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THE EFFECT OF THE INTEGRATED MATHEMATICS LESSONS WITH CHILDREN'S LITERATURE ON THE FIFTH GRADE STUDENTS' PLACE VALUE UNDERSTANDING

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Abstract: The comprehension of the place value concept which is based on the grouping of numbers in accordance with distinct systems is not so easy. One of the sources that may contribute to the comprehension of the place value and making connections with daily life is children's books. The effects of several tools on the comprehension of the place value have been analyzed in the literature, but the effects of children's books in this regard have not been so frequent. Therefore, the aim of the study is to analyze the effects of the fifth-grade mathematics lessons integrated with children's books on the students' place value understanding. The study was designed through the case study which is a kind of the qualitative research methods. The participants of the study are 32 fifth grade students. The data of the study were obtained through the place value test, the place value achievement test, and an interview form. The findings indicate that the mathematics lessons integrated with the picture books have positive effects on the fifth-grade students' comprehension and achievement about the place value. Also, the students participated in the study mostly reported positive views about the mathematics lessons integrated with the children's books.

Key words: children's literature, mathematics education, place value

1. Introduction

The place value is one of the key concepts in mathematics which is the basis for various mathematical concepts and topics (Major, 2012). If not learned in a meaningful way, the place value comprehension, which causes individuals to have problems in terms of mathematics lessons in the following years and students may have trouble in learning further mathematical topics (Moeller et al., 2011). Also, students' comprehension about the place value does not increase with the grade levels over time as it is normally expected. It is reported that even successful students have difficulty in comprehending the concept of place value (Dinç Artut & Tarım, 2006). As expected, students with poor understanding about place value show lower performance than their peers in the activities concerning the learning domain of numbers and operations (Chan, Au & Tang, 2014). Some of the difficulties related to the comprehension of the place value are about the organization of the teaching process. Excessive emphasis on the rules and the lack of connections are just some of the problems with instructional processes that make it difficult to learn the place value (Price, 2001). Due to the lack of connections students may have difficulties in establishing a connection between the symbols of numbers and their real-life counterparts (Baroody, 1990). For this reason, research suggests that such connections can be developed through some teaching tools that can also be used for the teaching of the place value (Can & Durmaz, 2021; Mutlu & Sarı, 2019; Sarı & Aydoğdu, 2020). One of the materials that may serve this connection is thought to be children's books.

1. 1. Teaching mathematics and children's literature

Children's books can be used to enrich the mathematics teaching. Such an integration provides an opportunity to relate the mathematical content with daily life (Moyer, 2000). It is reported that when the mathematical concepts are taught in a context or in a story and not as isolated knowledge, students learn them much better, and learning becomes more permanent (Casey et al., 2008). The integration of mathematics teaching and children's literature does not only contribute to connecting mathematics with

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daily life (Golden, 2012). Because such an integration provides an opportunity to introduce the mathematical concepts in a context (Wallace, Clark & Cherry, 2006), to eliminate the potential misconceptions (Courtedo et al., 2013) and to offer differentiated mathematical lessons to meet the diverse learning needs of students (Forbringer, 2004). It has also other advantages such as mathematics anxiety can be reduced by increasing students' interest and confidence with a less threatening learning environment (Furner, 2017); learning is made much easier (Ruiz et al., 2010) through different representations of the mathematical concepts (Trakulphadetkrai et al., 2019) and students' motivation and active participation in lessons can be improved through addressing student interest (Keat & Wilburne, 2009; Luedtke & Sorvaag, 2018; Whitney et al., 2017). Because in classrooms where mathematics and children's literature are effectively integrated by employing various methods such as interactive read aloud, mathematical knowledge is actively constructed through the learners' own experiences (Van den Heuvel-Panhuizen & Van den Boogaard, 2008). Thus, using an approach delivered to students of all ages and levels, including those with reading difficulties (Moore, 2008), the academic achievement of students can be improved (Capraro & Capraro, 2006; Green, 2013; Lemonidis & Kaiafa, 2019).

One of the important factors affecting the quality of the process of integrating mathematics teaching and children's literature is the books used. It is important to examine whether the books that are considered to be used in the mathematics lessons have suitable features in terms of mathematics teaching. If there are some problems identified in these books, they should be used after the necessary adaptations. Because although some children's books offer very rich contexts for meaningful learning of mathematics, there are some errors in the contents of the books (Nurnberger-Haag, 2017). For instance, Nurnberger-Haag et al. (2020) found that those children's books which focus on counting skills contain incorrect examples which may lead to misconceptions among students. Similarly, Ward et al. (2017) argues that although children's books support the counting skills of the children, there are some representations in these books which do not correctly follow the counting principles.

There is another significant factor in the integration process which is also important as much as the content of the children's books. It is competency and beliefs of the people who realize the integration of the children's books and mathematics teaching. Both pre- and in-service teachers have opinions on that integrating children's literature with mathematics teaching is more appropriate for the early childhood period (Can et al., 2020). However, it should be noted that the majority of the studies on the integrating children's literature with mathematics teaching have been carried out on a sample of pre-school children (Wu, 2019).

