmly said: "First we have to write the fraction 4/10 as decimal. Then it is easier to read. The decimal representation of the number 4/10 is 0.4. Since 0 is to the left of the decimal number, zero is the whole part, and the decimal part consists of tenths, so it is read as four tenths. That is, zero and four tenths, it is read. "She said."Well done! You got it right." said Pinocchio. "Next, I have a question to ask Yusuf." Tell me, Yusuf; how is it that the fraction 27/1000 is read as a decimal? "Yusuf smiled thereupon because he knew the answer," Dear Pinocchio! "he said." As Mine said, we must write it in decimals first. The decimal notation for 27/1000 is 0.027. Of course, you thought I would be wrong by writing the answer 0.27, right? But, since the denominator is 1000, I have not forgotten that the decimal part must have three digits. "So, Pinocchio said well done to Yusuf and moved on to the last question. Well, What if I asked my questions reversely? So, if I said the decimal number and asked you to show it with a fraction bar, what would you do then? "Pinocchio asked.

Yusuf and Mine looked at each other in surprise upon this question. Because; While this part was being covered in class , they remembered that they could not go to school because they were both sick. Suddenly, they got anxious. "If we do not get this question right, how will we return home?" said Yusuf. When Mine said the same thing, Master Gepetto, who was working on repairs behind them, whispered to help the children. Thereupon, the children answered the question. "No! You got it wrong, children." Pinocchio said. While Yusuf and Mine looked at each other confusedly, Pinocchio's nose suddenly started to grow in length. Pinocchio suddenly started laughing when his nose elongated towards Yusuf and Mine. "Hahaha. Guys, I lied to you for you to see how my nose is growing." he said. Yusuf and Mine took a deep breath and burst out laughing. Since Pinocchio told the truth, his nose started to become shorter and returned to normal. Then "Oh children! You never lie, no matter what." he added.

"Come on everybody, get to work." Master Gepetto said. Thereupon, Yusuf and Mine said goodbye to them, left the shop and continued their way hand in hand.

Snow White and the 7 Dwarfs and the Land of Mathematics

As Yusuf and Mine continued on their way, they ended up in a deserted forest. Moving forward anxiously, they saw a small hut among the trees. They immediately went towards the hut and started knocking on the door and waiting. Suddenly, the door opened very loudly. Around an old and very short man who opened the door, there were 6 more people of his own height. "Yusuf, I think we have come to the house of the seven dwarfs." Said Mine. The dwarf who opened the door smiled and said, "You got it right, Mine. We are seven dwarfs. Welcome to our hut."

Yusuf and Mine went inside with joy. "Well, where is Snow White?" asked Mine curiously. The dwarves also said that Snow White was not at home, and they would ask a few questions until she came. "I'm asking the first question" said the old dwarf and continued:"Tell me children, how do we show decimal fractions on the number line?" Since Yusuf knew the answer, he immediately started to speak: "I want to explain this question by giving an example. For example, consider the number 1.6. First, we determine the interval by looking at the whole part of the number. Since the whole part is 1 here, our number is between 1 and 2 on the number line. We look at the decimal part of the number. Since the decimal part consists of 1 digit, we divide the range into 10 equal parts. Since the decimal part of our number in the example is 6, we count 6 parts from the beginning and mark our number. That is it! "Yusuf replied.

"Congratulations, Yusuf." said the old dwarf. Then another dwarf asked the second question: "Well, how do we sort the decimals?" Hearing this, Mine was happy to know the answer to the question, "First, we look at the whole part of the numbers. The number with the larger part is already greater. But, if the whole parts are equal, then we look at the decimal part. If the number of digits in the decimal of two numbers is equal, the known order is made. "Mine replied. Meanwhile, the wise dwarf in the corner suddenly said: "What if the numbers of digits in the decimal parts of the two numbers are not equal?" Just as Mine was to answer the question, the door suddenly opened and the beautiful Snow White came in. Mine, unable to take her eyes off the beautiful princess, started to answer the question: "If the number of digits in the decimal part is not equal, it is easy to equalize it. For this, we write zeros to the far right of the decimal part of those with less digits and we sort by looking at the numbers in the decimal part." answered the question and immediately took out her notebook and wrote an example.

2,17 3,15 2,19 2,7 2,75

2,17 < 2,19 < 2,70 < 2,75 < 3,15

"Well done, you know it again. "said the sleepy dwarf. Yusuf and Mine were very happy that they could answer all the questions correctly. Then, looking at Snow White, "Snow White, don't eat the apple that would be given to you! Because that apple is poisonous." they said. Snow White thanked them for this warning. Thereupon, the children left the hut for another journey and continued on their way in curiosity and excitement.

