Primary School Teachers' Experiences on The Process of Teaching Mathematics with The Digital Storytelling Method

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Abstract
In this study, it was aimed to analyze primary school teachers' experiences on mathematical education prepared with digital storytelling, and in this regard, phenomenological research design was utilized. Using the criterion sampling method among purposive sampling methods, a study group consisting of 25 primary school teacher teachers was chosen. The obtained data was analyzed by means of content analysis method. As a result of the research, it is seen that, according to statement of the primary school teachers, digital stories can be used in the mathematical lessons for being attention-grabbing, at introduction phase for activating prior knowledge, at development phase for allowing students to take active role in the process and at evaluation phase for helping to repeat subjects and identify the learning losses. Additionally, it was indicated by them that digital stories can be used in teaching of numbers and operations as well as geometry and measurement that are parts of mathematics curriculum. It was emphasized by the primary school teachers that the need of technological equipment and materials should be met during teaching process conducted with digital storytelling. Expressing that digital stories should be prepared in a way to allow students' active participation based on their interests, needs and individual differences, it was also highlighted by the primary school teachers that it is important to support the process with concrete materials and increase the number of digital stories for different subjects.

Keywords: Digital story, mathematics teaching, primary school teacher.

Introduction

Science and technology are given more importance in all areas of life as human needs become more different day by day (Dumlu Güler, 2011), and this rapid transformation also effects learning environments. With the integration of technology into educational processes, innovative opportunities emerge as to efficiently teach instructional objectives and learning outcomes (Kurudayıoğlu & Bal, 2014). Nowadays, instead of single-stimulus applications such as course books, teaching materials including multiple stimuli based on learning-by-doing and permanent learning are required (Kuzu Sarar and Durna, 2020). Accordingly, it is believed that enriching the teaching methods in education with digital materials considering the students' requests and needs will allow the students to structure what they learn and pay more attention to the lesson (Göçen, 2014). Utilization of digital materials that are interesting for students will offer an opportunity for a more productive educational process particularly in lessons such as mathematics in which some students display negative attitudes. In this respect, the digital storytelling draws attention as one of the most effective teaching methods since it enables students to structure and transfer what they learn in their mind and access the knowledge through concrete experiences (Yüksel Arslan et al., 2016).

Traditional storytelling has been used as a mean of communication among the people as well as a method to educate the students since the beginning of education (Yoon, 2013). Stories began to be recorded by means of paintings on cave walls since early humans and have become more common with the books printed thanks to invention of printing house (Turgut & Kışla, 2015). Thanks to stories, information based on experiences easily disseminated among the people, new information was obtained, and events were made sense of (Sever, 2014), thus the stories were begun to be frequently used for education purposes. In this context, the stories draw attention as an effective educational tool in educating well-qualified and creative people who can interpret and evaluate events in accordance with needs of the age (Ayvaz Tunç & Karadağ, 2013). The increase in the use of technology in education has provided different opportunities, and traditional stories have started to transform into digital stories by combining with technology (Eroğlu, 2022). Positive effects of stories in memorability have

enabled digital stories to be used as a learning tool in education and increased its importance in time (Ulum & Yalman, 2018).

As the stories have been recorded, kept and transferred to digital media through texts as well as published online using the technology, the concept of digital story has emerged (Gökben & Kışla, 2015). Using the images, voices, music and telling as a base, Rule (2005) describes digital storytelling as a modern portray of the stories with various dimensions and colors in interpreting of different characters, events, experiences and meanings. Digital storytelling is a process of presentation of an event that includes voice, image, photograph, music, video, animation effect and text on an interactive online media (Figa, 2004). Demirbaş (2019), on the other hand, describes the digital story as short videos with text, voice, picture and animation elements. Making the stages of writing story texts and transferring the written stories faster thanks to opportunities offered by online and digital media, students' interaction in the process can be increased by preventing them from becoming distracted. In addition, digital stories produced in combination with pictures, images and texts allow students to understand better and faster (Sur, 2022), and it is observed that the students have improved their skills of discovering, accessing and analyzing the knowledge, as well as different ideas and planning development (Ateş, 2023). The use of digital stories in education draws students' attention to the lesson and provides a creative learning environment (Sadik, 2008). In other words, with combination of technology and traditional storytelling, creating digital stories has been noted as one of the effective ways of increasing productivity in education (Kocaman Karoğlu, 2015).

Aside from the fact that access to information and its active use have been made a basic need of the people by developments in information and communication technologies in the current age (Çukurbaşı and İşman, 2014), it has changed various things in several fields of our lives, particularly in education environment (Karakoyun, 2014). Since science and technology is effective today, the idea indicating that an effective teaching activity cannot be provided by transferring knowledge based on direct instruction and rote learning has emerged (Aslan, 2014). With the improvement of technology over the years, ordinary educational materials have been far from being attention-grabbing for students whose expectations then have changed in learning environments. Accordingly, it is quite important to use proper, new and various methods in line with the age's technological improvements in education instead of traditional education methods in order to increase the output of education (Uslupehlivan et al., 2017). As methods of transferring and sharing the information have evolved into tools such as computer, information devices and multimedia technologies with the rapid change of technology, it can be expressed that the society in which we keep living is on the way to becoming an information society (Arslan, 2006). It is believed that technology-assisted learning is effective in development of the knowledge, skill and life-long learning process in order to achieve success in an ever-changing world (Domalewska, 2014). Knowledge, skills and competencies required for education should provide the skill of learning to learn and turning the knowledge content into experiences in addition to learning the knowledge (Gömleksiz & Pullu, 2017).

According to Usluel and Atal (2013), the technological opportunities accessed by students outside the school but not sufficiently offered in schools creates different problems, defined as "digital inconsistency". The students are ensured to be focus on the lessons and meaningful and permanent learning is provided when technology is effectively used in school and the problem of digital inconsistency is solved (Dola & Aydın, 2020). It has been similarly emphasized by Yang and Wu (2012)

that effective and active use of technology in learning environments is quite important in providing meaningful learning and catching the students' attraction. Additionally, it has been confirmed that the students played an active role during the lessons and started to display positive manners to the lesson with the use of digital storytelling (Demir & Kılıçkıran, 2018). Correspondingly, processes based on integration of technology into learning environments are very important in this period of rapid technological development (Çoruk & Seferoğlu, 2020).

Akkoyunlu & Kurbanoğlu (2003) mention that teachers should embrace effect of the technology on education and improve themselves in line with the ever-changing technology to be successful in education as the students grow up with the technology. Similarly, it has been stated by Kahraman (2013) that the teachers must improve themselves and keep up with the times in this regard due to continuous change and development in technology. The teachers can benefit from digital stories to define a process, present an opinion and explain educational topics using materials (Wang & Zhan, 2010). Making the teachers both guide and active player in classroom, the digital stories also help the teachers save time and fulfill an effective and permanent learning process (Mangal, 2020).

Being related to everything that exists and present in all branches of science, the mathematics, created by human being, is a tool as well as a branch of science, the importance of which is increasing day by day in our lives as the requests and needs of human beings have increased in almost all fields (Bozkurt, 2008). Since curriculums do not allow students to demonstrate their own skills, restrict their attention and active participations and necessitate the use of methods such as rote learning and direct instruction in mathematics teaching, the students become distracted and get bored (Lesser, 2001). Besides, the students cannot associate abstract mathematical concepts with their daily lives, and thus they begin to be prejudiced against the mathematics. (Küçükoğlu & İncikabı, 2020). Digital stories help students associate academical knowledge with everyday life, address colorful world of the children, make the students active player, present examples from everyday life and provide them with chance to have concrete experiences by activating more than one sense organ. In this way, it is pointed out as one of the alternative student-centered teaching methods in mathematics teaching.

According to Smeda et al. (2010), digital storytelling, as a contemporary approach integrating individuals' unique opinions with technology and centering the students, helps provide rich and cooperative learning and teaching environments. Thanks to integration of digital stories with learning environment, it becomes possible for the students to gain digital skills and understand better the topics described with the story (Behmer et al., 2006). In addition, it is believed that digital storytelling gains the skills of writing, organizing, presentation, communication, problem solving and evaluation (Robin, 2006). Mathematics teaching and learning become meaningful since the digital stories draw students' attention and enable them to transfer theoretical knowledge into everyday life (Schiro, 2004). In order for teachers and teacher candidates to experience digital stories, become familiar with and use it in education process, the concept of digital story firstly must be introduced to them (Kukul & Kara, 2019). For this reason, it is considered that supporting use of the digital stories in the mathematics teaching will help make mathematics lessons more entertaining and understandable. Additionally, it is believed that analyzing the primary school teachers' experiences on using digital stories in mathematics lessons will offer important opportunities for more frequent and effective use of digital stories in mathematics lessons. Taking this perspective into account, it has been aimed to analyze the primary school teachers' views about the mathematics teaching planned and implemented with digital storytelling method.

Method

Research Model

It has been planned to analyze primary school teachers' experiences on the use of digital story method, which is not a common teaching method in our country and is generally not preferred in mathematics lessons. Phenomenological research design uncovers participants' perceptions and experiences on the phenomena as well as meanings attributed to aforementioned factors based on the phenomena on which in-depth information cannot be obtained, which enables an appropriate research environment for studies conduct to analyze what the phenomena mean (Yıldırım & Şimşek, 2018). In this qualitative study, digital stories and lesson plans were prepared and used by teachers in classrooms with regard to specific learning outcomes for all levels of primary school in the mathematics teaching by implementing the phenomenological research design, and the teachers' views on the use of digital storytelling in mathematics teaching were determined.

Population and Sampling of the Research

The 25 primary school teachers, who voluntarily participated in this study, were selected from the 18-65 age group based on criterion sampling method among purposive sampling methods. The participants are selected based on predetermined criteria in line with the purpose of the study in this method (Yıldırım & Şimşek, 2018). While selecting the primary school teachers participating in this study, the criteria of having adequate knowledge on digital story, being able to use digital stories during the lessons and having sufficient skills in the use of media tools were taken into consideration. The interview questions that will be used for data collection were designed in a way that would not have any negative effect on the participants, and pseudonyms created for the participants were used when presenting the data obtained.

Table 1. *Demographic information of primary school teachers who participated in the study*

Participant	Gender	Class Level He/She Teaches	Educational Background	Place of Duty
Alper	Male	1st Grade	Undergraduate degree	City Center
Arda	Male	3rd Grade	Undergraduate degree	Village
Arzu	Female	2nd Grade	Undergraduate degree	Village
Bilge	Female	2nd Grade	Undergraduate degree	Village
Cansu	Female	3rd Grade	Undergraduate degree	Village
Cem	Male	2nd Grade	Undergraduate degree	City Center
Demir	Male	1st Grade	Undergraduate degree	City Center
Didem	Female	2nd Grade	Undergraduate degree	City Center
Efe	Male	2nd Grade	Master's degree	City Center
Elif	Female	1st Grade	Undergraduate degree	City Center
Emin	Male	1st Grade	Undergraduate degree	City Center
Eylül	Female	4th Grade	Undergraduate degree	City Center
Ezgi	Female	2nd Grade	Master's degree	City Center
Figen	Female	1st Grade	Undergraduate degree	City Center
Furkan	Male	3rd Grade	Undergraduate degree	City Center
Gamze	Female	2nd Grade	Undergraduate degree	Village
Hakan	Male	1st Grade	Undergraduate degree	City Center
İlker	Male	2nd Grade	Master's degree	City Center
Kerem	Male	3rd Grade	Undergraduate degree	Village
Koray	Male	1st Grade	Undergraduate degree	City Center
Mete	Male	4th Grade	Undergraduate degree	City Center
Oğuz	Male	4th Grade	Undergraduate degree	City Center
Ozan	Male	2nd Grade	Master's degree	City Center
Sude	Female	3rd Grade	Undergraduate degree	City Center
Zehra	Female	2nd Grade	Undergraduate degree	City Center

Table 1 displays the demographic information of the primary school teachers who participated in the study. When the information given on the table is analyzed, it is seen that 14 of the primary school teachers are male (f=14), 11 of them are female (f=11), 7 teachers teach 1st grade (f=7), 10 teachers teach 2nd grade (f=10), 5 teachers teach 3rd grade (f=5) and 3 teachers teach 4th grade (f=3). Additionally, it is observed that 21 primary school teachers have bachelor's degrees (f=21) whereas 4 primary school teachers have master's degrees (f=4). It is also seen that the number of teachers working in the city center (f=19) is higher than the number of teachers working in the village (f=6).

Educational Implementation Process

Preparation of Digital Stories

Taking factors of digital story presented in studies of Robin (2008), Lambert (2010) and Ohler (2013) into consideration, digital stories were created for 4 different grades of primary school, one for each, using the platform "Powtoon" by the researcher. Based on digital stories, lesson plans were prepared in a way that will cover two lesson hours (40'+40') for the teachers who will conduct the storytelling during the lessons. Issues that might be experienced by the students in everyday life were covered when plot of the digital story was fictionalized. The researcher considered activities in which students could participate during the process of preparation of digital story and lesson plan. In this way, active participation of the students was aimed. Four scientists specialized in mathematics teaching, educational sciences and Turkish language were consulted to get their opinions after both digital stories and lesson plans were prepared. The digital stories and lesson plans were reorganized taking the scientists' opinions into consideration. Digital stories and lesson plans completed afterwards were submitted to 4 primary school teachers and 1 information technologies specialist, and in line with Lawshe (1975) technique, content validity ratio was determined as 1 for all the digital stories and lesson plans.

Content and Practice Process of Digital Stories

Topic scope and content of the digital stories prepared in line with outcomes of the mathematics teaching for each grade level of primary school is specified below.

Within the scope of outcome "M.1.1.2.6. Solves problems that require addition with natural numbers." in the learning area of "Numbers and Operations" for 1st graders, a digital story lasting 02 minutes and 37 seconds, appropriate for students' levels, was prepared. In plot of the digital story prepared for 1st graders, three problems were presented about how many flowers three friends planted in the garden in a flower planting activity. The video was paused before answer of each problem was given, and the same objects presented in the story were distributed in the classroom. Then, the students were asked to find the answer on their own. The digital story was continued afterwards, and they were ensured to check their answers. At the end of the digital story, flowers of different colors and gardening materials were given to the students. Next, they were asked to choose a character from the story as well as flowers as many as they wanted. Then, the students were encouraged to create their own problems and gardens. In this direction, they were ensured to participate in problem-posing activities.