On the other hand, there are other studies which are carried out on a sample of children from other ages. For instance, it is reported that using children's literature in the mathematics lessons is one of the effective methods in activating middle school students' prior knowledge (Gregory & Kaufeldt, 2015). In addition, it is stated that the use of children's books improves the students' math achievement while decreasing their math anxiety (Green, 2013). However, only a very small part of the studies on the integration of mathematics teaching and children's literature are conducted experimentally and on a sample of middle school students (Edelman et al., 2019; Jett, 2014). Therefore, it is considered that investigating the effects of integrating children's literature in mathematics education at the middle school level is important.

Based on the previous ideas the research question of the study is developed as follows: 'What are the effects of mathematics lessons integrated with children's literature on 5th grade students' understanding of place value?'

The sub-research questions are given as follows:

1. What are the effects of integrating children's literature in mathematics lessons on the scores of the students from the place value test?
2. What are the effects of integrating children's literature in mathematics lessons on the scores of the students from the place value achievement test?
3. What are the views of the students about the mathematics lessons integrated with the children's books?

2. Methodology

This section presents the information on research design, participants, data collection tools, data collection process, data analysis and experimental procedure.

2.1. Design of the study

Given that the study aims at revealing the 5th grade students' views on mathematics lessons integrated with children's literature and at identifying the effects of these lessons on the students' understanding of place value the study was designed through the case study which is kind of the qualitative research methods. This design is suitable for collecting and analyzing qualitative and quantitative data both. The design was used in this study to reveal the effect of the intervention and the views of the participants on the process in question (Gillham, 2000; Yin, 2003). In the study, first the pre-and post-test quasi-experimental design with no control group was used, and the teaching of the place value was enriched with children's books. After the completion of the experimental process, the qualitative data of the study were collected in order to reveal the students' views on this implementation and to support the quantitative data.

2.2. Study group

The study group of the research consists of a total of 32 middle school students who attend the 5th grade and participate in the research voluntarily. The participants attended a socioeconomically middle-lower bussing school. The participants were chosen through the purposeful sampling technique. In the purposeful sampling technique, the participants are chosen based on the pre-established criteria allowing to select those participants in accordance with the purpose of the study (Balcı, 2020). The selection of the participants is guided by the following points: the studies on the integration of children's literature and mathematics teaching were carried out very little at the middle school level, that the mathematics teacher of the study group had experience in integrating children's literature and mathematics teaching and received in-service training on this topic.

2.3. Data collection tools

The data of the study were collected through three data collection tools each of which are described below. The students were given firstly the place value test, secondly the place value achievement test before the intervention. After the intervention they were given the place value test firstly, then place value achievement test, lastly interview questions.

2.3.1. The place value test

The place value test was developed by Major (2012) which targets the students of 3rd-9th. grades. It was translated into Turkish by the researchers. The test was developed based on The Number Framework (Bobis et al., 2005) and is consisted of 50 items. Some of the questions are in the following: "1) 7+10; 2) 10+?=18; 3) Write 14 as a number.; 4) 20=13+?; 5) 8 tens is the same as what number?". All 50 questions in Major (2012) were used in the study. Correct answers to the items are scored 1 and incorrect answers or no answer are scored 0. The three factors of the test are as follows: i) Units and decimals created using words, digits, and symbols, and counting by one and ten, and grouping with decimals, ii) concepts with multi units-grouping and regrouping, natural numbers with 3 and more digits, rounding the natural numbers and iii) extended multi-unit concept-natural numbers and decimal fractions, relationships between natural numbers and decimal fractions, simple fractions. It is reported that it is possible to use the test with a single factor to measure the place value understanding as a whole (Major, 2012).

2.3.2. The place value achievement test

The place value achievement test was developed by the authors based on the learning outcomes contained in the learning domain of natural numbers of the mathematics curriculum (Ministry of Education, 2018) for the fifth grade. The test is composed of eight open-ended items (see Appendix 1). The draft of the test was reviewed by two experts in the field of mathematics education. The reason for

the use of this test in addition to the place value test is to identify the effects of the integrated mathematics lessons on the acquisition of the learning outcomes contained in the learning domain of natural numbers which are specific to 5th grade level.

2.3.3. Interview form

Two open-ended questions were asked to the participants following the implementation in order to get their opinions on the mathematics lessons which are integrated with children's books. These questions are as follows: "What do you think about the children's books used in the mathematics classes? How do you feel about the lessons?" and "What did you like and dislike about these lessons which were using children's books? Would you like to participate in the lessons offered in this way again? Why?"