Results

Before analyzing the data obtained from the study, the normality test was applied to determine whether the exam results were suitable for normal distribution. Skewness and Kurtosis values of data groups were examined in normality test. According to George and Mallery (2003), if the Skewness and Kurtosis values are between +2 and -2, it can be said that the tested groups are suitable for normal distribution. In this study, Skewness and Kurtosis values were found to be -1.10 and 1.67, respectively. It can be suggested that the tests show a normal distribution since the values are in the range specified above. Therefore, it was deemed appropriate to use parametric tests for data analysis.

Mathematics Achievement Test

Mathematics achievement test was applied to both groups before and after the study in order to understand whether there was a significant difference between the mathematics achievement scores of the students in the experimental group in which mathematics teaching was taught through storytelling and the control group in which mathematics teaching was performed through traditional presentation.

Pre-Achievement Test Results

Table 2. *Comparison of Pre-Achievement Test Results of Experimental and Control Groups*

Groups	N	X	SS	df	t	p
Experimental	32	44,69	13,85	62	0,24	0,809
Control	32	45,47	11,87			

Looking at the pre-achievement test results of the experimental and control groups, the test average of the experimental group was 44.69 while the test average of the control group was 45.47. There is no significant difference between the two groups. It is understood from the p value that there is no significant difference between the groups (p = 0.809> 0.05). Therefore, the experimental and control groups were equal groups before the application.

Final Achievement Test Results

Table 3. *Comparison of Final Achievement Test Results of Experimental and Control Groups*

Groups	N	X	SS	df	t	p
Experimental	32	73,13	16,78	62	3,06	0,003
Control	32	57,19	24,19			

Looking at the final achievement test scores of the experimental and control groups, the test average of the experimental group increased from 44.69 to 73.13, and the test average of the control group from 45.47 to 57.19. The achievement scores of both groups increased. Whether this increase is significant or not is understood from the p value (p = 0.003 <0.05). When looking at the p value, it is found that there is a significant difference between the two groups. Therefore, a significant difference occurred between the experimental and control groups in terms of mathematics achievement after the application.

Mathematics Anxiety Scale

Mathematics anxiety scale was applied to both groups before and after the study in order to understand whether there was a significant difference between the mathematics anxiety scores of the students in the experimental group in which mathematics education was taught by storytelling and control group.

Pre-Anxiety Scale Results

Table 4. *Comparison of Pre-Anxiety Scale Results of Experimental and Control Groups*

Groups	N	X	SS	df	t	p
Experimental	32	73,43	0,28	62	-1,63	0,10
Control	32	76,12	0,36			

Considering the pre-anxiety scale scores of the experimental and control groups, the average anxiety score of the experimental group was 73.43, while the anxiety score of the control group was 76.12. There is no significant difference between the two groups. It is understood from the p value that there is no significant difference between the groups (p = 0.10> 0.05). Therefore, it can be said that the experimental and control groups had similar mathematical concerns before the application.

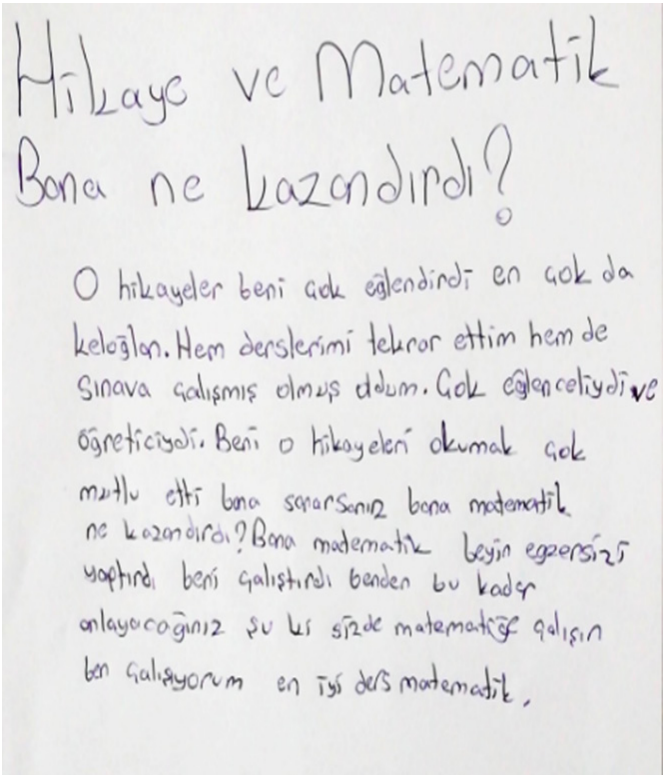
Final Anxiety Scale Results

Table 5. *Comparison of Experimental and Control Groups' Final Anxiety Scale Results*

Groups	N	X	SS	df	t	p
Experimental	32	45,34	0,46	62	-14,28	0,00
Control	32	75,48	0,36			