Figure 1. Scenes from the digital story prepared for 1st graders

Within the scope of outcome "M.2.2.3.2. Using the relation in a geometric pattern, creates new patterns of same relationship with different materials." in the learning area of "Geometric Patterns" for 2nd graders, a digital story lasting 03 minutes, appropriate for students' levels, was prepared. Plot of the digital story, prepared for 2nd graders, is based on a student's inability to decide on a gift for his/her brother in a classroom setting. In the digital story, the teacher tells the student that they will create a necklace with geometric patterns they will issue that day and mentions that s/he can give a gift like this to his/her brother if s/he wants as such a gift is more meaningful. The digital story contains different pattern rules. In order for them to make their own necklaces with these pattern rules, they were provided with materials for each pattern such as rope, geometric figure cards and glue. When pattern rules were being presented, the digital story was paused, and the students were asked to make their own necklaces. Afterwards, the digital story was continued, and all students were expected to check the patterns of the necklaces made by them.
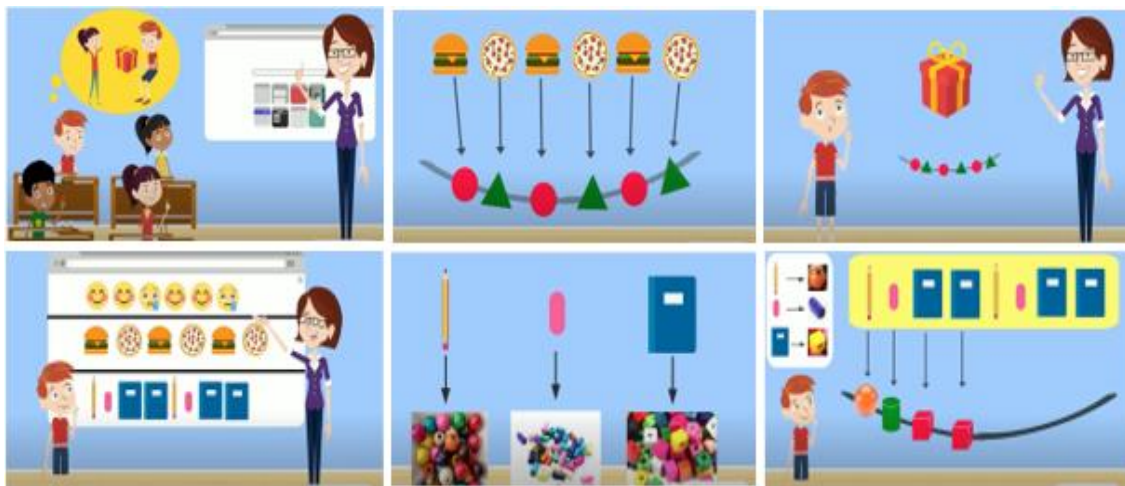

Figure 2. Scenes from the digital story prepared for 2nd graders

Within the scope of outcome "M.3.2.1.2. Explains the similarities and differences between cube, square prism and rectangular prism." in the learning area of "Geometry" for 3rd graders, a digital story lasting 03 minutes and 03 seconds, appropriate for students' levels, was prepared. Plot of the digital

story, prepared for 3rd graders, is based on two friends finding three treasure chests on the beach and trying to find the codes to open the chests. The codes consist of names of the geometric figures forming the chests. In the digital story, the chests in the shape of cube, square prism and rectangular prism are examined one by one; however, no specificity is mentioned about the chests. Meanwhile, the geometric figures were reviewed, and the video was paused when specific information was provided for each chest. Next, materials such as cube, square prism and rectangular prism models, colored papers and glue were handed out to the students. Afterwards, thanks to use of colorful papers, the students were ensured to view that the cube has 8 vertices, 6 faces, 12 edges and its all sides have the same length, that the square prism has 8 vertices, 6 faces and 12 edges and consists of 2 square faces and 4 rectangular faces, and lastly, that the rectangular prism has 8 vertices, 6 faces and 12 edges and its all sides consist of rectangles. In the final part, it was allowed that the students compared all the prisms in terms of similarities and differences. For instance, they examined that all prisms were similar in terms of having 8 vertices, 6 faces and 12 edges and all faces of the cube consisted of squares. Additionally, they examined that square prism consisted of 2 square faces and 4 rectangular faces and all faces of rectangular prism consisted of rectangles.
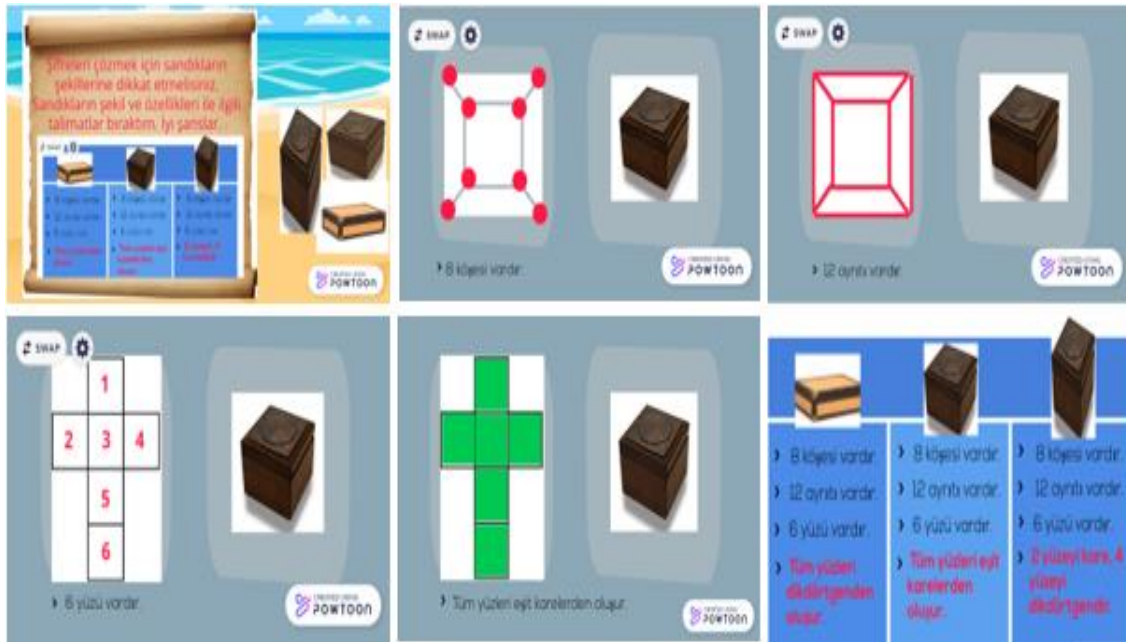

Figure 3. Scenes from the digital story prepared for 3rd graders

Within the scope of outcome "M.4.4.1.2. Creates a column graph." in the learning area of "Data Processing" for 4th graders, a digital story lasting 02 minutes and 57 seconds, appropriate for students' levels, was prepared. Plot of the digital story, prepared for 4th graders, is based on a little girl helping her mother prepare a care package for earthquake victims and categorizing the products to be included in the package. The parcels were divided into two categories, food and hygiene. Images of the objects were presented mixedly in order to find out exact number of the objects in the food category. Then, based on the images, the students were asked to create a tally table on the worksheets given by the teacher. Next, they were ensured to create a column graph of the food category. As for hygiene category, they were requested to form a frequency table based on the products specified on the figure chart, then create a column graph based on the frequency table and lastly another column graph based on the figure charts given for all products in all packages of both categories. Pausing the video, the students could

check their work. In this way, it was provided that the data was organized with object or figure chart, tally table and frequency table prior to creating a column graph.

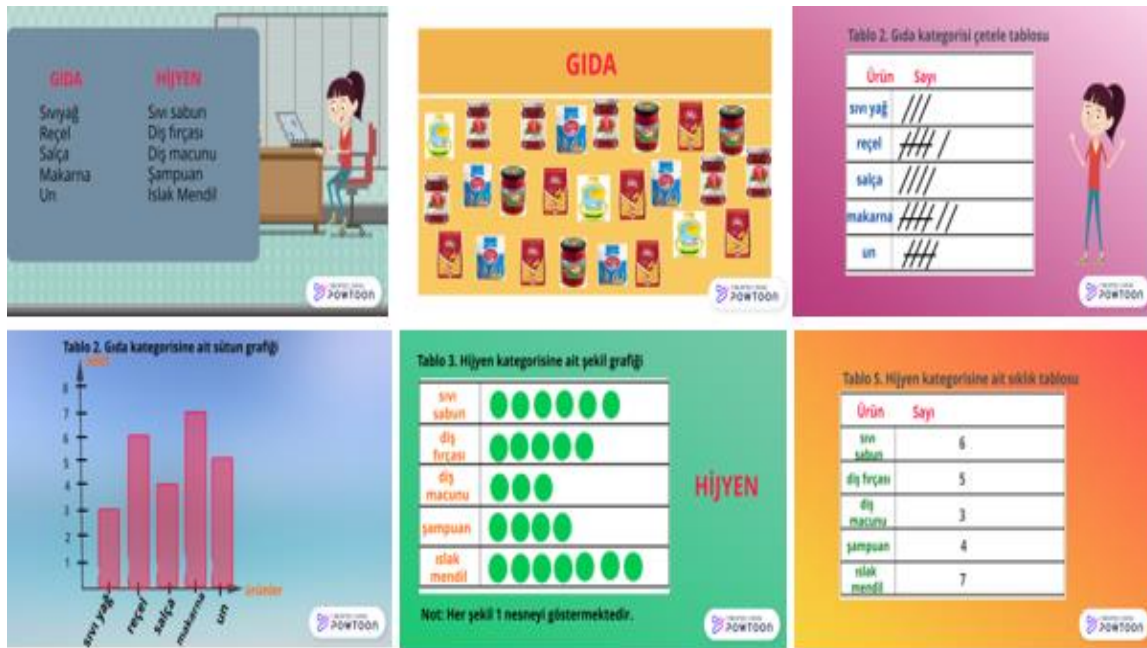*Figure 4.* Scenes from the digital story prepared for 4th graders

Flowcharts were prepared for the process in order to understand the actions done in the classroom while using the digital stories for mathematics teaching. In this context, process of practicing the lesson plan of the 1st graders is exemplified by the flowchart below.
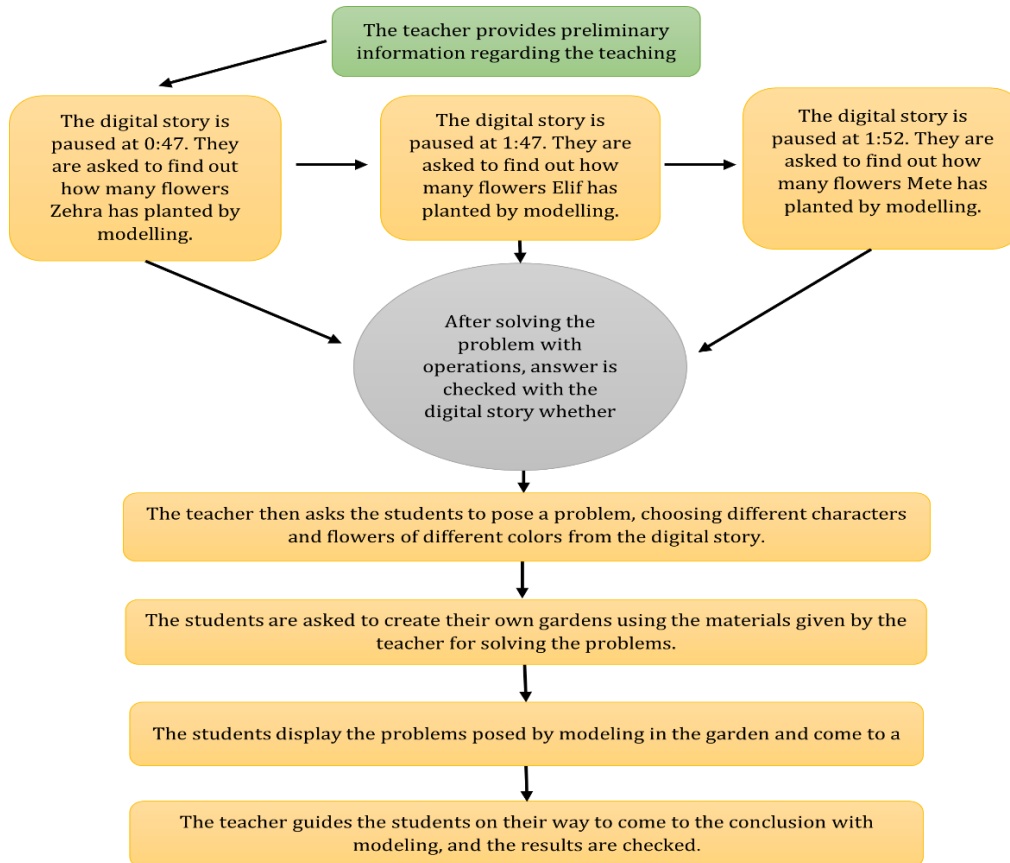

Figure 5. Flowchart of practicing a mathematics lesson with a digital story

Role of the Researcher in the Data Collection Process

By providing preliminary information with participants of the study prior to data collection process, the researcher explained how practice and interview process would be conducted. Digital stories, lesson plans and materials prepared within the scope of the study were submitted to primary school teachers during data collection process. While handing out the materials -planned to be used in activities of digital stories- to the primary school teachers, classroom sizes were considered. Upon receiving approval from the primary school teachers to participate in the classes, the researcher had the opportunity observe the teaching process. With the participation in the process, the researcher helped the primary school teachers hand out the materials, check activity results and fulfill classroom management, particularly for the primary school grades, in the crowded classrooms. Additionally, the researcher guided the students in distribution of tasks for group works, providing the need such as the scissors or glue with the groups and answering questions of the students about the activities.

Data Collection Tools

In the study, it was aimed to analyze the primary school teachers' views on the use of digital stories in mathematics teaching. In accordance with this purpose, interview questions were prepared reviewing the literature under the title of "Use of Digital Stories in Mathematics Teaching". The interview questions were revised twice prior to being sent to the specialists. Before asked to the participants, the interview questions were sent to 4 academicians specialized in the fields of Turkish language teaching, mathematics teaching in basic education, mathematics teaching in primary school and computer and instructional technologies in terms of whether the questions were well-oriented to the study or not. The specialists offered suggestions such as preferring the term "use of digital story" to the one "use of digital storytelling" or using the term "mathematics teaching process instead of "mathematics teaching". Considering the views of the specialists, the interview questions were changed for the third time.

Data Analysis Process

As the data analysis is based on the concepts of diversity, creativity and flexibility in qualitative research, the researcher is expected to develop the data analysis method to be used in the study by examining data analysis methods available and considering features of the research and collected data (Yıldırım & Şimşek, 2018). It is intended in phenomenological research that data is conceptualized and themes that can describe the phenomenon are identified in order to identify data analysis, experiences and meanings attributed to the experiences by conducting a content analysis. The obtained results are described, and findings are explained and interpreted within the identified themes and categories (Yıldırım & Şimşek, 2018).

The data analysis process in qualitative research was examined by Strauss and Corbin (1990) in two sections, "descriptive analysis" and "content analysis". The content analysis -which allows an in-depth analysis and identification of themes and subthemes that previously could not be identified- is more complicated than the descriptive analysis. It was decided to conduct the content analysis in this study as to examination of primary school teachers' views on the use of digital story during mathematics teaching process.

Strauss and Corbin (1990) mentioned about three types of coding, "Coding based on predetermined concepts", "Coding based on the concepts extracted from the data" and "Coding within a

general framework". Within the context of this study, *"Coding based on the concepts extracted from the data"* was used. As a result of an inductive analysis process, the obtained data was grouped within specific concepts by the researchers, and the codebook was obtained to be used during data analysis.

Ethical Permits of Research

In this study, all the rules specified to be followed within the scope of "Higher Education Institutions Scientific Research and Publication Ethics Directive" were complied with. None of the actions specified under the heading "Actions Contrary to Scientific Research and Publication Ethics", which is the second part of the directive, have been taken.

Ethics Committee Permission Information:

Name of the committee that made the ethical evaluation = Kırşehir Ahi Evran University Social Sciences and Humanities Scientific Research and Publication Ethics Committee.

Date of ethical review decision= 14.06.2023

Ethics assessment document issue number= 2023/05/10

Findings

After organizing the findings obtained within the scope of the study, it was explained in which stage or for which subject of mathematics lessons the digital stories can be used by the actively working primary school teachers as well as necessary requirements and recommendations were shared with them for digital storytelling to be used as an effective education method.

Educational Use of Digital Story in Mathematics Teaching

Table 2. *Primary school teachers' views on areas of educational use of digital story in mathematics teaching*

Main Theme	Category	Subcategory	Primary school Teachers
Stages of Lesson	Introduction	Attention Getting Activating Prior Knowledge	Arda, Figen, Kerem, Alper, Didem, Oğuz, Efe, Elif, İlker
	Development Phase	For Activities in The Lesson	Mete, Ezgi, Arzu, Koray, Demir, Zehra
	In General	Can Be Used at Any Stage	Bilge, Emin, Furkan, Sude
Mathematics Subjects	Numbers and Operations	Natural Numbers Four Operations with Natural Numbers Fractions	Arzu, Ezgi, Gamze, Cem, Cansu, Elif, Ozan, Oğuz, Alper, Zehra, Didem
	Geometry	Geometric Figures and Shapes	Kerem, Hakan, Mete
	Measurement	Time Measurement	Bilge, İlker
	In General	Entire Subjects	Arda, Cansu, Figen, Koray, Emin, Eylül, Furkan, Sude

Themes and categories as to primary school teachers' views on the educational use of the digital stories are shown on Table 2. It was stated that the digital story can be used in different parts of the lessons as well as it was mentioned that it can be used in when teaching learning areas of the mathematics curriculum.