2.4. Procedure

The children's books used in the courses are given in Appendix 2. The authors first reviewed the children's books related to the place value, and after reading these books, some of them were included in the scope of the study which were adapted to the mathematics lessons. The books considered to be included in the study were selected by considering the book selection criteria specifically developed for children's books with a mathematical context in the mathematics education literature (Hellwig et al., 2000). The criteria used in the selection of the books are accuracy, visuals included, the use of interesting words, connection of mathematical concepts, suitability to the target audience and unusual presentation of mathematical concepts in the books (Hellwig et al., 2000). Research shows that in the integration process, books are generally read interactively. Interactive reading aloud is the planning and reading of children's books aloud by the teacher (Ceyhan & Yıldız, 2021). The authors developed lesson outlines based on the interactive aloud reading technique which were examined by two experts in the field of mathematics education and then, the lessons were developed after the necessary corrections were made based on the feedbacks from the reviewers. The books included in the experiment were read by the teacher interactively. During the interactive reading aloud process students should be able to see the content of the book (Ceyhan & Yıldız, 2021). For this reason, the pages of the books were also reflected from the projection device, so the students were able to follow the illustrations aligned with the story. During the lesson, the teacher sometimes stopped reading the book in important parts of the story and asked questions to the students about the subject. Thus, the books are integrated into all parts of the course, not only in the introduction or warming up part of the lesson (Can et al., 2020), which is not an effective form of integration, as has been criticized in the related studies. Thus, presenting a context through ways of integrating children's literature with mathematics teaching, developing a concept or a skill and providing context for evaluation could be covered (Welchman-Tischler, 1992). The implementation of integrating mathematics teaching with children's books lasted for 4 weeks and 3 hours per a week. No material other than children's books was used in the lessons. Because in most of the studies, games and concrete materials etc. are used in the mathematics teaching process with children's books. It is stated in the literature that the effect of only children's books cannot be determined clearly and under which conditions they occur, since supplementary materials such as games are used in the teaching process (Van den Heuvel-Panhuizen & Elia, 2011).

2.5. Data analysis

The quantitative data of the study were first tested in terms of the normality of the distributions in order to select the appropriate data analysis methods. The analysis results of the distribution normality regarding the place value test and the place value achievement test used are given in Table 1.

Table 1. *Distribution of the scores from two tests*

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Place Value Achievement Test	.117	31	.200*	.961	31	.303
Place Value Test (Major, 2012)	.126	31	.200*	.946	31	.119

As can be seen in Table 1 the scores from two tests distribute normally (Can, 2016). t-test was used to see whether there were statistically differences between the scores from the place value test and the place value achievement test in pre-test and in post-test. Test results are given in findings section. The data obtained from the interview forms were examined through the content analysis. In order to ensure the credibility and internal reliability of the study, the reports by the students to the interview items are presented through direct quotations which are accompanied codes for the participants, such as S1 (Student 1), S2, S3 and so on. In order to ensure the generalizability and external validity of the study, the participants were determined through the purposeful sampling technique, and the participant characteristics and the implementation process were explained in detail as possible (Sharts-Hopko, 2002). The authors discussed the findings after analyzing them independently from each other in the data analysis process. Thus, consensus was tried to be achieved regarding the analysis of the data.

3. Findings

In this section, the findings obtained from the analyses made to reveal the effects of mathematics lessons that are integrated with children's literature on the 5th grade students' understanding about the place value and student views on the integration process are presented.

3.1. Findings on the scores from the place value test and the place value achievement test

For the both tests the pre- and post-test scores of the participants are analyzed using the t-test due to the fact that the data distributed normally (Can, 2016). Table 2 shows the result of the related samples t-test, which was conducted to determine whether there was a statistically significant difference between the scores of the "Place Value Test (Major, 2012)" applied before and after the experimental practice in which mathematics lessons integrated with children's literature were conducted.

Table 2. *Pre- and post-test results of the place value test (PVT)*

Measurement	N	X	S	sd	t	p
Pre-test	31	14.23	6.40	30	-2.114	.043
Post-test	31	15.96	7.22			

According to Table 2, it is seen that there is a statistically significant difference between the mean scores obtained before and after the experiment based on the integration of mathematics and children's literature [t (31) = - 2.114, p <0.05]. The difference is in favor of the post-test scores of the participants, but the significant of this difference is found to be not so high as shown in the impact size analysis (d = $\frac{t}{\sqrt{n}}$=0.380) (Can, 2016). Therefore, it can be argued that the mathematics lessons integrated with children's literature have positive effects on the place value comprehension of the fifth-grade students.

In order to examine the effect of mathematics lessons integrated with children's literature on the scores obtained from the place value achievement test, the related samples t test, which is a parametric test, was used because the data showed normal distribution. The related samples t test analysis result made to determine whether there is a statistically significant difference between the "Place Value Achievement Test" pre-test and post-test scores of the participants are given in Table 3.

Table 3. *Pre- and post-test results of the place value achievement test (PVAT)*

Measurement	N	X	S	sd	t	p
Pre-test	31	28.94	20.31	30	-3.954	.000
Post-test	31	42.35	23.61			

Table 3 indicates that there is a significant difference between the participants pre-test and post-test scores from the place value achievement test [t(31)=-3.954, p<0.01]. The impact size found (d=0.710) shows that this difference is at the medium level (Can, 2016). Therefore, it can be argued that the mathematics lessons integrated with children's literature have positive effects on the achievement of the fifth-grade students about the place value.

3. 2. Participants' views about the integration process

Following the implementation of the experimental process the views of the participants about the integrated lessons were analyzed. To this end they were asked to answer two items one of which is given as follows: Item 1. "What do you think about the children's books used in the mathematics classes (such as King's Tens, How Big is a Million?, The Largest of Numbers, and Can You Count It up to 101-Digit Numbers?)? How do you feel about the lessons integrated with these books?" The views of the participants obtained from their answers to this item are given in Table 4.