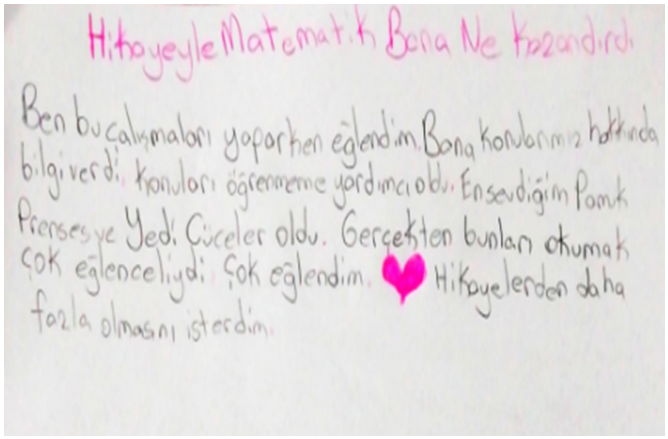
Considering the final anxiety scale scores of the experimental and control groups, the average anxiety scores of the experimental group decreased from 73.43 to 45.34, and the average anxiety scores of the control group from 76.12 to 75.48. There is a significant difference between the two groups. It is understood from the p value that there is a significant difference between the groups (p = 0.00 <0.05). Therefore, there was a significant difference between the experimental and control groups in terms of mathematical anxiety after the application.

At the end of the application, the experimental group students were interviewed about teaching mathematics through storytelling. Students were asked to write these opinions on the interview form. The forms written by some students are given below.

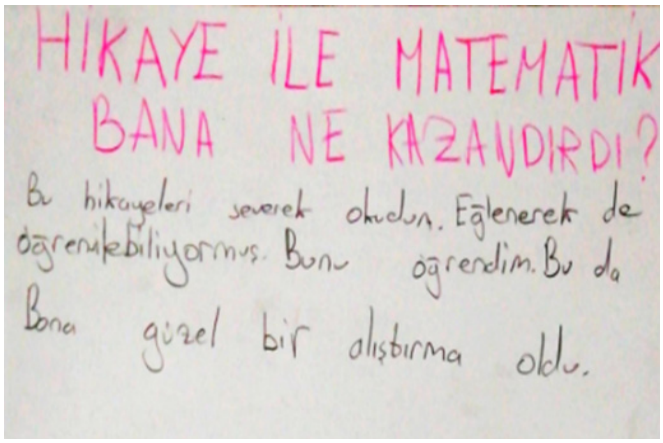

Hikaye ve Matematik
Bana ne kazandırdı?
O hikayeler beni çok eğlendirdi en çok da keloğlan. Hem derslerimi tekrar ettim hem de sınava çalışmış olmuş oldum. Çok eğlenceliydi ve öğreticiydi. Beni o hikayeleri okumak çok mutlu etti bana sorarsanız bana matematik ne kazandırdı? Bana matematik beyin egzersizi yaptırdı beni çalıştırdı benden bu kadar anlayacağınız şu iki sözde matematiğe çalışın ben çalışıyorum en iyi ders matematik.

(My thoughts on Teaching Math's through Storytelling
Those stories amused me a lot. Especially Keloghlan. I both repeated my lessons and studied for the exam. It was very fun and instructive. Reading the stories made me very happy

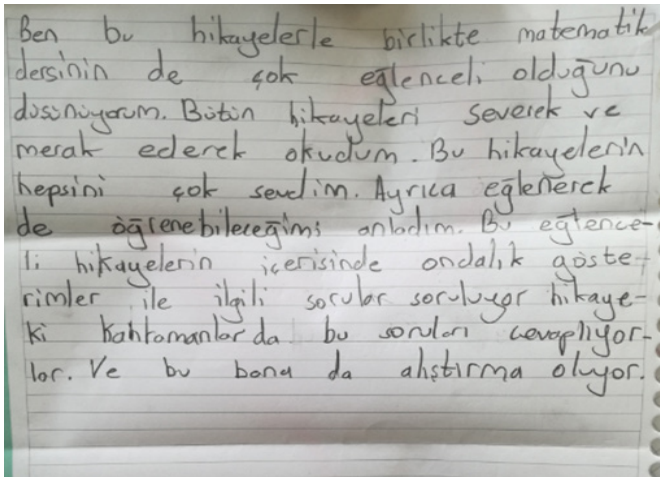
and was a brain exercise. I'm studying math now and it's the best subject for me)



(My thoughts on Teaching Math's through Storytelling
First of all, I had a lot of fun reading the stories. The stories gave me tips on topics and helped to learn the lesson. My favorite story was Snow White and the seven dwarfs. It was really enjoyable to read them. I would like the stories to be more in the upcoming lessons.)