Stages of Lesson

Introduction: While preparing a lesson plan in mathematics teaching, it is aimed that the students are motivated, informed about the target and their prior knowledge is activated at the introduction stage. In line with this aim, teaching activities are organized. It was stated by the primary school teachers in the study that the digital stories can be used at the introduction stage in getting attention and activating prior knowledge.

It was emphasized by the primary school teachers that the use of the digital stories in the stage of attention getting will be more advantageous since it is believed by them that the digital stories help students focus on the lesson, ensure permanent learning, and facilitate the learning of abstract concepts. Teacher Arda's views on the use of digital stories in the stage of attention getting in mathematics teaching are as follows:

> *I think it will be more beneficial to use them at the introduction stage. Because it is very difficult to have the students concentrate at the introduction of a lesson. Following first breaktime, a child already spends the first 4-5 minutes of a 40-minute lesson to focus. So, you have only one chance to get his/her attention. If you get it even with a visual element, the child will focus on the subject a while. That's why I think that using the digital stories at the introduction stage is more advantageous. - Arda*

Teacher Figen, on the other hand, highlights that the use of the digital stories at the introduction stage of a lesson will allow permanent learning in mathematics teaching:

> *I believe that digital stories are important to get the attention of the children. It can be used at the introduction stage to get their attention, which can also allow permanent learning. It really gives permanent effect on the children. They should be used at the introduction stage in my opinion. - Figen*

Teacher Kerem notes that the digital stories should be used in the stage of attention getting as the digital stories will attract attention of the students:

> *When the mathematics is combined with this story and you start the lesson with a story to get students' attention, they will listen to the lesson more carefully. It can particularly be better to use it at the introduction stage to draw their attention. - Kerem*

Teacher Alper expresses that it will be very beneficial to use digital stories as a preliminary study in order for students to focus on the lesson in mathematics teaching:

> *It can be initially used in a more comfortable manner in the stage of oral presentation. Because the use of stories seems to be very useful in providing preunderstanding or prestudy on the subject. We both attract the students' attention effectively and have them focused on the lesson. In addition, the lessons become more entertaining. But it becomes very advantageous only for the introduction stage of the lesson. - Alper*

Teacher Didem addresses that digital stories can grab the students' attention to the lesson because the subjects are seen as a whole:

> *Digital stories can be used at the introduction stage. They help us get the students' attention and have them focused on the lesson. They can also be used for explanations in terms of*

presenting the subjects as a whole. I believe that they can be used in this way as a means of expression. **- Didem**

Teacher Oğuz, on the other hand, points out effects of the use of the digital stories at preparation stage on the students in mathematics teaching:

The digital stories can be more effective at the introduction stage as they can motivate the children. So, preparation stage is better for the stories in my opinion. In this way, the students can be ensured to be more interested in the lesson at the beginning of the class. **- Oğuz**

Primary school teachers state that digital story activities can be used in mathematics teaching to uncover students' pre-learning. For instance, Teacher Efe mentions that digital stories can be used as a tool to examine the student's prior knowledge by saying that *"The stories can be used at the introduction stage to check the student's prior knowledge."* Teacher Elif, on the other hand, similarly emphasizes that the digital stories can be used to activate prior knowledge by saying that *"I think they are effective for activating prior knowledge. In this way, we can have the students concentrated on the lesson."*

Teacher İlker exemplifies how digital story activities can be used to activate prior knowledge in mathematics teaching as follows:

The stories can be used at the introduction stage to see the students' prior knowledge. Pausing the story at certain times, questions that take place in the digital stories can be asked to them and, in this way, their prior knowledge can be discovered. **- İlker**

Development: It is required that activities should be prepared with appropriate methods and techniques in line with targets, students, physical conditions of school and classroom for the development stage when planning a lesson plan for teaching process. It was stated by the primary school teachers in the study that, with the digital stories, the students can have a chance to learn by doing and experience the educational activities on their own as well as it was highlighted that the digital stories should be used in the development stage of a lesson during the mathematics teaching.

It was also stated by the primary school teachers that the digital stories should be used in lecturing stage in the mathematics teaching by emphasizing the benefits of the digital stories such as activating of more than one sense organ, motivating the students and concretizing abstract concepts. Teacher Mete points out that the digital stories should be used in the preparation stage of the lesson in mathematics teaching due to opportunity of concretizing abstract concepts:

The stories can be used at the beginning of the subject. And the digital stories can be resorted to at the very beginning of the subject in terms of concretizing abstract concepts and providing preliminary preparation. Afterwards, the teacher can have the students understood by any means in line with his/her own skills. **- Mete**

Teacher Ezgi states that digital stories should be used when covering a new subject as they facilitate to concretize abstract concepts in mathematics teaching:

I think that if we are just starting the lesson, the digital story should be used so that the students can concretize abstract concepts more easily. It is more of an introductory stage activity. **- Ezgi**

Teacher Arzu explains that digital stories should be used to make the subject clear for the students because of addressing more than one sensory organ of the students:

> *In my opinion, it is important to use digital stories at preparation stage. Because the students can see, experience and feel the stories, in this way, they can comprehend the subject both visually and aurally at the preparation stage.* **- Arzu**

The primary school teachers mentioned that the learning environment should be supported with methods and techniques and, in this process, active role taking of the students will have positive impacts on them. Teacher Koray expresses that the digital story should be presented at the preparation stage in comparison to the introduction stage:

> *At the introduction stage, the students are already provided with sufficient preliminary information. And the students get readiness. As they will learn this information by doing afterwards, the stories can be more useful at the development stage in my opinion. Because the students do not know what and how to learn a subject at the introduction stage.* **- Koray**

Teacher Demir points out that the digital stories should be used as classroom activities:

> *For example, I lecture on a subject first. And the more materials or learning strategies we use during learning process, the more students we reach. Also, learning level increases more if this process is visually supported. The students should also be included in the learning process. In this regard, a teacher should prepare a plan in his/her mind and lecture on the topic in line with that plan. Then, using the digital materials, the teachers have the students studied individually, solved a problem or answered a question on their own, which also should be followed by the teacher. Thus, it is more advantageous to use the stories at the development stage.* **- Demir**

Teacher Zehra stresses that the use of different methods, techniques and digital stories will be beneficial in mathematics teaching as well as the digital stories can be used at the stage of attention getting:

> *In mathematics teaching, the students may need a change since some subjects sometimes come one after another very rapidly. But you can have them focused on something different using the digital stories even if you follow the same technique or method. The digital stories can be beneficial for such subjects.* **- Zehra**

In General: Most of the primary school teachers stated that the digital stories can be created to get the students' attention, activate prior knowledge, make the students be active in the process or reinforce what they learn in mathematics teaching process by taking instructional objectives into account, thus the digital stories can be used throughout of a lesson. In this context, Teacher Bilge addresses that the digital stories can be used in every stage of the mathematics teaching process:

> *The digital stories can be used for students' readiness, and repetition or oral presentation of a subject. At the same time, stories that can be used in every stage of a lesson can be prepared, like the ones you have provided with us. Or stories that will be used only in one stage can be created. As a result, the teachers can use them in every stage.* **- Bilge**

Teacher Emin reports that the digital stories can be used in three stages of a lesson for some specific purposes:

First of all, the stories can be used to get attention at the introduction stage. Using the visual images in the video, the students' attention can be got. They can also be preferred for the introduction stage to motivate the students. Covering a lesson on a different platform with different practice and method, teachers can have the students be well-motivated. The digital stories can also be benefited in making learning targets clear to students and activating prior knowledge. For instance, a video displaying the addition with models will make it clear to the students that the lesson will cover addition. Once again, they can be used as a tool to support the lecturing at the development stage. Teachers can also use them at the end of a lesson as a means of assessment. In other words, the digital stories can be benefited in every three stages of a lesson. - Emin

Teacher Furkan, in a similar way, states that the digital stories can be used in every stage of a lesson in mathematics teaching process:

In fact, the teachers can use the stories in every stage. Sometimes, we can make the students watch a digital story at the beginning of a lesson. In my experience, lecturing on a subject in an interactive manner after having them watched a digital story, they were quite focused and motivated. Thus, they can be used to get the students' attention at the introduction stage. The digital stories can also be preferred to get feedback from the students or make them learn a topic better at the development stage and examine the learning losses at evaluation stage. They can be used in every three stages. I think that the use of the digital stories is beneficial for each one of the stages, introduction, development and evaluation. - Furkan

Teacher Sude, on the other hand, remarks that the digital stories should be used in every stage of a lesson depending on the subject to be lectured on:

Firstly, the stories can be used at the introduction stage. Secondly, they can be used as reinforcers in the end. Some crucial and important points are told in the middle of a lesson, which should be forgotten at no time. For the students to comprehend these points, we can use the methods they like and the digital stories. In fact, they like it very much. Every stage of the teaching process is appropriate for the stories in my opinion. It also depends on the subject to be covered in the lesson. So, the subjects being covered are important in this regard. - Sude

Mathematics Subjects

Numbers and Operations: The primary school teachers mentioned that the use of digital stories can be effective in teaching the learning outcomes within learning area of numbers and operations in mathematics teaching. For example, the primary school teachers discussed that the subject of rhythmic counting is considered as abstract by the students and, therefore, the subject can be concretized with the use of the digital stories in primary school mathematics teaching. Teacher Arzu points out that the use of the digital stories for the subject of rhythmic counting in mathematics teaching can have positive impacts on the students:

Rhythmic Counting. Why rhythmic counting? For instance, when you try to teach how to count objects by 2s, the students do not understand how to do rhythmic counting by 2s. It becomes abstract for them. However, when we tell them this subject using the digital stories,

*we can turn these abstract concepts into experiences. Because it is important for students to turn the learning outcomes to experiences. **- Arzu***

Based on their own experiences, the primary school teachers similarly think that use of the digital stories will be beneficial for subjects such as positional notations and rounding. Teacher Ezgi indicates that the digital stories can be benefited most in the subject of rounding decimals:

*Patterns, rounding decimals, place value... We generally cover place value concepts and place values in lessons of 2nd graders. However, I benefited from the digital stories most in rounding decimals. **- Ezgi***

Teacher Gamze expresses her views on the ways in which the digital stories would affect the developmental level of the students if the subjects of place values and rounding were taught using the digital stories in her classroom:

*We cover the subjects of positional notation and rounding, such as decimal place and hundreds place. Such subject can be discussed using a very nice and beneficial digital story. I also think that this 3-5-minute video will be very effective in explanation of the subject. In the lessons, we already try to explain a subject making a story of it with visual materials and pictures. However, digital stories can be more functional in this regard. As games are more appropriate particularly to developmental period of the 1st and 2nd graders and the digital stories gamify the subjects, the students can participate in the lessons more actively in my opinion. Besides, it becomes easier for the students to think from specific to the general since they pay special attention to the lesson. **- Gamze***

The primary school teachers mentioned that the digital stories should be prepared about the subject of four operations since they thought that it would help students to concretize the operations. Teacher Cem explains that covering the subject of four operations using a digital story will positively effect the students:

*Because of being visually more descriptive, they can be preferred for the four operations. Sometimes the students are unable to visualize some concepts in their minds. For example, when they are asked that "What is the sum of 2 apples plus 2 apples?", they may not picture visualized in their minds; however, they can comprehend concrete objects more easily as they see it. **- Cem***

The primary school teachers stated that the use of digital stories in problem solving in primary school mathematics teaching would ensure students to comprehend better and provide real examples from the daily life. Additionally, they noted that the students may have problems in problem solving because they generally do not like reading, but the digital stories can sort these problems out. Teacher Cansu mentions that the use of digital story in teaching the subject of problem solving will have positive effects on the students and the process:

Problems can be told through digital stories. With problems, we put into sentences the things that have occurred in our lives or have experienced by us. Thus, the problems, parts of our daily lives, can be narrated by being visualized. The digital stories are much more useful in solving these problems. Because problems have many stages. The students can comprehend

these stages better. That is, they can understand and solve problems better because they have experienced some things. In this sense, many processes take place at the same time. - Cansu

Teacher Elif states that explaining the subject of problem solving with the digital stories will have a positive effect on students' reading habits:

You can use the digital stories for the subjects of addition or subtraction. Or four operations as well as division and multiplication. The four operations can be told more easily with the digital stories. You can even use them for the subject of problem solving. Why problem solving? Because not all students can understand what they read. Sometimes they understand what they read but cannot get to the point. Listening may be more effective for them in this regard. Reading and listening at the same time can be more productive, too.
 - Elif

Teacher Ozan makes a similar explanation and emphasizes the effect of the student's attitude towards reading on problem solving and mentions that digital stories will offer benefits in this regard:

Which subjects? The digital stories definitely need to be used for problems. Since a student does not like to read and has difficulty in understanding what s/he reads, problems can be narrated and explained more easily. Sometimes a student tries to do operations with the given numbers but does not understand the question. The child adds, subtracts, multiplies with the given numbers. But s/he does not understand what the problem is asking of him/her. In this case, the student does the operations directly by rote. For example, they can understand the problem more easily by animating or storytelling the problem with the help of the digital stories. - Ozan

Teacher Oğuz emphasizes that explaining the subject of problem solving in mathematics teaching with the digital stories leave a mark on students' lives:

For example, in mathematics, narrative problems about calculations and four operations provide examples from the students' daily lives and can help children to better understand the subject. I think that they will understand better if the problems are given from the students' own lives and experiences. - Oğuz

Teacher Alper points out that the use of digital stories in problem solving has an undeniable impact on the students' learning processes:

For instance, there is a digital story that I used before, and it was very effective for the subject of addition. At the same time, the digital stories can be very useful for primary school children's perception of problems. Because the digital story is a cutting-edge method in turning abstract concepts into concrete ones. It is very productive. Thus, it seems to be useful for the subject of problems. And I think it will. - Alper

Primary school teachers stated that fractions can be taught using digital stories because they are considered as abstract by the students. Teacher Zehra notes that when the subject of fractions is taught using a digital story, it has an impact on students:

The digital stories with more visuals that help support abstract concepts can be more useful. For example, when fractions are taught using the digital stories, the students can be more

comfortable understanding the subjects related to fractions. In other words, I think that these stories would be more effective in subjects that mainly involve abstract concepts. - Zehra

Teacher Didem explains that the use of digital stories for the subject of fractions is effective for both the teachers and the students.