Table 4. *Participants' opinions regarding children's books and integrated instruction*

Opinions	Frequency
Fun/nice/exciting.	31
The book made us to understand the lesson/to learn much more easily.	6
It was like a story/a tale.	3
It made us feel special.	2
It connected mathematics with real life.	1
I did not understand how the time passed.	1
It was very consistent with the course.	1

As can be seen in Table 4 all of the participants stated that the mathematics lessons integrated with the children's books was fun (f=31). It suggests that the participants enjoyed the learning process. Some participants reported that the lesson delivered through the children's books facilitated their understanding and learning the topics studied (f=6). The findings indicate that the participants have positive opinions about the lessons. Figure 1 presents the opinions of the students.

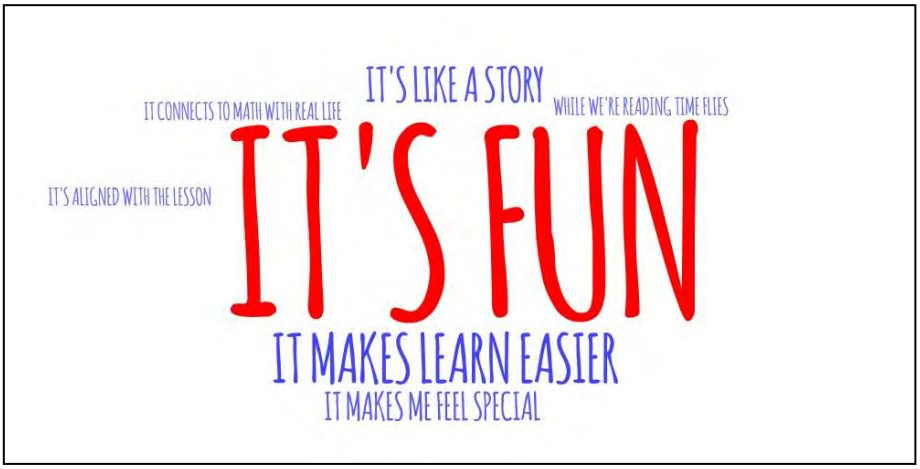


Figure 1. Participants' opinions regarding children's books and integrated instruction

Direct quotations showing the views of the participants are given as follows:

S1: "...Very nice, it told mathematics like a story in real life."

S12: "...The book was very nice, it made me feel very special, because math is easy when it is so fun. So, I would like to…"

S24: "The book created good feelings, because I love to read, I like to listen to the books even more. I read ten pages every night and tell myself what I understand."

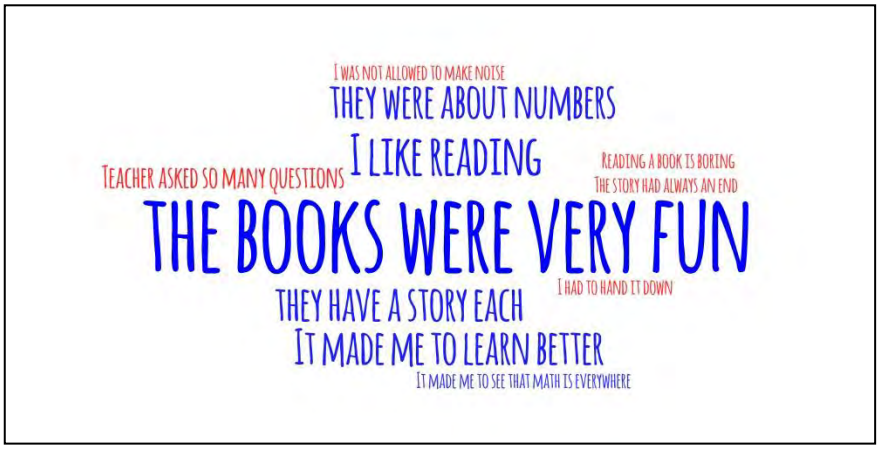
The second item asked to the questions about their views on the lessons is as follows: Item 2. "What did you like and dislike about the teaching of the lesson using children's books? Would you like to participate in the lessons offered in this way again? Why?" Their views obtained from the answers to the Item 2 are given in Table 5.

Table 5. *Positive and negative opinions of the participants about the lessons integrated with the children's books*

Positive opinions	**f**	**Negative opinions**	**f**
The books were very fun	15	Teacher asked so many questions	2
I like reading (books)	3	The story had always an end	1
They have a story each	3	I was not allowed to make noise	1
They were about numbers	2	I had to hand it down (notes from the book while reading)	1
The story allowed me to understand the topic	2	Some students in the classroom damage the books while reading them	1
Never ending numbers	1	Reading a book is boring	1
It made me to learn better	1	Long stories sometimes are being boring	1
Everyone in the classroom is quiet to hear the story	1		
It made me to see that math is everywhere.	1		
Everyone in the classroom read the books	1		

Table 5 shows that the participants generally have positive views about the lessons integrated with the children's books. However, there are some participants who reported negative views due to the longer stories (f=1) and due to many questions asked in the lesson while reading alouds (f=2). It should be noted that the points that the students reported as negative dimensions (such as being uncomfortable with the damaging the books by other students, ending the story, etc.) are actually positive opinions in terms of implementation. Figure 2 presents the participants' views based on the frequency.

Figure 2. Participants' positive and negative opinions



Some of the student views are given as follows:

S4: "It was so fun that I couldn't even take my eyes off the book."

S15: "What I liked was that the story was about numbers. What I didn't like is that the story was not longer."

S17: "I understood the subject in the first lecture of the teacher that is what I liked. The part I didn't like is that sometimes I couldn't write while trying to get notes about the story."