(My thoughts on Teaching Math's through Storytelling
I read these stories fondly. You can learn by having fun. I have learned this. It was a very good exercise for me.)



(My thoughts on Teaching Math's through Storytelling
I think the math lesson is very fun with these stories. I read all the stories with amusement and curiosity. I liked all of these stories. I also understand that you can learn by having fun.

In these funny stories, questions about decimal notations are asked, and the heroes in the story answer these questions. This stays in my mind and becomes an exercise.

Conclusion, Discussion and Suggestions

Mathematics is more abstract compared to other sciences. For this reason, it is frequently stated in scientific studies that mathematics is considered difficult by the majority of society. The educational approaches adopted in mathematics teaching are among the main factors that led to the formation of this idea. With the curriculum changes made in our country in recent years, modern approaches have been adopted in mathematics lessons, the principles of constructivist approach have started to be used, especially in mathematics teaching, and the subject has come to the fore by visualizing and making the students to understand by connecting with their social life. This study is important in terms of introducing cultural stories. It is also important in terms of examining the effect of storytelling teaching on students' achievement levels and anxiety towards mathematics. The results obtained from this study are also important for teachers, as they may create positive changes in the teaching methods adopted by teachers (Katipoğlu, 2016).

In this study, the effect of teaching mathematics through storytelling on students' mathematics achievement, mathematics attitude and mathematics anxiety was examined. Accordingly, two 5th grade study groups

consisting of 64 students in total were selected and the study was carried out with these two 5th grade students. Two classes were assigned as experimental and control groups. In the experimental group, the mathematics lesson was taught through the storytelling method, while in the control group, the lesson was taught through the traditional presentation method. The application was carried out in a secondary school in Bornova district of Izmir province and lasted 6 weeks. The following results have been achieved in line with the data obtained as a result of the application:

- Before and after the study, the mathematics achievement test prepared by the researcher was applied to both classes selected as the experimental and control groups. According to the results of the mathematics achievement test applied before the lessons start, the success scores of both groups were equal to each other. After the application, the mathematics achievement scores of the experimental group students were found to be significantly higher than those of the control group students. According to these results, it was determined that teaching through storytelling is more effective than the traditional method in increasing students' mathematics achievement. This result is in line with the studies of Ünüvar (2019), Yaralı (2019), Akdemir (2018), Yıldırım (2018), Sertsöz (2017), Aksoy (2010), Kavasoğlu (2010), Subaşı (2010), Öztürk (2011), Erdağ (2011), Tayan (2011), Yılmaz (2012) and Coşkun (2013)

- The mathematics anxiety scale developed by Recep Bindak (2005) was applied to both classes selected as the experimental and control groups before and after the study. According to the results of mathematics anxiety scores before the application, it was seen that the anxiety scores of both groups were equivalent to each other. After the application, the mathematics anxiety scores of the experimental group students were found to be significantly lower than those of the control group students. According to these results, it was determined that teaching through storytelling was more effective than the traditional method in reducing students' mathematical anxiety, decreasing their fear towards mathematics and endearing mathematics. This result is in line with Ünüvar's (2019) study.

After the application, the students in the experimental group were asked their opinions about teaching through the story with an open-ended question, and the effects of this method on them were tried to be determined. Students generally stated that;

- After the story-based teaching, the lessons turned into fun and they liked lessons more,
- With the help of stories, they both repeat their lessons and study the exam,
- Mathematics lessons are difficult and cause confusion, with the help of stories, these confusions are eliminated and the subjects become easier and more enjoyable,
- Learning by having fun is permanent and they develop positive feelings towards their teacher.
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When the mathematics textbooks are examined, it is seen that there is not enough room for teaching through story. Using this method more in textbooks can facilitate teaching and make the lesson more enjoyable. In addition, teachers' teaching the lessons by integrating the teaching method with the traditional method and using the stories related to daily life can increase the success in teaching. Stories to be developed with mathematical literacy problems, which have gained importance in recent years, can directly affect students' permanent learning. Since this study is limited to the subject of decimals, the effect of mathematics teaching on students can be examined with different stories.

Teachers can be trained on how to visualize and make a lesson more concrete. Thus, teachers can support the teaching with visual tools and associate it with daily life while teaching mathematics, which is an abstract subject. They can increase the motivation level of the students especially by using the storytelling model. Teachers can create stories themselves or they can be presented to students ready-made.

The research was conducted with 5th grade students. Research can be diversified by expanding the study group. In addition, different psychological factors can be examined using the storytelling method. The effect of teaching through stories can be investigated with different data collection methods. In their comments, the students generally asked other course teachers to teach with stories. In this respect, teaching with a narrative story can be applied not only for mathematics lessons but also in other branches and its effect on students can be examined. Storytelling can be transformed into animation or cartoon format using emergent technologies and presented to students. Thus, the way can be paved for addressing different senses.

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