The digital stories can make teaching the subject of fractions very easy. Because this is an abstract subject for students and the digital stories can easily concretize them. From the teachers' point of view, there will be no difficulty in producing content when preparing a digital story. For example, the following plot can be easily used in a digital story about the subject of fractions. There is a cake that will be divided equally between four people. Similar stories from the students' daily lives can be used to explain division in an easy way. - Didem

Geometry: The primary school teachers reported that the subjects within the sub-learning area of geometric figures and shapes can be effectively taught by using the digital stories. It was also stated by the primary school teachers that the digital stories can be effective for geometric figures and shapes in mathematics teaching since the stories can facilitate permanent learning, visualization of figures and shapes and make the figure features easier to learn. Teacher Kerem mentions that when the subject of geometric figures and shapes is taught using the digital stories, it has significant effects on the students:

Geometric subjects, triangles, squares and rectangles are more abstract shapes for students. Therefore, it can be more useful to explain these shapes with meaningful animations and narrations. This makes it more memorable. It also attracts the attention of children. - Kerem

Teacher Hakan highlights that explaining figures and shapes with narrations through stories provides permanent learning:

Very good digital stories can be prepared for geometric figures. It might make sense to animate and characterize geometric shapes in the digital stories. I think that it will also be very effective for the verbal parts of the mathematics told through storytelling. That story will be more permanent in the students' minds. Learning process will also be easier. - Hakan

Teacher Mete asserts that the use of digital stories in mathematics subjects is important in terms of geometrical figure and object features:

They can be used to describe geometric figures. Since geometric figures may be diagonal and the students have to add the lengths of the vertices of geometric figures, it is a little more difficult for the students to comprehend this subject. Thus, we can use digital stories for that. - Mete

Measurement: It was stated by the primary school teachers that the digital stories can be used for the sub-learning area of time measurement in the mathematics teaching. The primary school teachers emphasize that it is important to benefit from the digital stories for the sub-learning area of time measurement in mathematics teaching, especially for calendars and times. Teacher Bilge reports that the students have difficulty in learning calendars within the sub-learning area of time measurement and the digital stories can be effective in this regard:

The calendar is the most confusing subject for the students. As teachers, we have a lot of difficulty with the concepts of year, month, week, day and the problems in which these concepts are used, especially in the lessons of 1st and 2nd grade students. Concepts such as

*yesterday, tomorrow, days, weeks, months, seasons and years are very difficult for the students to learn. The digital stories can easily be used in this sense. It can also be more advantageous for the students. **- Bilge***

Teacher İlker points out that the subjects of measurement, weighing and patterns in the mathematics can be taught using the digital stories, and these digital stories should be used particularly for the subject of times:

*I think that the digital stories are appropriate for teaching the time. Likewise, the story you prepared about patterns was very useful. It may not be used to teach the four operations, however; I believe that the stories can be used to exemplify or repeat such subjects. But I think it can be directly used in teaching of patterns, times, measurement and weighing. **- İlker***

Entire Subjects: The primary school teachers were responded to the question "Which mathematics subjects can be taught more easily using the digital stories? Please explain with the reasons." and they mostly responded by highlighting that all subjects in primary school mathematics teaching can be taught more easily with the digital stories. Teacher Arda states that all subjects can be taught in mathematics teaching using the digital stories:

*The stories can be used for the subjects of fractions, possibly times and geometric figures. All in all, these are the tools that can be used as materials. They can be preferred for these subjects to make them more memorable. Again, it can be used for the four operations. Actually, when we think about it, we can support these stories with visuals. Obviously, the digital stories can be used for many things. Every subject can be covered with them. We can even make problems more understandable for the students using the digital stories. **- Arda***

Teacher Cansu mentions that the mathematics is intertwined with life, thus the digital stories can be used in all subjects:

*Since we use four operations in the problems, it can be effective in four operations. It can also be used for the subjects of fractions and times. In fact, it can give good results in almost all subjects. The mathematics is about our lives. Therefore, the digital stories can be used in all subjects and every student can benefit from them. **- Cansu***

Teacher Figen points out that all subjects in mathematics teaching can be taught with the digital stories and it is important to include drama method in the process:

*In fact, I think that all primary school mathematics subjects can be turned into stories. We also practice various projects. In one of them, for example, we convert fractions or length measurements into digital texts and then use them with drama method. This really provides permanent learning for students. Thus, I think that visual and digital texts can be used in all subjects of mathematics. **- Figen***

Teacher Koray explains that all subjects that can be converted from abstract to concrete can be taught using the digital stories:

I think that it is appropriate to explain every subject that can be concretized with a digital story. I can't think of a mathematics subject for which we can't use these stories. All subjects in primary school can already be concretized for the students. Whether it is geometry,

arithmetic, tables & graphs or problem solving, all of these are subjects that you should support the students with visual materials. Thus, these stories can be used for anything.
 - Koray

Teacher Emin notes that the digital stories concretize the subjects and ensure permanent learning, so they can be used in all subjects:

The digital stories can be used particularly to concretize abstract subjects and help students understand better. Thus, they can be used as a supportive tool for such subjects, definitely increasing permanent learning. Similarly, the subjects of multiplication and division become possible to explain with simpler models, making it easier for the students to understand. We can also explain geometric figures and patterns with these stories. I think they can be used in every subject of the mathematics. Because it already concretizes the subjects and provides permanent learning. Therefore, it is possible to use them in every subject of the lesson. - Emin

Teacher Eylül states that the digital stories can be used in all subjects in mathematics teaching, and it is important to prepare digital stories by gamifying them:

I think that the digital stories can be very resultful in the subjects of symmetry and patterns. The digital stories prepared particularly for the subject of patterns in a gamified way attract a lot of attention. It can be very productive in the lower age groups. The students can be very interested in the patterns presented in a colorful way. But in general, the stories can be used in all areas of mathematics. They can also be used by teachers for geometric figures, length measurements, and perhaps problems. I think that they can be used for every subject. - Eylül

Teacher Furkan explains that the more the mathematics is integrated with stories from everyday life, the better it is understood by the students, and emphasizes that all subjects can be taught with the digital stories:

Almost any subject can be explained through the digital stories. The digital stories can be prepared particularly in line with the subjects of geometric figures or fractions. Because it is really a subject that students have a lot of difficulty with due to being abstract. For example, explaining what prism, edge, fractions, whole, half and quarter are by showing and concretizing them will provide the students with more permanent learning. Obviously, the more the mathematics is narrated, the better it is understood by the students. When we express the subjects in a way that is related to their daily lives, the students can understand better and more. - Furkan

Teacher Sude remarks that all mathematics-related subjects can be taught using the digital stories:

All subjects of the mathematics can be explained with these stories. I mean that these stories can color the monotonous narration. Any subject can be taught with the stories, such as natural numbers, rhythmic counting, multiplication, addition, tables. When you use the digital stories, you have the students participated more in the lesson. All subjects can be covered much better if the digital stories are supported by interactions with the students. I think there is no subject that cannot be taught with these stories. - Sude

Primary School Teachers' Needs for the Use of Digital Stories in Mathematics Teaching

Table 3. *Primary school teachers' needs for the use of digital stories in mathematics teaching*

Theme	Category	Primary School Teachers
Student-Based Needs	Readiness and Student Interaction	Bilge, Hakan, Efe
	Consideration of Individual Differences	Elif, Oğuz, Alper, Demir
Digital Story-Based Needs	Technological Equipment	Arzu, Ezgi, Figen, Ozan, Koray, İlker, Oğuz
	Material Support	Zehra, Efe, Mete, Didem
	Teachers' Readiness	Sude, İlker, Eylül, Emin, Mete

It is seen in the Table 3 that the primary school teachers' needs for the use of digital stories in the mathematics teaching process are grouped under the titles of student-based needs and digital story-based needs.

Student-Based Needs

The needs of students for the use of digital stories in the mathematics teaching process were listed by the primary school teachers, which are readiness, student interaction and consideration of individual differences. The primary school teachers emphasized that the students' family life and prior knowledge are of great importance for the situations that may be needed when using the digital stories in the mathematics teaching. Teacher Bilge notes that the needs for the use of digital stories in mathematics teaching should be addressed from the perspective of both the students and the learning environment:

First, the students' readiness is more important than the materials. The difference between a student's behavior at home and at school is very important, as well. For example, although there are smart boards at our school, the students' family profile is very low in general. Other than that, smart boards are not available in each classroom. Readiness is more important than materials and equipment in my opinion. This is what we need the most. - Bilge

Teacher Hakan believes that the needs for the use of digital stories in mathematics teaching should be considered from both teachers and students' perspectives:

Prior knowledge and readiness of both teachers and students need to be suitable, so that the stories can be more useful. The students found it difficult at first when I used the stories, and I also had difficulty when I was lecturing on a subject with the stories. For this reason, I believe that the readiness is important. - Hakan

The primary school teachers emphasized that, the students should be involved in the process one-on-one and student interaction can be ensured by having the infrastructure level that the students themselves can use regarding the needs for the use of digital stories in the mathematics teaching. Teacher Efe states that the students should have access to the required equipment for them to use the digital stories themselves in mathematics teaching:

The students need to have an infrastructure, which can be educational tools and a skill. It is better if they can use these stories themselves. We show them on the smart board in the classroom. However, it would be better if the students could, for example, turn on the computer and fulfill these things themselves. - Efe

The primary school teachers highlighted that individual differences of students should be considered in order to carry out the mathematics teaching process more effectively with the digital stories: Teacher Elif states that individual differences of the students should be minimized in order to use the digital stories more effectively:

For more effective use, the environment must be suitable firstly. The classroom also needs to be appropriate. The difference between the students' individual differences should also not be too obvious, as well. I mean there are some students, it is really a problem to make them sit for 2-3 minutes. But there are also other students who can sit and listen to a story for 15 minutes. - Elif

Teacher Oğuz explains that the digital stories should be prepared in accordance with the students' learning level in the mathematics teaching:

Even in a digital environment, mathematical stories should be problem-oriented and aim at the students' perception level. The stories should be better comprehended by the students. - Oğuz

Teacher Alper mentions that, by looking at his school, the digital stories should be created based on individual differences of the students:

The stories should definitely be appropriate to the students' level. The students in our primary school are very different from other students in terms of understanding. They perceive things much differently. Thus, we will have to come down to their level. - Alper

Correspondently, Teacher Demir states that personal digital stories should be prepared:

I believe that it would be more logical and efficient to create stories by considering the students' environment and being inspired by their environment in the mathematics teaching. The name of their neighborhood, their school or their friends should be included in the stories, and the students should be involved in the process one-on-one. - Demir

Digital Story-Based Needs

It is stated by the primary school teachers that the three main factors required for the mathematics teaching process to be carried out more effectively using the digital stories are the necessary technological equipment, material support and teachers' readiness. For instance, it is pointed out by the primary school teachers that a better technological infrastructure may be needed for the mathematics teaching process to be carried out more effectively using the digital stories. Teacher Arzu states that technological equipment is needed for teaching mathematics and using digital stories effectively:

Readiness of the necessary material is a must such as smart board, computer and audio system. The students' access to a digital story is also important. Is it presented in an understandable way? Have adjustments been made where necessary, where it should be paused? It should be open to the effective use of the students and teachers. - Arzu

Teacher Ezgi asserts that, in addition to the providing digital equipment, technical preparations should be made according to the technical infrastructure of the school where the implementation will take place:

First of all, there must be electronic equipment such as internet infrastructure, projectors and computers. But if there is no internet access available at the school, you probably need to prepare at home. You need to download and transfer the video to your computer and prepare in advance. - Ezgi

Teacher Figen states that, in addition to providing technological infrastructure, providing tablets with the students can ensure effective learning in the use of digital stories in mathematics teaching:

Smart board is a must for sure. There must be a projector and computer if there is no smart board available. Also, when using the digital story, if the students had a tablet, it would make it easier to learn such things. - Figen

Teacher Ozan emphasizes that the technological infrastructure should be of quite good quality for more effective mathematics teaching:

Certainly, the infrastructure at the school needs to be of good quality. There needs to be an environment with internet, projector or computer. Technological means should be foolproof, which our school already has. We will not have problems in this aspect, but if there is no such infrastructure at other schools, it will be a big problem. If we want to use a digital story, there should definitely be a smart board or a projector. - Ozan

Teacher Koray indicates that the audio system and digital infrastructure should be prepared prior to the lesson in order to use the digital stories more effectively in mathematics teaching:

Students' attention, sufficient materials and time are needed. Apart from these, of course, technical infrastructure is important. Projectors and computers are a must as well as an audio system. First, the necessary materials must be available. After adequate preparation, all that remains is to use the stories for the students. Thus, I do not think that we need too much. - Koray

Teacher İlker remarks that, in addition to technological infrastructure, measures should be taken to prevent problems that may arise during the teaching process in order to use digital stories more effectively in mathematics teaching:

Technological infrastructure is important. Besides, even if there is a technological infrastructure, smart board, or internet, the situations such as outage of internet or electricity, or the voice not being as loud as it should be can make this process difficult. The technological infrastructure particularly needs to be runproof. - İlker

Teacher Oğuz similarly states that the technological infrastructure should be of good quality in order to use the digital stories more effectively in the mathematics teaching:

First of all, the technological infrastructure must be very good. Once the technological infrastructure is ensured to be good, the students should have technological devices such as tablets. - Oğuz

The primary school teachers stated that material support should be provided along with activities that will increase in-class interaction in order to use the digital story more effectively in the mathematics teaching process. Teacher Zehra explained the positive aspects of providing materials that students can touch and feel together with the digital stories by stating, *"It is more effective for students*

when they use cardboards and scissors in mathematics lessons and when these materials are included in the lesson." Teacher Efe indicated mentioned that the digital stories should be supported with materials in the teaching process and that the materials should be prepared in accordance with the level of the students by stating, *"There should be plenty of materials. The works need to be prepared in advance in a way that is suitable for the level of the children."* Teacher Mete mentions that supporting digital stories with materials will have an impact on the teaching process:

> *Together with the digital story, we can bring materials appropriate to the content of the digital story and reinforce the subject. In this way, we can also make them touch the materials directly. This allows the information to be permanent and makes it easier for the students to learn. - Mete*

Teacher Didem states that it is important to increase the number of activities in supporting the digital stories with materials in the teaching process:

> *Activities are required to be done again and again in the lesson. When planning the digital story and the lesson process, it would be better if the number of activities that the student will interact with is increased. Also, if it is supported with different methods and techniques in addition to the digital story, it will be better in terms of teaching the subject. - Didem*

It was stated by the primary school teachers that the teacher who will carry out this practice should have a good command of the content and activities of the digital story, technological field knowledge and digital equipment in order to use the digital story more effectively in the mathematics teaching process. Teacher Sude emphasized the importance of teachers' readiness for digital stories to be more effective in teaching by stating, *"The classrooms need to be very well-equipped as well as the teachers."* Similarly, Teacher İlker indicates that teachers' readiness is important in the use of the digital stories in the mathematics teaching:

> *I think that it will be useful for the teacher to make a regular plan and preparation for both the content of the digital story and the activities to be done afterwards in order to make it more effective and efficient. - İlker*

Teacher Eylül notes that the teacher's technological field competence is important in using the digital stories more effectively in the mathematics teaching:

> *Teachers really need to have a good command of web 2.0 tools. Teachers can prepare an animation suitable for the class level. Now there are many online opportunities with web 2.0 and web 1.0 tools. I think the students will be very happy and pay attention to the lesson if the teachers make such a lesson plan. - Eylül*

Teacher Emin stresses that the teachers need to know the purposes and benefits of the digital story as well as where it is used before the lesson:

> *First of all, the teacher should definitely be prepared for the lesson and have a good command of the subject. The teachers should know what the digital story is, for what purpose it is used, in which part of the lesson it is used, what kind of benefit it provides, and whether the story is related to the subject or not. In addition, the stories should be designed in accordance with the purpose. - Emin*

Teacher Mete implies that the teachers need to have a good command of the digital story process as well as the subject before starting to teach mathematics with the digital stories:

*Firstly, the teachers should already have a great command of the subject as well as the digital story. The instructions that the digital story offers to teachers should be appropriately used by carefully following high control skills. This needs to be balanced so well so that efficiency and time savings become very good. Besides, the teacher should already be prepared before the lesson. **- Mete***

Recommendations for the Use of Digital Stories in Mathematics Teaching Process

Table 4. *Primary school teachers' recommendations for the use of digital stories in mathematics teaching process*

Theme	Category	Primary School Teachers
Recommendations For Preparation Process of Digital Stories	Catchy Content	Elif, Cansu, Cem,
	Consideration of Needs and Requests	Oğuz, Alper, Demir
	Reproduction of Digital Stories	Bilge, Ozan, Furkan
Recommendations for Implementation of Digital Stories	Concretization with Materials	Arda, Kerem, Hakan, Demir, Furkan
	In-Class Active Participation	İlker, Sude, Didem, Efe, Sude

The recommendations given by the primary school teachers for the preparation and use of digital stories in the mathematics teaching process were presented on Table 4.