S20: "I liked everything. Look it was too beautiful to be described. Storybook of math is such a beautiful feeling that is ubiquitous, too much to be told!"

S23: "I don't like being asked too many questions, I like listening to the reading of the story. Yes, it was nice."

S24: "I wish the lessons were taught this way because I like stories but when they are long, I get bored sometimes."

S25: "No, it would be boring. I do not like reading books, but the mathematics lesson."

It is observed that the students either liked or did not like the courses taught with children's books for various reasons. For example, there are participants who love mathematics but do not like to read books or long stories which for them become boring after a while, etc. The findings of the study are discussed in the section below in relation to the previous findings.

4. Discussion, Conclusion and Suggestions

In this study, the effects of the mathematics lessons integrated with children's literature on the 5th grade students' comprehension and achievement of the place value was examined. The findings of the study suggest that this integration has a positive effect on the participants' understanding and achievement of the place value.

The difficulties faced and mistakes made by the students about the concept of the place value also pose obstacles to the comprehension of other topics of mathematics. For example, the difficulties such as forgetting the remaining number, starting the addition and subtraction from the higher digits, having problems breaking apart digits and decimals for subtraction, tendency to subtract the number smaller than the larger number regardless of the position of the number, making the operations with hundreds instead of decades, forgetting the remainder to use in the multiplication or incorrect addition, writing the result from left to right in division, and not knowing where to write the zero in the process are actually problems related to the concept of place value (Özmen, 2017). Such problems arise due to the reasons such as teaching mathematical concepts in isolation and detachment from context and preferring rule-oriented teaching rather than teaching based on the conceptual understanding. Therefore, teaching mathematical concepts in connection to daily life is important in providing meaningful learning. One of the ways to connect mathematics with daily life is to make use of the children's books in mathematics teaching. Interactive read aloud and shared story reading, which are frequently used techniques in the integration of mathematics teaching and children's literature, provide a context that allows mathematical concepts to be associated with real life and problem solving (Columba et al., 2005). These teaching approaches also improve the participation of the students who face with academic difficulties or with behavioral problems in lessons (Whitney et. al., 2017). As mentioned above the participants cited the "being quiet to hear the story" as a positive dimension of these courses. However, there are others who cited the "not being able to talk in the classroom" as a negative dimension. In addition, in this study, it is observed that the 5th grade students from a bussing school system and whose socioeconomic levels are low-medium, improved their level of understanding and achievement about the place value through the children's books with the interactive read alouds. This finding is similar to that reported by Young-Loveridge (2004) who found positive effects of the mathematics lessons using literature on the students from lower socioeconomic classes. Similarly, Green (2013) concluded that the mathematics lessons integrated with children's books have positive contributions on students' academic achievement. Given that one of the participants stated that "the integrated courses made him to see that mathematics is everywhere", it can be argued that such an integration provided an opportunity to make connections between mathematical concepts and daily life. This finding is consistent with the findings reported in the study by Van den Heuvel-Panhuizen et al. (2009).

When the views of the students about the implementation of the integrated mathematics lessons are examined, it is found that their views on integration are consistent with the previous findings in the literature. One of the participants' views, "everyone is silent in order to listen to the story in the classroom." may suggests that students can pay more attention to the course when it is delivered through an interdisciplinary approach (Clements & Sarama, 2007; Luedtke & Sorvaag, 2018). The mathematics achievement of the students in the study varies within their own classes. However, the change in their test scores indicate that the integration of children's literature and mathematics can improve the mathematics skills of students with different learning characteristics (Forbringer et al., 2016; McGuire et al., 2020). Moreover, as in the studies of Van den Heuvel-Panhuizen et al. (2016), positive results and feedback were obtained in this study, even though no material other than books was used or no additional activity was performed. This can be considered as a powerful tool to enrich mathematics teaching with children's books. However, it can be seen from the views of the students that such an integration has

also some negative sides. For example, a student who does not like to read books, but likes mathematics stated that s/he did not enjoy this process, and another student reported that the story was too long. Likewise, there is a student who stated that although s/he liked reading children's books in mathematics lessons, s/he did not like the splitting of the story because of the questions asked in the interactive read aloud technique. These views suggest that despite the benefits of the children literature and mathematics education integration process, it may not be an appropriate and effective approach for each student. For this reason, in the planning process, which is one of the important points regarding the integration process, the characteristics of the student should be considered. So, it is necessary not to harm literature while teaching mathematics and balance the two areas as much as possible (Austin, 1998).

For the integration process to achieve its purpose, it has a critical role to include qualified books in the process and to use them effectively. This requires the teacher, who would integrate literature and math, to read the math themed books more than once each, and to evaluate the suitability of these books for the purpose of the lesson and for the integration. Because although there are many children's books especially related to numbers, the content of these books may be inaccurate (Nurnberger-Haag, 2017) and even most of the content may not be aligned with the numeracy development (Ward et al., 2017). For this reason, the ineffective use of quality books or the inclusion of poorly qualified books in the integration process cause the integration to be ineffective in the learning processes instead of supporting them (Flevares & Schiff, 2014). Therefore, the integration of children's literature and mathematics teaching should be planned well. Research suggests that although student engagement is high in mathematics lessons that are integrated with children's literature and students are motivated without a purposeful teaching in these courses, they do not always succeed in acquiring the concepts from the children's books alone (Rathé et al., 2016). Therefore, for the integration to be productive, teachers need to make serious preparation and planning (Whitney et al., 2017).

Although this study has some positive aspects, it also has some limitations. First, the participants of the study were chosen through the purposeful sampling, and the study was carried out using a quasi-experimental design with no control group. Because it was necessary to work with an experienced teacher in structuring and implementing the mathematics lessons using the children's literature in order to accurately reveal the effects of the experimental practice on the students' place value understanding. Since it is not possible to carry out the related study without teachers' volunteer participation, the purposeful sampling method was used (Van den Heuvel-Panhuizen et al., 2016). In addition, the study focused only on the development and views of 5th grade students regarding the concept of place value. For future studies, it may be suggested to conduct studies that will test the effect of integrating children's literature with mathematics teaching concerning the different topics of mathematics. However, it is usually preschool students who participate in experimental studies on mathematics teaching that makes use of the children's literature. Studies can be carried out using more effective experimental designs with students of different age groups such as middle school level.

References

Austin, P. (1998). Math books as literature: which ones measure up? *The New Advocate*, *11*(2), 119-133.

Balcı, A. (2020). *Sosyal Bilimlerde Araştırma Yöntem, Teknik ve Ilkeler* (14th Ed.) [Research Methods, Techniques and Principles in Social Sciences]. Ankara: Pegem Yayıncılık.

Baroody, A. (1990). How and when should place value concepts and skills be taught? *Journal for Research in Mathematics Education, 21*(4), 281-286.

Can, A. (2016). *SPSS ile Bilimsel Araştırma Sürecinde Nicel Veri Analizi* (4th Ed.), [Quantitative Data Analysis in Scientific Research Process with SPSS]. Pegem Akademi.

Can, D., & Durmaz, B. (2021). *Diskalkulik Çocuklara Onluk Sayı Sistemi-Basamak Değeri Öğretimi* [*Teaching Number System-Place Value to Dyscalculic Children]* (In: Diskalkuli-Matematik Öğrenme Güçlüğüne Sahip Çocuklara Matematik Öğretimi [Teaching Mathematics to Children with Dyscalculia-Math Learning Disabilities], (Editors: Yılmaz Mutlu, Sinan Olkun, Levent Akgün, Mehmet Hayri Sarı), Vizetek Yayıncılık, pp. 145-172.

Can, D., Özer, A. & Durmaz, B. (2020). Views of pre-service primary school teachers about the integration of children's literature in mathematics teaching. *International Journal of Progressive Education, 16*(4), 99-114.

Capraro, R. M. & Capraro, M. M. (2006). Are you really going to read us a story? Learning geometry through children's mathematics literature. *Reading Psychology, 27*(1), 21-36

Casey, B., Erkut, S., Ceder, I., & Mercer Young, J. M. (2008). Use of a storytelling context to improve girls' and boys' geometry skills in kindergarten. *Journal of Applied Developmental Psychology, 29*, 29-48.

Ceyhan, S., & Yıldız, M. (2021). *Örnek Kitap Okuma Planlarıyla Ilkokulda Etkileşimli Sesli Okuma [Interactive Read Aloud in Primary School with Sample Reading Plans]*. Ankara: Pegem Yayıncılık.

Chan, W. W. L., Au, T. K., & Tang, J. (2014). Strategic counting: A novel assessment of place-value understanding. *Learning and Instruction, 29*, 78-94.

Clements, D. H., & Sarama, J. (2007). *Building Blocks-SRA Real Math, Grade Pre-K*. Columbus, OH: SRA- McGraw Hill.

Columba, L., Kim, C. Y., & Moe, A. J. (2005). *The power of picture books in teaching math & science. Grades PreK-8*. Scottsdale, AZ: Holcomb Hathaway.

Courtade, G. R., Lingo, A. S., Karp, K. S., & Whitney, T. (2013). Shared story reading: Teaching mathematics to students with moderate and severe disabilities. *Teaching Exceptional Children*, *45*(3), 34-44.

Creswell, J. W., & Plano Clark, L. V. (2015). *Karma Yöntem Araştırmaları Tasarımı ve Yürütülmesi [Designing and Conducting Mixed Methods Research]* (Translation Editors: Yüksel Dede & Selçuk Beşir Demir), Anı Yayıncılık, 2nd Ed., Ankara.

Dinç Artut, P., & Tarım, K. (2006). İlköğretim öğrencilerinin basamak değer kavramını anlama düzeyleri [Elementary school students' level of understanding of the place value concept]. *Eğitimde Kuram ve Uygulama*, 2(1), 26-36.

Edelman, J., Green, K., & Jett, C. C. (2019). Children's literature to inform mathematics teaching and learning: A systematic review of the research literature from 1991-2016. *The International Journal of Science, Mathematics and Technology Learning, 26*(1), 49-60.

Flevares, L., & Schiff, J. (2014). Learning mathematics in two dimensions: A review and look ahead at teaching and learning early childhood mathematics with children's literature. *Frontiers in Psychology, 5*, 459. doi:10.3389/fpsyg.2014.00459.

Forbringer, L. L. (2004). The thirteen days of halloween: using children's literature to differentiate instruction in the mathematics classroom. *Teaching Children Mathematics*, 11(2), 82-90.