Recommendations for Preparation Process of Digital Stories

The primary school teachers' recommendations for the preparation process of digital stories during the mathematics teaching were grouped under the categories of catchy content, consideration of needs and requests and reproduction of digital stories. It was recommended by the primary school teachers that content of the digital stories to be used in the mathematics teaching process should be appropriate to the level of the students and consist of factors that will attract their interest. Teacher Elif noted based on her class that she has some recommendation on content of digital stories to be used in the mathematics teaching:

*The content of digital stories can be more attention getting if they consist of plots that attract children's attention more. What I mean is more dynamic stories. Since I teach 1st graders, motional stories that can energize the students may be interesting for them. **- Elif***

Teacher Cansu states that the digital stories to be used during the teaching process should consist of cartoon characters to attract students' attention:

*Everything can be taught much better in line with the needs and requests of the students if the stories can be reproduced for each subject. We can attract their attention more if we are able to use more characters from current cartoons that children watch. **- Cansu***

It was recommended by the primary school teachers that the digital stories to be used in mathematics teaching should include characters of real people. Teacher Cem recommends that real videos and characters should be shown in the digital stories prepared for the mathematics teaching:

*In one of the digital stories, there were mostly pictures. I think videos can also be added. Not in the form of simulations, but real videos. I think the digital stories would be better if real videos displaying children are added to the plot. **- Cem***

Teacher Oğuz states that the digital stories used in the mathematics teaching process should be prepared by taking into account the needs and requests of the students' developmental periods:

The materials, stories and tools presented in the form of digital story should be increased and addressed to the students in a concretized way. In this way, the students can understand the subjects better. In addition, the content needs to be enriched and designed in accordance with the students' level. Thus, the storytelling method can be more effective in the mathematics.
- Oğuz

It was suggested by the primary school teachers that individual differences of the students should be taken into account when organizing the content of digital stories prepared for the mathematics teaching. Teacher Alper expresses that individual differences should be considered when preparing the digital stories:

The digital story can also be translated into other languages for other children. Or it can be narrated in a way that children using different languages can understand for us to be able to explain and convey the digital story better. For instance, a digital story can be prepared in a simple level so that a child with autism can understand it better. When we act in accordance with their level, we can involve the students in the lesson. This will make the stories much more useful. In fact, one of our biggest problems is individual differences. While fifteen students in the class understand the lesson, other fifteen others do not. Therefore, not all students get the maximum out of the lesson. Only when the individual differences are taken into consideration, these digital stories will become more useful. - Alper

Teacher Demir asserts that it is necessary to be careful when preparing digital stories since the place where students live, -city center or village- and the situations they encounter in their surroundings differ:

The digital stories should be prepared by taking into account the socioeconomic and cultural background of the student. For example, interest in the mathematics of a student living in the city center of Ankara differs from another student living in a more rural area. The students live together with animals in the rural area. S/he sends the sheep out to grass and takes care of the cows. Thus, examples in the digital stories should be built on these experiences. Also, it is illogical to ask time of school bus service to a student studying at a rural school. Because the students in a rural area do not take the school bus, rather s/he goes to school by walking. The life of a student in the rural area is different from the daily events experienced by a student in the city center. In this context, the digital stories will be more productive if these differences are taken into account. - Demir

After the implementation within the scope of research, it was recommended by most of the primary school teachers that digital stories should also be prepared for other grade levels and other subjects in the mathematics teaching and that the digital story method should become more common. Teacher Bilge suggests that examples of digital stories should be increased for the use in the mathematics teaching:

We request more digital stories to be used in the mathematics as well as examples. We find it difficult to prepare activities in the digital media. That's why we want these digital stories to increase and more of these. In other words, we want these stories to be provided with us

as a resource. Honestly, it would make us very happy. We will be very happy if the stories become more common. - Bilge

Teacher Furkan mentions in a similar way that it is important to increase the number of digital stories for use in the mathematics teaching:

I think that the more we make digital stories more common and the more we incorporate them into education, the more we will benefit from them. Such methods really need to be applied particularly for primary school students to understand abstract subjects more easily. That's why we need to increase the number of stories. Sometimes we see a lot of innovation in education, but it needs to be more widespread. - Furkan

Teacher Ozan states that digital stories should be prepared for each subject in order to teach the mathematics in an entertaining way:

The use of digital stories is a very good method. I am in favor of using it at every school. But first, the infrastructure of each school must be made proper for the use of the digital stories. This is the first thing I want to point out from the beginning. Secondly, I am in favor of applying these digital stories for every subject of the mathematics as much as possible. This is a must. Because most students do not like or understand the mathematics. However, the mathematics can be more entertaining with the help of these stories. I think that we need to let go of the rote learning a little bit. – Ozan

Recommendations For Implementation of Digital Stories

The primary school teachers' recommendations for the use of digital storytelling method in the mathematics teaching process were grouped under the titles of concretization with materials and active participation. It was stated by the primary school teachers that the subject to be explained in the mathematics teaching process should be concretized with materials in the implementation process of the digital stories. Teacher Arda notes that presence of materials in the process of using digital stories in the mathematics teaching has effects on the learning process:

Video and materials should be in harmony with each other. It should be presented as a whole. So that the lesson continues as a whole. After a certain point, we see that the digital story does not make much sense if the lesson consists of just images. But I think that it will be more useful if we support the digital story with some kind of materials. It is necessary to support the digital story with some materials instead of just using it. For example, the students see a cube in a video, it is nice. But in order for them to understand what this cube is like, they need to touch and feel it. - Arda

Teacher Kerem mentions by referring to a mathematics subject that it is important to use materials during the mathematics teaching with digital stories:

We can bring other materials to the classroom along with the digital stories. For instance, we can explain geometric figures with stories and make models of them before the lesson and bring them to the classroom. In this way, 3D shapes become more memorable for the students. - Kerem

Teacher Hakan emphasizes that using concrete materials in the mathematics teaching process carried out with digital stories has positive effects on the students:

*It is of great important to concretize the subjects in the mathematics. When the students concretize the subjects in their minds or are provided with concrete, we ensure a very effective learning. In other words, I think that the students need to see abstract concepts clearly with their eyes and touch them with their hands. Maybe this can be possible for grades 1, 2, 3; however, in grades 4 and, there is not much need for it anymore. Because they can perceive abstract subjects. They should be involved in the process for sure. I think that concrete examples should absolutely be provided with the students. - **Hakan**

Teacher Demir recommends that the students can be ensured to be active participants in the process thanks to materials appropriate for the content of digital stories in the mathematics teaching:

*Thanks to the digital stories, we can have the students involved in the process by providing opportunities of one-to-one learning and learning by doing. Thus, we can make the learning process more efficient. We can support the digital stories with activities that students can be involved in following the use of these stories. For example, activities that are in harmony with the digital stories can be prepared. Activities that present concrete examples can be created. Such as drawing a shape in a notebook using a pencil. Or a textbook or activity book suitable for these stories can be used. Any concrete material can be prepared as well in a way that would be in parallel with the stories. - **Demir**

Teacher Furkan states that the students can be provided with permanent learning by supporting the digital stories with materials in the mathematics teaching:

*When the students learn by seeing, touching, watching and doing, the subjects become more permanent for them. Thus, I think that it will be more effective for the students to make this widespread. If these stories are also supported with materials and we bring materials to the classroom related to the subject we are teaching, the students can touch and experience these materials. This eventually makes their learning more permanent by involving them in the teaching process. Therefore, these digital stories need to be more common. - **Furkan**

It was recommended by the primary school teachers that number of the classroom activities in which the students can actively participate should be increased during the implementation process of digital stories in the mathematics teaching. Teacher İlker points out that increasing the number of the activities during the implementation of digital stories in the mathematics teaching will have positive effects on learning process:

*I saw the activity right after your digital story. The activity was prepared in a way that would support this digital story and make the teaching process very easy and effective. I think that it can be possible for the students to learn more effectively and efficiently, particularly if number of the activities is increased in line with the digital stories. - **İlker**

It was recommended by the primary school teachers that the digital stories in the mathematics teaching should be prepared in such a way that the students can participate interactively. Teacher Sude describes that the digital stories can be organized interactively in the mathematics teaching:

We already carry out regular lessons together with the students. Our current education system is quite different from the past understanding of "the teacher tells and the student listens". We can make the learning process valuable, make it a little bit more enjoyable and

*remarkable. We can show the story to the students and ask them questions about the story. Or we can ask the students to prepare questions about the story. They can prepare cards or questions in written form about the digital story. **- Sude***

Teacher Didem recommends that the digital stories can be turned into interactive stories in the mathematics teaching:

*I think that more additional materials can be used. Also, an environment where the students would interact more can be created. In other words, the story can be turned into an interactive one, through which the students can make a choice. In this way, the stories can be more effective. **- Didem***

Teacher Efe states that the digital stories should be prepared in such a way that the students can be participate in the process in order for the digital stories to be more useful in the teaching process:

*The students need a lot of practice. Besides, there should be a lot of material available to be used by the students and the students have to be involved in the process. Thus, the stories should be prepared in an interactive way. **- Efe***

Discussion and Conclusions

In the light of data obtained within the scope of the story, it is observed that the teachers expressed their opinions about for which stage or subject of the mathematics lesson they should use the digital stories. Moreover, they described what the student-based and story-based needs arise during the implementation of digital stories in the mathematics teaching process as well as they presented their recommendations for preparation and implementation of the digital stories to be used in the mathematics lesson.

It was emphasized by the primary school teachers that the use of digital stories would provide students with the opportunity of concretization of the subjects when starting to cover a new subject and would help the students focus on the lesson and gain permanent learning and have preliminary information about the subject. The obtained findings correspond to research conducted by Göçen Kabaran et al. (2019) in which the primary school teachers and primary school teacher candidates had stated that the digital stories can be used to have students pay attention to the lesson providing the opportunity to concretize the subjects in the teaching process. It was also indicated by the primary school teachers that the digital stories need to be used at the development stage of the lesson in the mathematics teaching by involving the students learning by doing, experiencing the studies on their own, being allowed to do individual works. It was also highlighted by the primary school teachers that the digital stories can be used at any stage of the lesson in the mathematics teaching. Correlatively, it was pointed out by Sadik (2008) as a result of his research that the digital stories can be used for any lesson in the curriculum. The primary school teachers remarked that, depending on the activities and content, the digital stories can be used at the introduction stage for stimulation, attention getting, discovery of prior knowledge and motivation; at the development stage for reinforcing what the students would learn and having the students participated in the process; lastly, at the evaluation stage for repeating the subject and identify the students' learning loss.

It was stated by the primary school teachers that the subjects of rhythmic counting, problems, concept of place value, four operations and fractions within the learning area of numbers and operations

can be effectively taught with the use of digital stories. They specified that the subjects of rhythmic counting, concept of places, four operations and fractions are found abstract by primary school students, therefore, it would be better to teach these subjects using the digital stories. Moreover, the primary school teachers stated that, due to having limited reading habit and difficulty in understanding what is read, the students have difficulty in learning the subject of problems and the teaching process with digital storytelling can offer positive effects on the students regarding problem solving skills. Correlatively, it was determined as a result of the research conducted by Dinçer and Yılmaz (2019) that the digital stories improve the students' problem-solving skill. The primary school teachers laid emphasis on the importance of the use of digital stories for the subject of problems since the subject is ensured to be supported with visuals, narrated, concretized, and contains examples from the student's daily lives. In addition, it was put forward by the primary school teachers that using the digital stories for teaching the subjects of the sub-learning area of "geometric figures and shapes" within the learning area of "geometry" would provide permanent and memorable learning since, according to the teachers, features of geometric figures and shapes are considered abstract by the students and the digital stories would provide the opportunity of turning abstract shapes into concrete ones. It was noted in the research of Göçen Kabaran et al. (2019) that the digital stories achieved the purpose of the outcomes by providing concrete learning opportunities based on the teachers and teacher candidates' statements. On the whole, the fact that the digital stories are supported with audio and visuals and address to more than one sensory organ, as underlined by the teachers participating in the study, offers concrete learning opportunities making it easy for the students to visualize the abstract subjects in their minds as well as enables the effective use of digital stories in teaching of entire subjects within the curriculum.

The primary school teachers highlighted that technological equipment such as internet, projector, computer, smart board should be ready during the mathematics teaching process implemented with digital stories, and the digital infrastructure needs to be checked prior the lesson. Similarly, it was stated by Kutlucan et al. (2019) in their research that the technological infrastructure of schools should be improved for digital stories to be more effective in teaching lessons and values. It was stated by the primary school teachers who participated in the study that the teachers should have a good command of technology and have a good grasp of the content and activities of the prepared digital story. Demirer (2013) put forward that the teachers should be provided with adequate field knowledge and skills for the digital stories to give better results in the learning process, and this view appears to correspond to the findings of this study. In the research conducted by Heo (2009), it was laid emphasis on the importance of faculties of education in respect of providing experiences on the methods to be used during teaching process with teacher candidates in teacher training programmes. Correlatively, it was stated in the research carried out by Daniels (2013) that teacher candidates can improve their qualities in their branches thanks to the digital stories in an educational aspect while Kim et al. (2021) described digital stories as motivating educational tool for the teachers' vocational development. In this context, it can be advised that teaching with digital stories should be integrated into the teaching courses in teacher programs for teacher candidates to improve their branch competence with digital story as well as in-service training opportunities should be offered to ensure teachers' branch competence in teaching with digital stories. Additionally, digital stories prepared for different lessons and subjects can be presented to teachers via the Education Information Network [EIN] preparing lesson plans and materials in line with these stories.

The primary school teachers stated that students' readiness should be taken into consideration to increase efficiency of digital stories in the mathematics teaching process, and it is important to make the students active participants in the mathematics teaching process implemented with digital stories. Similarly, it was emphasized that more productive and useful teaching process can occur when the students' individual differences are considered in the mathematics teaching process carried out with digital stories, and digital stories are prepared in accordance with the students' levels. The primary school teachers mentioned that customized digital stories can be prepared in the mathematics teaching by considering the students' surroundings, their living conditions, structure of their school and classroom, and their social circles. In the research regarding the transfer of digital materials prepared from examples of daily life into educational environment, it was underlined by Bhatt (2012) that digital stories enable to correlate daily life and the lessons. In the research conducted by Karakoyun (2014), it was determined that teacher candidates made recommendations for preparation of customized stories for digital stories to be used in teaching process. It was inferred from the research carried out by Yürük (2015) that involving the students in the digital story scripts prepared by the teachers enables the students to motivate. In line with the findings of the research and researchers' views in the literature, it is believed that content of the digital stories should be prepared in a way to consider cultural and linguistic characteristics of the environment where the students live as well as structures and current events around them.

The primary school teachers advised in the research that the characters in the story should be portrayed by real people, the content should consist of cartoon characters that will draw the students' attention, and the digital stories should be prepared based on the student's requests and needs in the preparation process of digital story. As a result of his research, Yürük (2015) pointed out that the students at 5th grade exhibited positive attitudes towards the digital stories since the content of the digital stories prepared for them had resemblance to cartoons. When considered from this point of view, it is of great importance to create digital stories considering the students' needs, requests and areas of interest required by their developmental characteristics.

It was highlighted by Yılmaz et al. (2017) that multiple disciplines are utilized together during implementation of digital stories that are important for the students with individual differences. Moreover, it was emphasized in the Mathematics Curriculum that the students' individual and cultural differences should not be ignored, and necessary attention should be paid to the use of appropriate models and approaches that reveal the students' learning differences (Ministry of National Education [MoNE], 2018). The primary school teachers recommended that, when preparing a digital story for the mathematics teaching, the content should be organized based on the stage of the lesson in which it will be used, and materials should be carefully chosen. In this regard, the digital stories should be prepared by considering the students' individual differences such as linguistic characteristics, learning levels and special cases.