Forbringer, L., Hettinger, A., & Reichert, E. (2016). Using the picture book extra yarn to differentiate common core math instruction. *YC Young Children*, *71*(2), 22-29.

Furner, J. M. (2017). Using fairy tales and children's literature in the math classroom: Helping all students become Einstein's in a STEM world. *Journal of Advances in Education Research*, *2*(2), 103-112.

Gillham, B. (2000). *Case Study Research Methods*, London: Continuum.

Golden, L. (2012). Children's literature in mathematics instruction. *Library Media Connection, 31*(2), 40-41.

Green, S. (2013). *Improving comprehension in middle school math by incorporating children's literature in the instruction of mathematics*. (PhD Thesis). Retrieved from ProQuest LLC. (ED554063).

Gregory, G., & Kaufeldt, M. (2015). *The motivated brain: Improving student attention, engagement, and perseverance*. Alexandria, VA: ASCD.

Hellwig, S. J., Monroe, E. E., & Jacobs, J. S. (2000). Making informed choices: Selecting children's trade books for mathematics instruction. *Teaching Children Mathematics, 7,* 138-143.

Jett, C. C. (2014). Using mathematics literature with prospective secondary mathematics teachers. *Journal of Mathematics Education at Teachers College*, *5*(2), 49-53.

Keat, J. B., & Wilburne, J. M. (2009). The impact of storybooks on kindergarten children's mathematical achievement and approaches to learning. *US China Education Review*, *6*(7), 61-67.

Lemonidis, C., & Kaiafa, I. (2019). The effect of using storytelling strategy on students' performance in fractions. *Journal of Education and Learning*, *8*(2), 165-175.

Luedtke, M., & Sorvaag, K. (2018). Using children's literature to enhance math instruction in K-8 classrooms. In L. Jao & N. Radakovic (Eds.), *Transdisciplinarity in Mathematics Education* (pp. 47-71). Springer, Cham.

Major, K. (2012). *The Development of an Assessment Tool: Student Knowledge of the Concept of Place Value*, In J. Dindyal, L. P. Cheng & S. F. Ng (Eds.), Mathematics education: Expanding horizons (Proceedings of the 35th annual conference of the Mathematics Education Research Group of Australasia). Singapore: MERGA. © Mathematics Education Research Group of Australasia Inc., pp: 481-488.

McGuire, P., Himot, B., Clayton, G., Yoo, M., & Logue, M. E. (2020). Booked on math: developing math concepts in pre-k classrooms using interactive read-alouds, *Early Childhood Education Journal*. https://doi.org/10.1007/s10643-020-01073-1

Ministry of Education (2018). Matematik Dersi Öğretim Programı-İlkokul ve Ortaokul 3,4,5,6,7,8. Sınıflar için [Mathematics Curriculum-Primary and Middle Schools 3, 4, 5, 6, 7, 8th grades], Ankara.

Mix, K. S., Smith, L. B., Stockton, J. D., Cheng, Y. L., & Barterian, J. A. (2017). Grounding the symbols for place value: Evidence from training and long-term exposure to base-10 models. *Journal of Cognition and Development*, *18*(1), 129-151.

Moeller, K., Pixner, S., Zuber, J., Kaufmann, L., & Nuerk, H.C. (2011). Early place-value understanding as a precursor for later arithmetic performance-A longitudinal study on numerical development. *Research in Developmental Disabilities*, 32, 1837-1851.

Moore, K. E. (2008). Integrating children's literature and mathematics. Theses and Dissertations. 745. https:// rdw.rowan.edu/etd/745

Moyer, P. S. (2000). Communicating mathematically: Children's literature as a natural connection. *The Reading Teacher, 54,* 246–255.

Mutlu, Y., & Sarı, M. H. (2019). İlkokul öğrencilerinin basamak değeri kavrayışlarının geliştirilmesi [Improving primary school students' understanding of place value]. *Kastamonu Eğitim Dergisi*, *27*(2), 657-667.

Nurnberger-Haag, J. (2017). A cautionary tale: how children's books (mis) teach shapes. *Early Education and Development, 28*(4), 415-440.

Nurnberger-Haag, J., Alexander, A. N. & Powell, S. R. (2020). What counts in number books? A content-domain specific typology to evaluate children's books for mathematics, *Mathematical Thinking and Learning*, DOI: 10.1080/10986065.2020.1777365

Olkun, S., & Toluk Uçar, Z. (2007). *Ilkoğretimde Etkinlik Temelli Matematik Öğretimi [Activity-Based Mathematics Teaching in Primary Education]*, Ankara: Maya.

Özmen, R. (Ed.). (2017). *Matematikte Öğretimsel Stratejiler-Problem Çoözme, Doğal Sayılar, Doğal Sayılarla Doört Işlem.[Teaching Strategies in Mathematics-Problem Solving, Natural Numbers, Operations with Natural Numbers]*. Ankara: Eğiten Kitap.

Price, P. S. (2001). *The development of year 3 students' place-value understanding: Representations and concepts.* (PhD Thesis). Retrieved from http://eprints.qut.edu.au/15783/

Rathé, S., Torbeyns, J., Hannula-Sormunen, M. M., & Verschaffel, L. (2016). Kindergartners' spontaneous focusing on numerosity in relation to their number-related utterances during numerical picture book reading, *Mathematical Thinking and Learning*, 18(2), 125-141.