When data obtained as a result of the research was analyzed, the primary school teachers stated that the process needs to be supported with materials in order for the students to comprehend abstract concepts in a concretized way during implementation of the digital stories in the mathematics teaching. In addition, it was believed by the teachers that increasing number of the in-class activities prepared in parallel with the content of the story will contribute to effective and permanent learning during implementation of the digital stories in the mathematics teaching. In the research conducted by Wang

and Zhan (2010) with university students, digital stories were used for four different courses and, as a result, it was emphasized that the students understood the course subject better as well as their interest, desire and motivation for the course increased. It was underlined that watching digital stories alone will not be sufficient for effective teaching. Moreover, it was stated that the teacher should prepare the classroom environment, support the digital story process with activities and materials and aforesaid activities should have examples from daily life. (Yürük, 2015). In accordance with these recommendations and views, in-service training can be provided with the teachers in respect of preparation and effective use of digital stories and preparation of lesson plan, in-class activity and materials.

The primary school teachers also recommended in the research that the students similarly need to experience the preparation process of digital story to make mathematics teaching with digital story more permanent. It was inferred by Kutlucan et al. (2019) that permanent learning is ensured since the students directly participate in the process. Kotluk and Kocakaya (2015) stated that preparing digital stories for high school students in physics teaching is effective in the development of students' 21st century skills. In the study carried out by Küçükokka et al. (2022), it was correlatively emphasized that the importance of technology has increased due to the current pandemic and digital skills need to be improved. When the Mathematics Curriculum is examined, it was observed that digital competence covers the students' safe and questioning use of technological tools, access to information, and contribution to the development of communication skills by participating in the internet and virtual environment. In accordance with this information, making the students participate in the preparation process of digital stories will be beneficial with regards to ensuring permanent learning, developing basic skills, preparing, presenting and sharing information on digital media.

Recommendations

Considering the findings and results obtained in regard to the use of digital story in the mathematics teaching process, recommendations were examined in two sections: recommendations for implementation process of the digital story and recommendations for future research.

Recommendations for Implementation Process of Digital Stories

- It is observed in the research that, based on the teachers' statements, the students could not turn their learning into experience since content of the digital stories lacked examples from the students' daily lives in the mathematics teaching process. Therefore, it is advised that the digital stories should include examples from the students' lives.
- It is demonstrated in the research that, as recommended by the teachers, the digital stories should be prepared for each subject, the stories can be integrated into other lessons and they should be provided with teachers as a resource. In this respect, it can be recommended to share and make it widespread the digital stories, lesson plans and materials prepared in conformity with most of the lessons, subjects and student levels on an online platform such as Education Information Network (EIN).

Recommendations for Future Research

- It can be advised to examine the skills and views of 1st, 2nd, 3rd and 4th grade primary school students and teachers regarding the preparation process of digital story in mathematics teaching for future research.

- In future research, it can be recommended to analyze the effects of the mathematics lessons planned and implemented based on digital stories on 1st, 2nd, 3rd and 4th grade primary school students' academic success, particularly on the subjects of problems, concept of place value, geometric figures and fractions.

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BIOGRAPHICAL NOTES

Contribution Rate of Researchers

Author 1: 50%

Author 2: 50%

This study was produced from the master's thesis of the first author. A part of this study was presented as an oral presentation at the 2nd International Educational Sciences Congress.

Conflict Statement

There is no conflict of interest with the people participating in the research.

Genişletilmiş Türkçe Özet

Dijital Öyküleme Yöntemiyle Matematik Öğretimi Sürecine Yönelik Sınıf Öğretmenlerinin Deneyimleri

Giriş

İnsan ihtiyaçlarının gün geçtikçe farklılaşması sebebi ile bilim ve teknolojiye hayatın her alanında daha çok önem verilmekte (Dumlu Güler, 2011) ve bu hızlı dönüşüm eğitim öğretim ortamlarını da etkilemektedir. Eğitsel süreçlere teknolojinin entegrasyonu ile beraber öğretim hedeflerinin ve kazanımlarının etkin bir şekilde öğretilebilmesi için yenilikçi fırsatlar ortaya çıkmaktadır (Kurudayıoğlu & Bal, 2014). Günümüzde ders kitapları gibi tek uyaranlı uygulamalar yerine yaparak yaşayarak öğrenme ve kalıcı öğrenme esaslı birden fazla uyaranı içerisinde barındıran öğretim materyallerine ihtiyaç duyulmaktadır (Kuzu Sarar & Durna, 2020). Buna bağlı olarak eğitim öğretimde kullanılan öğretim yöntemlerinin öğrencinin istek ve ihtiyaçları göz önünde bulundurularak dijital materyallerle zenginleştirilmesinin öğrencinin öğrendiklerini yapılandırmasını ve derse olan ilgilerinin artırılmasını sağlayacağı düşünülmektedir (Göçen, 2014). Özellikle bazı öğrencilerin matematik gibi olumsuz tutum sergilediği derslerde öğrencilerin ilgisini çeken dijital materyallerin kullanılması eğitsel sürecin daha verimli yürütülmesi için fırsat sunacaktır. Bu doğrultuda öğrencinin öğrendiklerini aktarabilmesi için zihninde yapılandırabilmesine ve bilgiye somut yaşantılar aracılığıyla ulaşabilmesine fırsat sunduğundan dolayı dijital öyküleme (Yüksel Arslan vd., 2016) en etkili öğretim yöntemlerinden biri olarak dikkat çekmektedir.

Teknolojinin kullanılarak öykülerin metinler aracılığı ile dijital ortama aktarılabilmesi, kaydedilip saklanabilmesi, çevrimiçi ortamlarda yayınlanabilmesi ile birlikte dijital öykü kavramı ortaya çıkmıştır (Gökben & Kışla, 2015). Rule (2005) dijital öyküyü düzenlenen görseller, ses, müzik ve anlatımını temel alarak farklı karakteri, olayı, tecrübeyi ve anlamlandırmayı çeşitli boyutlar ve renklerle öykülerin modern tanımlaması olarak açıklamaktadır. Dijital öykü etkileşimli bir çevrim içi ortamda ses, görsel, fotoğraf, müzik, video, hareket efekti ve metnin yer aldığı bir durumun sunulması sürecidir (Figa,

2004). Demirbaş (2019) ise dijital öykünün metin, ses, resim, hareket elemanlarının birlikte bulunduğu kısa videolar olarak tanımlamaktadır. Çevrim içi ve dijital ortamların sunduğu imkanlar ile öykü metni yazma ve yazılan öyküleri transfer etme aşamalarının daha hızlı yapılmasıyla öğrencilerin dikkatlerinin dağılması engellenerek öğrencinin süreçteki etkileşimi artırılabilir. Bunun yanında resimlerin, görüntülerin ve metinlerin biraraya gelmesi ile oluşan dijital öyküler öğrencilerin daha iyi ve hızlı kavramasını sağlamakta (Sur, 2022) ve dijital öykü yöntemi ile öğrencilerin bilgiyi keşfetme, bilgiye erişme, bilgiyi inceleme, farklı fikir ve planlama becerilerini geliştirdiği görülmektedir (Ateş, 2023). Öğretimde dijital öykülerin kullanılması öğrencinin ilgisini derse çekmekte ve yaratıcı öğrenme ortamı oluşturmaktadır (Sadik, 2008). Bir başka deyişle teknolojik gelişmeler ile geleneksel öykü anlatımının bir araya getirilmesiyle dijital öyküler oluşturmak eğitimde verimliliği arttırmanın etkinli yollarından biri olarak dikkat çekmektedir (Kocaman Karoğlu, 2015).

İçinde bulunduğumuz yüzyılda bilgi iletişim ve teknolojilerinde yaşanan gelişmeler bilgiye ulaşmayı, bilgiyi aktif kullanmayı insanların yaşamının temel ihtiyacı haline getirilmesini sağlamasının yanında (Çukurbaşı ve İşman, 2014) başta eğitim ve öğretim ortamı olmak üzere hayatımızın birçok alanında değişim gerçekleştirmiştir (Karakoyun, 2014). Günümüzde bilim ve teknolojinin etkin olmasından dolayı bilginin anlatım ve ezber temelli aktarılması ile etkili bir öğretim etkinliği sağlanamayacağı düşüncesini ortaya çıkarmaktadır (Aslan, 2014). Yıllar içinde teknolojinin gelişmesi ile birlikte öğrenciler için alışılmış öğretim materyalleri dikkat çekici olmaktan uzaklaşmış ve öğrencilerin öğretim ortamlarından beklentileri farklılaşmıştır. Buna bağlı olarak eğitim alanında dönemin teknolojik gelişmelerine uygun, yeni ve çeşitli yöntemlerin geleneksel öğretim yöntemleri yerine kullanılması eğitim ve öğretimin veriminin artırılmasında oldukça önemlidir (Uslupehlivan vd., 2017). Teknolojinin hızla değişmesiyle beraber bilgiyi aktarma ve paylaşma yöntemlerinin bilgisayar, haberleşme araçları ve çoklu ortam teknolojileri gibi araçlara evrilmesinden dolayı yaşamımızı devam ettirdiğimiz toplumun bilgi toplumu olma yolunda ilerlediği söylenebilir (Arslan, 2006). Her gün değişen dünyada başarı elde edilebilmesi için teknoloji destekli öğrenmenin bilgi, beceri ve hayat boyu öğrenme sürecinin gelişiminde etkili olduğu düşünülmektedir (Domalewska, 2014). Eğitim öğretim için gerekli bilgi, beceri ve yeterliklerin bilgiyi öğrenmenin yanında öğrenmeyi öğrenme yeterliğini, bilginin içeriğini yaşama aktarma becerisi kazandırılmalıdır (Gömleksiz & Pullu, 2017).

Usluel ve Atal'a (2013) göre öğrencinin teknolojinin sağladığı olanaklara okul dışında kolayca ulaşabilmesi ancak okullarda bu olanakların yeterli olmaması "dijital uyumsuzluk" olarak tanımlanan farklı sorunların ortaya çıkmasına sebep olmaktadır. Teknolojinin okulda zengin bir şekilde kullanılmasıyla ve dijital uyumsuzluk sorununun çözülmesiyle öğrencilerin ilgisinin konu üzerinde tutulması, anlamlı ve kalıcı öğrenmenin gerçekleşmesi sağlanır (Dola & Aydın, 2020). Benzer olarak Yang ve Wu (2012) öğrenme ortamlarında teknolojinin zengin ve etkin bir şekilde kullanılmasının anlamlı öğrenmenin sağlanmasında ve öğrencilerin dikkatinin çekilmesinde oldukça önemli olduğunun vurgusunu yapmaktadırlar. Bunun yanında dijital öykünün kullanımı ile birlikte öğrencilerin ders sürecinde aktif rol oynadıkları ve derse olumlu görüş geliştirmelerine yardımcı olduğu tespit edilmiştir (Demir & Kılıçkıran, 2018). Buna bağlı olarak teknolojinin hızla geliştiği bu dönemde teknolojinin öğrenme ortamlarına entegre edilmesine dayalı süreçler oldukça önemlidir (Çoruk & Seferoğlu, 2020).

Akkoyunlu ve Kurbanoğlu (2003) öğrencilerin teknoloji ile büyümesinden dolayı öğretmenlerin öğretimde başarılı olabilmesi için teknolojinin eğitimdeki etkisini benimsemeleri, kendilerini değişen teknolojiler ile birlikte geliştirmeleri gerektiğinden bahsetmektedir. Benzer şekilde Kahraman (2013)

teknolojinin sürekli değişmesi ve gelişmesi ile öğretmenlerin kendilerini bu yönde geliştirmeleri ve çağa uyum sağlamaları gerektiğini belirttiği görülmektedir. Öğretmenler bir süreci tanımlamak, bir düşünceyi sunmak, materyallerin kullanarak eğitsel konularla ilgili açıklama yapmak için dijital öykülerden yararlanabilirler (Wang & Zhan, 2010). Bunun yanında dijital öykü öğretmeni sınıf içinde hem rehber hem de etkin kılarak öğretmene zaman açısından tasarruf imkanı vermekte, etkili ve kalıcı öğrenme gerçekleştirmesini sağlamaktadır (Mangal, 2020).

Matematik var olan her şey arasındaki ilişkiyle alakadar olan, bütün bilim dallarında var olan ve yaratıcısı insan olan bir araç olmakla birlikte insanoğlunun istek ve ihtiyaçlarının neredeyse bütün alanlarda artması ile yaşamımızdaki önemi gün geçtikçe fazlalaşan bir bilim dalıdır (Bozkurt, 2008). Matematik öğretiminde ders programlarının öğrencilerin kendi yeteneklerini göstermelerine imkan vermemesi, derse olan ilgilerini ve etkin katılımlarını sınırlandırması ve bunun yanında ezber temelli, düz anlatım gibi yöntemlerin kullanılması öğrencilerin dikkatlerini yitirmelerine ve sıkılmalarına sebep olmaktadır (Lesser, 2001). Bunun yanında öğrenciler matematikte yer alan soyut kavramları günlük hayatları ile ilişkilendirememekte bu nedenle matematik dersine karşı ön yargıları oluşmaktadır. (Küçükoğlu & İncikabı, 2020). Dijital öyküler, öğrencilerin akademik bilgiyi içinde bulunduğu yaşam ile ilişkilendirmesi, çocuğun renkli dünyasına hitap etmesi, süreçte öğrenciyi aktif kılması, yaşamından örnekler taşıması ve birden fazla duyu organına hitap ederek somut yaşantılar edinmesine imkan sunmasıyla matematik öğretiminde kullanılabilecek alternatif öğrenci merkezli öğretim yöntemlerinden biri olarak dikkat çekmektedir.

Smeda ve diğerlerine (2010) göre dijital öyküleme bireyin özgün düşünceleri ile teknolojiyi bütünleştiren, öğrenciyi merkeze alan çağdaş bir yaklaşım ve teknolojik olarak zengin, işbirlikli öğrenme ve öğretme ortamlarının sağlanmasına yardımcı olmaktadır. Öğrenme ortamına dijital öykülerin entegre edilmesi ile öğrencilerin dijital beceri kazanmaları ve öykü kapsamında temel alınan konuyu daha iyi kavramaları açısından imkan sağlanmaktadır (Behmer vd., 2006). Bunun yanında dijital öyküleme yönteminin yazma, organize etme, sunum, iletişim, problem çözme ve değerlendirme becerilerini de kazandırdığı düşünülmektedir (Robin, 2006). Dijital öykü, öğrencilerin ilgisini çekmesi ve teorik bilgilerin günlük yaşam transfer edilmesine yarımcı olmasıyla matematik öğretimini ve öğrenmeyi anlamlı hale getirmektedir (Schiro, 2004). Öğretmen ve öğretmen adaylarının öğretimde dijital öykü kullanımnı deneyimleyebilmesi, bilmesi ve süreçte kullanabilmesi için öncelikle dijital öykü kavramı ile tanışmasını sağlamak gerekir (Kukul & Kara, 2019). Bu sebeple dijital öykülerin matematik öğretimi sırasında kullanılmasının desteklenmesi, matematik derslerinin daha eğlenceli ve anlaşılır hale gelmesinde yardımcı olacağı düşünülmekte ve sınıf öğretmenlerinin dijital öyküleri matematik dersinde kullanmalarına yönelik tecrübelerinin incelenmesinin dijital öykülerin matematik derslerine daha sık ve etkin şekilde kullanılması için önemli fırsatlar sunacağına inanılmaktadır. Bu bakış açısı göz önünde bulundurularak sınıf öğretmenlerinin dijital öyküleme yöntemli ile planlanan ve uygulanan matematik öğretimi dersine yönelik görüşlerinin incelenmesi amaçlanmıştır.

Yöntem

Araştırmanın Modeli

Ülkemizde yaygın bir öğretim yöntemi olmayan ve genellikle matematik dersinde tercih edilmeyen dijital öykü yöntemine dair sınıf öğretmenlerinin dijital öykünün matematik öğretimi sürecinde kullanılmasına yönelik deneyimlerinin araştırılması planlanmıştır. Buna bağlı olarak bu nitel

çalışmada olgubilim araştırma deseni uygulanarak matematik öğretiminde ilkokulun her sınıf düzeyi için belirli kazanımlara ilişkin dijital öyküler ve ders planları hazırlanmış, öğretmenlerle beraber sınıflarında uygulanmış ve öğretmenlerin dijital öykülemenin matematik öğretiminde kullanıma yönelik görüşleri belirlenmiştir.

Araştırmanın Evren ve Örneklemi

Bu çalışmaya gönüllü olarak katılan 25 sınıf öğretmeni 18-65 yaş grubu bireylerden amaçsal örnekleme yöntemlerinden ölçüt örnekleme metodu ile seçilmiştir. Bu çalışamaya katılan sınıf öğretmenleri seçilirken dijital öykü kapsamında bilgi yeterliğine sahip olması, dijital öyküyü derste kullanabilmesi ve medya araçlarının kullanımında yeterli beceriye sahip olması ölçütleri göz önünde bulundurulmuştur.

Eğitsel Uygulama Süreci

Dijital Öykülerin Hazırlanması

Araştırmacı tarafından "Powtoon" platformu kullanılarak Robin (2008), Lambert (2010) ve Ohler'in (2013) çalışmalarında yer alan dijital öykünün ögeleri dikkate alınarak ilkokulun 4 ayrı sınıf düzeyi için birer dijital öykü oluşturulmuştur. Uygulama yapacak öğretmenlerin derste kullanması için dijital öyküler temel alınarak iki ders saatini (40'+40') kapsayacak şekilde ders planları hazırlanmıştır. Dijital öyküde olay örgüsü kurgulanırken öğrencilerin günlük hayatta karşılaşabilecekleri durumlar dikkate alınmıştır. Araştırmacı dijital öykü ve ders planı hazırlama sürecinde öğrencinin derse katılabileceği etkinlikler göz önünde bulundurmuş, bu sayede öğrencinin sürece etkin katılımını sağlanmayı amaçlamıştır. Hem dijital öyküler hem de ders planları oluşturulduktan sonra matematik öğretimi, eğitim bilimleri ve Türkçe üzerine uzmanlaşmış 4 bilim insanından görüş alınmış, dijital öyküler ve ders planları uzman görüşleri dikkate alınarak tekrar düzenlenmiştir. Sonrasında hazırlanan dijital öyküler ve ders planları 4 adet sınıf öğretmenine ve bir adet bilişim teknolojileri uzmanına yollanmış ve Lawshe (1975) tekniği doğrultusunda dijital öykü ve ders planlarının hepsinin kapsam geçerlilik oranları 1 olarak belirlenmiştir.

Dijital Öykülerin İçeriği ve Uygulama Süreci

İlkokulun her sınıf düzeyi için matematik öğretimi kazanımları doğrultusunda hazırlanan dijital öykülerin konu kapsamına ve içeriklerine yönelik bilgiler aşağıda yer almaktadır.

İlkokul 1. sınıf matematik öğretimi için "Sayılar ve İşlemler" öğrenme alanında "M.1.1.2.6. Doğal sayılarla toplama işlemini gerektiren problemleri çözer." kazanım kapsamında öğrenci seviyesine uygun, 02 dakika 37 saniye süreli dijital öykü hazırlanmıştır. 1. sınıf için hazırlanan dijital öykünün olay örgüsünde üç arkadaşın bir çiçek dikme etkinliğinde bahçeye kaç çiçek diktikleri ile ilgili üç adet problem verilmiştir. Her problemin cevabı verilmeden önce video durdurulmuş ve öyküdeki nesnelerin aynısı öğrencilere dağıtılarak problemin cevabını kendilerinin bulması istenmiştir. Sonrasında ise dijital öykü devam ettirilmiş ve buldukları cevabı kontrol etmeleri sağlanmıştır. Dijital öykünün sonunda verilen karakterler, farklı renkteki çiçekler ve bahçe görseline yönelik materyaller öğrencilere dağıtılmıştır. Öğrencilerden karakter belirlemeleri ve istedikleri renkte ve sayıda çiçek seçerek kendi problemlerini ve kendi bahçelerini oluşturmaları istenmiştir. Bu doğrultuda problem kurmaya yönelik çalışmalara katılmaları sağlanmıştır.

İlkokul 2. sınıf matematik öğretimi için "Geometrik Örüntüler" öğrenme alanında "M.2.2.3.2. Bir geometrik örüntüdeki ilişkiyi kullanarak farklı malzemelerle aynı ilişkiye sahip yeni örüntüler oluşturur." kazanımı kapsamında, öğrenci seviyesine uygun, 3 dakikalık dijital öykü oluşturulmuştur. 2. sınıf için hazırlanan dijital öykünün olay örgüsü bir sınıf ortamında bir öğrencinin kardeşine hediye almaya karar verememesi üzerine kurgulanmıştır. Dijital öyküde öğretmen öğrencisine o gün işleyecekleri geometrik örüntüler konusu ile kolye oluşturacaklarını söyler, dilerse kardeşine böyle bir hediye verebileceğini ve böyle bir hediyenin daha anlamlı olduğundan bahseder. Dijital öyküde farklı örüntü kuralları bulunmaktadır. Bu örüntü kuralları ile kendi kolyelerini oluşturmaları için her örüntü için ip, örüntüde yer alan geometrik şekil kartları ve yapıştırıcı gibi materyaller öğrencilere dağıtılmıştır. Dijital öykü örüntü kuralında durdurulmuş ve öğrencilerin kendi kolyelerini oluşturmaları istenmiştir. Sonrasında dijital öykü devam ettirilmiş ve bütün öğrencilerden oluşturdukları kolyelerdeki örüntüleri kontrol etmesi beklenmiştir.

İlkokul 3. sınıf matematik öğretimi için "Geometri" öğrenme alanında "M.3.2.1.2. Küp, kare prizma ve dikdörtgen prizmanın birbirleriyle benzer ve farklı yönlerini açıklar." kazanımı kapsamında öğrenci seviyesine uygun, 03 dakika 03 saniye süreli dijital öykü hazırlanmıştır. 3. sınıf için hazırlanan dijital öykünün olay örgüsü sahilde iki arkadaşın üç adet hazine sandığı bulması ve sandıkları açmak için şifreleri çözmeye çalışması üzerine kurgulanmıştır. Şifreler sandıkları oluşturan geometrik cisimlerin isimlerinden oluşmaktadır. Dijital öyküde küp, kare prizma ve dikdörtgen prizma şeklindeki sandıklar tek tek incelenir ancak özel bir durumu olması özelliğine değinilmez. Bu sırada geometrik cisim incelenirken her özellikte video durdurulmuş ve sınıfa getirilen küp, kare prizma ve dikdörtgen prizma modelleri, renkli kâğıtlar ve yapıştırıcı gibi materyaller öğrencilere dağıtılmıştır. Öğrencilerin küpün 8 köşesi, 6 yüzü, 12 ayrıtı olduğu ve tüm yüzlerinin eşit karelerden oluştuğu, kare prizmanın 8 köşesi, 6 yüzü, 12 ayrıtı olduğu ve 2 yüzünün kare, 4 yüzünün dikdörtgenlerden oluştuğu ve son olarak dikdörtgen prizmanın 8 köşesi, 6 yüzü, 12 ayrıtı olduğu ve tüm yüzlerinin dikdörtgenlerden oluştuğu renkli kâğıtlar yardımı ile modeller üzerinde incelemeleri sağlanmıştır. Son bölümde ise kazanımında yer alan tüm prizmalarda 8 köşesinin, 6 yüzünün ve 12 ayrıtının bulunması yönünden benzer oldukları ve küpün bütün yüzlerinin karelerden oluşması, kare prizmanın 2 yüzünün kare ve yüzünün dikdörtgenlerden oluşması, dikdörtgen prizmanın ise tüm yüzlerinin dikdörtgenlerden oluşması yönünden farklı oldukları incelenerek öğrencilerin karşılaştırma yapmaları sağlanmıştır.

İlkokul 4. sınıf matematik öğretimi için "Veri İşleme" öğrenme alanında "M.4.4.1.2. Sütun grafiğini oluşturur." kazanım kapsamında öğrenci seviyesine uygun, 02 dakika 57 saniye süreli dijital öykü hazırlanmıştır. 4. sınıf için hazırlanan dijital öykünün olay örgüsü, küçük bir kızın annesine depremzedelere yardım kolisi hazırlamasına ve kolide yer alacak ürünlerin kategorize edilmesine yardımcı olması üzerine kurgulanmıştır. Koliler gıda ve hijyen olmak üzere iki kategoride toplanmıştır. Gıda kategorisindeki ürünlerin sayısını belirlemek için nesnelerin görselleri karışık olarak verilerek, öğrencinin öğretmenin verdiği çalışma kâğıtlarına görsellerden hareketle çetele tablosu oluşturması istenmiştir. Çetele tablosundan yola çıkarak ise gıda kategorisine ait sütun grafiği oluşturmaları sağlanmıştır. Hijyen kategorisinde ise şekil grafiğinde verilen ürünlerden yola çıkarak sıklık tablosu, sıklık tablosundan yola çıkarak da sütun grafiği oluşturmaları ve son olarak her iki kategori için de bütün kolilerde yer alan ürünler yönelik verilen şekil grafiklerinden yola çıkarak sütun grafiği oluşturmaları istenmiştir. Öğrencilerin ortaya çıkardığı çalışmaların kontrolleri video durdurularak yapılmıştır. Böylelikle sütun grafiği oluşturulmadan önce verilerin, nesne veya şekil grafiği, çetele ve sıklık tablosu ile düzenlenmesi sağlanmıştır.

Araştırmacının Veri Toplama Sürecindeki Rolü

Araştırmacı çalışmanın katılımcılarına veri toplama süreci öncesinde ön bilgilendirme yaparak uygulamanın ve görüşme sürecinin nasıl yürütüleceğine dair açıklamalar yapmıştır. Çalışması kapsamında oluşturulan dijital öyküleri, ders planları ve materyalleri veri toplama sürecinde sınıf öğretmenlerine ulaştırmıştır. Dijital öykü sürecinde uygulanacak etkinlikler kapsamında materyaller sınıf öğretmenlerine ulaştırılırken her sınıfın mevcudu dikkate alınmıştır. Sınıf öğretmenlerinin derse katılabileceğini belirtmesi üzerine araştırmacı öğretim sürecine katılma ve gözlem yapma fırsatı bulmuştur. Araştırmacının uygulama sürecine katılması ile birlikte sınıf mevcudu kalabalık olan sınıflarda araştırmacı materyallerin dağıtılmasında, etkinlik sonuçlarının kontrollerinin sağlanmasında ve özellikle ilkokulun ilk basamağındaki sınıf seviyelerinde sınıf yönetimi konusunda sınıf öğretmenine yardımcı olmuştur. Araştırmacı grup etkinliklerinde grup içindeki görev dağılımlarında, grupların makas, yapıştırıcı gibi ihtiyaçlarının karşılanmasında ve öğrencilerin etkinlikler konusunda sorularını cevaplamada öğrencilere rehberlik etmiştir.

Veri Toplama Araçları

Araştırmada sınıf öğretmenlerinin matematik öğretiminde dijital öykü yönteminin kullanılmasına yönelik görüşlerinin incelenmesi amaçlanmıştır. Bu amaç doğrultusunda "Matematik Öğretiminde Dijital Öykü Kullanımı" başlığı altında alanyazın incelenerek görüşme soruları hazırlanmıştır. Görüşme soruları uzmanlara gönderilmeden 2 defa revize edilmiştir. Hazırlanan görüşme soruları katılımcılara uygulanmadan önce çalışmanın amacına yönelik olup olmadığının incelenmesi açısından Türkçe öğretimi, temel eğitimde matematik öğretimi, ilköğretimde matematik öğretimi ve bilgisayar ve öğretim teknolojileri eğitimi alanlarında uzman olan 4 akademisyene gönderilmiştir. Uzmanlar "dijital öyküleme kullanımı" terimi yerine "dijital öykü kullanımı" teriminin veya "matematik öğretimi" yerine "matematik öğretim süreci" ifadelerinin kullanılması gibi öneriler sunmuştur. Uzman görüşleri dikkate alınarak görüşme sorularında 3. kez değişiklikler yapılmıştır.

Veri Analizi Süreci

Nitel araştırmalarda veri analizi çeşitlilik, yaratıcılık ve esneklik kavramlarını temele aldığından dolayı araştırmacının, hali hazırda bulunan veri analiz yöntemlerini inceleyerek araştırma ve toplanan verilerin özelliklerini göz önüne alarak, araştırmasında kullanacağı veri analiz yöntemini geliştirmesi beklenir (Yıldırım & Şimşek, 2018). Olgubilim araştırmalarında veri analizi, tecrübeleri ve tecrübelere yüklenen anlamları tespit etmek amacıyla içerik analizi yapılarak verilerin kavramsallaştırılması ve olguyu açıklayabilecek temaların belirlenmesi gayreti vardır. Elde edilen sonuçlar betimlenerek bulgular belirlenen temalar ve kategoriler dahilinde açıklanarak yorumlanmaktadır (Yıldırım & Şimşek, 2018).

Strauss ve Corbin (1990) nitel araştırmalarda veri analiz sürecini "betimsel analiz" ve "içerik analizi" olmak üzere iki bölümde incelemiştir. İçerik analizi, betimsel analize göre daha karmaşıktır, derinlemesine analiz yapılmasına olanak sağlar ve öncesinde belirlenemeyen temaların ve alt temaların belirlenmesini sağlar. Bu çalışmada sınıf öğretmenlerinin matematik öğretim sürecinde dijital öykü kullanılmasına yönelik görüşlerinin incelenmesi için içerik analizi yapılmasına karar verilmiştir.

Strauss ve Corbin (1990) "Daha önceden belirlenmiş kavramlara göre yapılan kodlama", "Verilerden çıkarılan kavramlara göre yapılan kodlama" ve "Genel bir çerçeve içinde yapılan kodlama" olmak üzere üç tür kodlama biçiminden söz etmektedir. Bu çalışma kapsamında ise *"Verilerden çıkarılan*

kavramlara göre yapılan kodlama" türü kullanılmıştır. Elde edilen veriler tümevarımcı bir analiz süreci sonucunda araştırmacılar tarafından belirli kavramlar çerçevesinde gruplanmış ve veri analizi sırasına kullanılacak kod kitapçığı elde edilmiştir.

Bulgular

Matematik Öğretiminde Dijital Öykünün Eğitsel Kullanımına Yönelik Bulgular

Dijital öykünün dersin farklı kısımlarında kullanılabileceğini belirtilmiş, yine matematik programında yer alan öğrenme alanlarına ait konuların öğretiminde kullanılabileceğinden bahsedilmiştir.

Dersin Aşamaları

Sınıf öğretmenlerinden bazıları matematik öğretiminde dijital öykülerin öğrencinin dikkatini derse toplamasını, kalıcı öğrenmeler gerçekleştirmesini ve soyut kavramların öğrenmeyi kolaylaştırmasını sağladığını düşündükleri için dersin dikkat çekme aşamasında kullanılmasının daha iyi olacağını vurgulamıştır.

Öğretim sürecine yönelik ders planlanırken gelişme bölümünde dersin amaçlarına, öğrenciye, okul ve sınıfın fiziki koşullarına uygun yöntem ve tekniklerle etkinlikler düzenlemek gerekir. Araştırmada sınıf öğretmenleri öğrencinin dijital öykü ile yaparak yaşayarak öğrenme fırsatı yakalayabileceğini ve eğitsel etkinlikleri kendisinin deneyimleyeceğini belirtmiş ve matematik öğretimi sürecinde dijital öykülerin gelişme bölümünde kullanılmasının gerekliliğini vurgulamışlardır. Sınıf öğretmenleri matematik öğretiminde dijital öykülerin öğrencinin birden fazla duyu organını işe koşması, motive olması, kavramları somutlaştırması gibi faydalarını vurgulayarak dijital öykünün konu anlatımı aşamasında kullanılması gerektiğini belirtmişlerdir.