Rogers, A. N. (2014). *Investigating whole number place value assessment in Years 3-6: Creating an evidence-based Developmental Progression*. PhD Thesis, School of Education College of Design and Social Context RMIT University, Australia.

Rogers, R. M., Cooper, S., Nesmith, S. M., & Purdum-Cassidy, B. (2015). Ways that preservice teachers integrate children's literature into mathematics lessons. *The Teacher Educator*, *50*(3), 170-186.

Ruiz, E. C., Thornton, J. S., & Cuero, K. K. (2010). Integrating literature in mathematics: A teaching technique for mathematics teachers. *School Science and Mathematics*, *110*(5), 235-237.

Sarı, M. H., & Aydoğdu, Ş. (2020). The effect of concrete and technology-assisted learning tools on place value concept, achievement in mathematics and arithmetic performance. *International Journal of Curriculum and Instruction 12*(1), 197-224.

Sharts-Hopko, N. C. (2002). Assessing rigor in qualitative research. *Journal of the Association of Nurses in Aids Care*, 13 (4), 84-86.

Trakulphadetkrai, N. V., Aerila, J. A., & Yrjänäinen, S. (2019). Bringing mathematics alive through stories. In *Story in Children's Lives: Contributions of the Narrative Mode to Early Childhood Development, Literacy, and Learning* (pp. 199-225). Springer, Cham.

Van den Heuvel-Panhuizen, M., & Van den Boogaard, S. (2008). Picture books as an impetus for kindergarteners' mathematical thinking. *Mathematical Thinking and Learning, 10,* 341-373.

Van den Heuvel-Panhuizen, M., Van den Boogard, S., & Doig, S. (2009). Picture books stimulate the learning of mathematics. *Australasian Journal of Early Childhood, 34*(2), 30-39.

Van den Heuvel-Panhuizen, M., & Elia, I. (2011). Kindergartener's performance in length measurement and the effect of picture book reading, *ZDM*, 43, 621-635.

Van den Heuvel-Panhuizen, M., Elia, I., & Robitzsch, A. (2016). Effects of reading picture books on kindergartners' mathematics performance, *Educational Psychology*, 36:2, 323-346.

Wallace, F. H., Clark, K. K., & Cherry, M. L. (2006). How come? What if? So what? Reading in mathematics classrooms. *Mathematics Teaching in the Middle School, 12,* 108-115.

Ward, J. M., Mazzocco, M. M., Bock, A. M., & Prokes, N. A. (2017). Are content and structural features of counting books aligned with research on numeracy development? *Early Childhood Research Quarterly*, *39*, 47-63.

Welchman-Tischler, R. (1992). *How To Use Children's Literature to Teach Mathematics*. Reston, VA: The National Council of Teachers of Mathematics.

Whitney, T., Lingo, A. S., Cooper, J., & Karp, K. (2017). Effects of shared story reading in mathematics for students with academic difficulty and challenging behaviors. *Remedial and Special Education*, *38*(5), 284-296.

Wu, J. F. (2019). Research on picture books: A comparative study of Asia and the World. *Malaysian Journal of Library & Information Science*, 24(2), 73-95.

Yıldırım, A. & Şimşek, H. (2013). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri [Qualitative Research Methods in Social Sciences]*. Seçkin Yayıncılık, Ankara.

Yin, R. K. (2003). *Case Study Research: Design and Methods.* (3rd ed.). Thousand Oaks, CA: Sage.

Young-Loveridge, J. M. (2004). Effects on early numeracy of a program using number books and games, *Early Childhood Research Quarterly*, 19, 82-98.

Appendix 1. Place Value Achievement Test

1. Explain digit and number with one example.
2. Model "1503" with based-ten blocks.
3. Perform the given operations.
    a. $250 \times 100 =$
    b. $57 \times 10 =$
4. Perform the given operations.
    a. $54000 \div 1000 =$
    b. $6700 \div 10 =$
    c. $7800 \div 100 =$
5. Round up 2019,
    a. To the nearest tenth,
    b. To the nearest hundredth.
6. Show the digits and periods of the number 321,536 in the place value chart. Then write the place value of each number in front of it. What are the place values of the 3s? Explain.
7. Write the reading of the number 425,607,089.
8. Write the number "seven hundred and four million six hundred and fifty-eight thousand nine hundred and twenty-three" with digits.

Appendix 2. Children's Books

Neuschwander, C. (2014). *Kral'ın Onlukları [King's Tens]* (Translator: Prof. Dr. Enis Sınıksaran), Doruk Yayıncılık, ISBN: 978-975-553-611-8.

Milbourne, A. (2011). *Bir Milyon Ne Kadar Büyük? [How Big is A Million?]* (Translator: Meltem Yenal Coşkun), TÜBİTAK, ISBN: 978-975-403-575-9.

Holm, M. (2017). *Sayıların En Büyüğü [The Largest of Numbers]* (Translator: Nezihat Bakar Langeland), Uçanbalık Yayıncılık, ISBN: 978-975-587-283-4.

Wells, R. (2016). *101 Basamaklı Sayılara Kadar Sayabilir Misiniz?[Can You Count It Up To 101-Digit Numbers?]* (Translator: Evra Günhan Şenol), TÜBİTAK, ISBN: 978-605-312-047-6.

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