Sınıf öğretmenlerinin birçoğu matematik öğretim süreci için dijital öykülerin öğretim hedeflerini dikkate alarak hazırlanması ile dikkati çekmek, ön bilgilerini harekete geçirmek, öğrencinin süreçte aktif olmasını sağlamak veya öğrenmelerini pekiştirmek amacıyla oluşturulabileceğini ifade etmiş ve dersin genelinde kullanılabileceğini vurgulamışlardır.

Matematik Konuları

Sayılar ve İşlemler: Sınıf öğretmenleri dijital öykülerin matematik öğretiminde sayılar ve işlemler öğrenme alanında yer alan kazanımların öğretilmesinin etkili olabileceğinden bahsetmiştir**.** Örneğin, sınıf öğretmenleri ilkokul matematik öğretiminde ritmik saymalar konusunun öğrenciler için soyut kaldığından ve bu nedenle dijital öyküler ile konunun somutlaştırılabileceğinden söz etmiştir.

Geometri: Sınıf öğretmenleri geometrik cisimler ve şekiller alt öğrenme alanında yer alan konuların dijital öyküler ile öğretilebileceği konusunda görüş bildirmiştir. Sınıf öğretmenleri öğrencilerin kalıcı öğrenme gerçekleştirebilmeyi, cisimleri ve şekilleri zihinlerinde canlandırmayı kolaylaştıracağı ve şekil özelliklerinin daha kolay öğretilebileceği için matematik öğretiminde geometrik cisimler ve şekiller konusunda dijital öykülerin kullanılabileceğini belirtmiştir.

Ölçme: Sınıf öğretmenleri ise matematik öğretiminde zaman ölçme alt öğrenme alanında dijital öykü kullanılabileceğini belirtmişlerdir. Sınıf öğretmenleri matematik öğretiminde zaman ölçme alt öğrenme alanında özellikle takvim ve saatler konusunda dijital öykü kullanılmasının önemini vurgulamıştır.

Bütün Konular: Sınıf öğretmenleri kendilerine yöneltilen 'Size göre hangi matematik konuları dijital öyküler ile daha kolay öğretilebilir? Nedenleri ile açıklayınız.' sorusuna çoğunlukla ilkokul matematik öğretiminde yer alan tüm konuların dijital öyküler ile daha kolay öğretileceğini vurgulayarak yanıt vermiştir.

Sınıf Öğretmenlerinin Matematik Öğretiminde Dijital Öykü Kullanımına Yönelik İhtiyaçlarına İlişkin Bulgular

Sınıf öğretmenlerinin matematik öğretim sürecinde dijital öykü kullanımın yönelik ihtiyaçlarının öğrenci temelli ihtiyaçlar ve dijital öykü süreç temelli ihtiyaçlar başlıkları altında toplandığı görülmektedir.

Öğrenci Temelli İhtiyaçlar

Sınıf öğretmenlerinin matematik sürecinde dijital öykü kullanımında öğrencilere yönelik sıraladıkları ihtiyaçlar hazırbulunuşluk ve öğrenci etkileşimi ve bireysel farklılıkların dikkate alınması olarak ortaya çıkmaktadır. Sınıf öğretmenleri matematik öğretiminde dijital öykü kullanılırken ihtiyaç duyulacak durumlar için öğrencinin aile yaşantısının ve ön bilgilerinin önemini vurgulamışlardır.

Dijital Öykü Temelli İhtiyaçlar

Sınıf öğretmenleri matematik öğretim sürecinin dijital öyküler ile daha etkin bir şekilde yürütülebilmesi için, gerekli üç temel faktörün dijital öykülerin uygulanması için gerekli teknolojik donanım, materyal desteği ve öğretmen hazırbulunuşluğu olduğu görülmektedir. Örneğin, sınıf öğretmenleri matematik öğretim sürecinin dijital öyküler ile daha etkin bir şekilde yürütülebilmesi için teknolojik alt yapının iyi olmasına ihtiyaç duyulabileceğini belirtmişlerdir.

Matematik Öğretim Sürecinde Dijital Öykü Kullanımına Yönelik Önerilere İlişkin Bulgular

Sınıf öğretmenlerinin matematik öğretim sürecinde dijital öykünün hazırlanmasına ve kullanımına yönelik verdikleri öneriler sunduğu gözlenmiştir.

Dijital Öykü Hazırlama Sürecine Yönelik Öneriler

Sınıf öğretmenlerinin matematik öğretimi sırasında dijital öykülerin hazırlık sürecine yönelik önerileri ilgi çekici içerik, ihtiyaç ve isteklerin dikkate alınması ve dijital öykülerin çoğaltılması kategorileri altında gruplanmıştır. Sınıf öğretmenleri matematik öğretim sürecinde kullanılacak olan dijital öykülerin içeriğinin öğrencilerin seviyesine uygun, ilgilerini çekecek ögelerden oluşması gerektiği önerilerinde bulunmuştur.

Dijital Öykünün Uygulanmasına Yönelik Öneriler

Sınıf öğretmenlerinin matematik öğretim sürecinde dijital öyküleme yönteminin kullanılmasına yönelik önerileri materyallerle somutlaştırma ve aktif katılım başlıkları altında toplanmıştır. Sınıf öğretmenleri matematik öğretim sürecinde dijital öykülerin uygulamasına yönelik süreçte anlatılacak konunun materyallerle somutlaştırılması gerektiğini belirtmiştir.

Tartışma ve Sonuç

Çalışma kapsamında elde edilen veriler incelendiğinde öğretmenlerin dijital öyküleri matematik dersinin hangi aşamalarında ve konularında kullanabileceklerine yönelik görüş belirttikleri, matematik dersi sırasında dijital öyküleri uygularken öğrenci ve öykü temelli ihtiyaçlarının neler olduklarını

açıkladıkları ve matematik dersine yönelik dijital öykülerin hazırlanması ve ders içinde uygulanmasına yönelik önerilerini sundukları görülmektedir.

Sınıf öğretmenleri yeni konuya başlandığında dijital öykülerin kullanılmasının öğrencilere konuyu somutlaştırma fırsatı sunacağını, öğrencinin dikkatini derse toplayarak öğrenmenin kalıcı olmasına ve konu ile ilgili bir ön fikir edinmesine yardım sağlayacağını vurgulamıştır. Elde edilen bulgular Göçen Kabaran ve diğerlerinin (2019) sınıf öğretmeni ve sınıf öğretmeni adaylarının dijital öykülerin öğretim sürecinde konuları somutlaştırma imkanı vererek derse dikkat çekmek amacı ile kullanılabileceğini belirttikleri araştırması ile örtüşmektedir. Sınıf öğretmenleri matematik öğretiminde dijital öykülerin öğrencinin yaparak yaşayarak sürece dahil edilmesini, yapılan çalışmaları kendisinin deneyimlemesini ve bireysel çalışmalar yapmasını sağlayarak dersin gelişme bölümünde kullanılması gerektiğini de ifade etmektedir. Yine sınıf öğretmenleri matematik öğretiminde dijital öykülerin dersin bütün aşamalarında kullanılabileceğini vurgulamaktadır. Benzer bir şekilde Sadik (2008) araştırmasının sonucunda dijital öykünün öğretimde müfredattaki dersler için kullanılabileceğini belirtmektedir. Sınıf öğretmenlerinin hazırlanan dijital öyküdeki etkinliklerin ve olayların içeriğine göre güdüleme, dikkat çekme, ön bilgileri keşfetme ve derse motive etmek için giriş aşamasında; öğrencilerin öğrenmelerini pekiştirmek ve öğrencinin sürece dahil olması için gelişme aşamasında; konunun tekrar edilmesi ve öğrencilerin öğrenme eksikliklerini belirlemek için değerlendirme aşamasında kullanılabileceğini açıkladıkları görülmektedir.

Sınıf öğretmenleri sayılar ve işlemler öğrenme alanında yer alan ritmik saymalar, problemler, basamak kavramı, dört işlem ve kesirler konularının dijital öyküler ile etkin bir şekilde öğretilebileceğini ifade etmiştir. Ritmik saymalar, basamak kavramı, dört işlem ve kesirler konularının ilkokul seviyesindeki öğrenciler için soyut kaldığını, bu yüzden de dijital öyküler ile öğretilmesinin daha iyi olacağını belirtmişlerdir. Buna ek olarak sınıf öğretmenleri öğrencilerin okuma alışkanlıkları sınırlı olduğu ve okuduğunu anlamada zorlandıkları için problemler konusunu öğrenmede güçlük çektiklerini ve dijital öyküleme ile öğretimin öğrencilerin problem çözme becerilerine olumlu etkide bulunabileceğini belirttikleri görülmektedir. Benzer şekilde Dinçer ve Yılmaz' ın (2019) araştırmaları sonucunda dijital öykülerin öğrencilerin problem çözme becerisini geliştirdiği tespit edilmiştir. Sınıf öğretmenlerin konuyu görseller ile desteklemesi, öyküleştirmesi, somutlaştırması ve öğrencinin günlük yaşamından örnekler sunmasından dolayı problemler konusunda dijital öykülerin kullanılmasının önemini vurgulamıştır. Ayrıca sınıf öğretmenlerinin matematik öğretiminde geometrik cisimler ve şekil özelliklerinin öğrenciler için soyut kaldığını, dijital öykülerin ise soyut kalan cisimleri somutlaştırma imkanı sağlayacağını düşündükleri için geometri öğrenme alanında yer alan geometrik cisimler ve şekiller alt öğrenme alanında bulunan konuların dijital öyküler ile öğretilmesinin kalıcı öğrenme sağlayacağını belirtmektedir. Göçen Kabaran ve diğerleri (2019) araştırmalarında öğretmen ve öğretmen adaylarının dijital öykülerin somut öğrenme imkanı vererek kazanımların amacına ulaştığını belirttikleri görülmektedir. Genel olarak dijital öykülerin ses ve görseller ile desteklenerek birden fazla duyu organına hitap etmesi, çalışmaya katılan öğretmenlerin de vurguladığı gibi soyut konuların öğrencinin zihninde canlandırmasını kolaylaştırarak somut öğrenme fırsatları sunmakta ve programda yer alan tüm konuların öğretiminde etkin olarak kullanılabilmesine imkan sağlamaktadır.

Sınıf öğretmenleri dijital öykü ile yürütülen matematik öğretimi esnasında internet, projeksiyon, bilgisayar, akıllı tahta gibi teknolojik araç-gereçlerin hazır olması ve ders öncesinde kullanılacak dijital alt yapının kontrol edilmesinin gerekliliğini vurgulamaktadır. Benzer şekilde Kutlucan ve diğerleri

(2019) araştırmalarında ders ve değerler öğretiminde dijital öykülerin daha etkili olabilmesi için okulların teknolojik alt yapısının iyileştirilmesi gerektiğini ifade etmektedir. Çalışmaya katılan sınıf öğretmenleri matematik öğretimi sırasında öğretmenlerin teknolojik alan yetkinliğine sahip olması, hazırlanan dijital öykünün içeriğine ve etkinliklere hakim olması gerektiğini belirtmektedir. Demirer (2013) dijital öykülerin öğrenme sürecinde olumlu sonuçlar verebilmesi için öğretmenlere yeterli alan bilgi ve becerilerinin kazandırılması gerektiğinden bahsetmekte ve bu görüşün araştırmanın bulguları ile örtüştüğü görülmektedir. Heo (2009) araştırmasında öğretmen yetiştirme programlarında öğretmen adaylarına öğretim esnasında kullanacakları yöntemlere ilişkin tecrübe edinmelerini sağlamak konusunda eğitim fakültelerinin önemini vurgulamaktadır. Benzer şekilde Daniels (2013) çalışmasında öğretmen adaylarının eğitimsel açıdan kendi alanlarında öğretmen özelliklerinin dijital öyküler ile geliştirilebileceğini belirtmiş ve Kim ve diğerleri (2021) ise dijital öykülerin öğretmenlerin mesleki gelişimleri için motive edici bir eğitsel araç olarak tanımlamıştır. Bu bağlamda öğretmen adaylarının dijital öykü alan yeterliğinin geliştirilmesi için dijital öyküler ile öğretimin, öğretmen programlarında yer alan öğretim derslerine entegre edilmesi ve öğretmenlerin dijital öyküler ile öğretim konusunda alan yeterliğinin sağlanması için hizmet içi eğitim fırsatları sunulması önerilebilir. Bunun yanında farklı ders ve konular için oluşturulmuş dijital öyküler, bu öykülerle ilişkili ders planları ve materyaller hazırlanarak Eğitim Bilişim Ağı [EBA] üzerinden öğretmenlere sunulabilir.

Sınıf öğretmenleri matematik öğretim sürecinde dijital öykülerin etkililiğinin artırılması için öğrencinin hazırbulunuşluğunun dikkate alınması gerektiğinden ve öğrencilerin dijital öykü ile yürütülen matematik öğretim sürecinde aktif kılınmasının öneminden söz etmektedir. Benzer şekilde öyküler ile yürütülen matematik öğretim sürecinde öğrencilerin bireysel farklılıklarının dikkate alındığında ve dijital öyküler öğrencinin seviyesine uygun şekilde düzenlendiğinde daha etkili bir öğretimin gerçekleştirilebileceğini vurgulamaktadır. Yine sınıf öğretmenlerinin matematik öğretimi için dijital öykülerin öğrencilerin yaşadığı çevre, yaşam koşulları, okul ve sınıfının yapısı ve arkadaş çevresi dikkate alınarak kişisel dijital öykülerin hazırlanabileceğinden söz ettikleri görülmektedir. Bhatt (2012) günlük yaşamda yer alan dijital materyallerin öğretim ortamına transfer edilmesini incelediği araştırmasında yaşam ve dersin birbiri ile ilişkilendirilmesine olanak sağladığını vurgulamıştır. Karakoyun (2014) araştırmasında öğretmen adaylarının dijital öykülerin öğretimde kullanılabilmesi için kişisel öyküler oluşturulabileceğine dair öneride bulunduklarını tespit etmiştir. Yürük' ün (2015) araştırmasında öğretmenlerin oluşturdukları dijital öykü senaryolarında öğrencilerinin içinde yer almasının öğrencinin güdülenmesini sağladığı sonucuna ulaşılmıştır. Araştırmanın bulguları ve alanyazındaki araştırmacıların görüşleri doğrultusunda öğretimde kullanılmak üzere oluşturulacak dijital öykülerin içeriğinin öğrencilerin yaşadığı çevrenin kültürel ve dil özelliklerinin, çevresinde bulunan yapıların ve güncel olayların dikkate alınarak hazırlanması gerektiği düşünülmektedir.

Araştırmada sınıf öğretmenleri matematik öğretiminde dijital öykü hazırlama sürecine yönelik öyküde kullanılan karakterlerin gerçek kişilerden oluşmasını, öykünün içeriğinin öğrencilerin dikkatlerini çekecek çizgi film karakterlerinden oluşmasını, dijital öykülerin öğrencinin istek ve ihtiyaçları göz önünde bulundurularak hazırlanmasını önermektedir. Yürük (2015) araştırmasının sonucunda ilköğretim 5. sınıf öğrencileri için hazırlanan dijital öykülerin içeriğinin çizgi filme benzemesinden dolayı öğrencilerin dijital öykülere karşı olumlu görüş geliştirdiklerini belirtmiştir. Buradan yola çıkarak öğrencilerin gelişimsel özelliklerinin getirdiği ihtiyaçların, isteklerin ve ilgi alanlarının dikkate alınarak dijital öykülerin oluşturulması oldukça önemlidir.

Yılmaz ve diğerleri (2017) dijital öykü uygulamalarında birden fazla disiplinin bir arada kullanıldığını ve dijital öykülerin bireysel farklılıklara sahip öğrenciler için önemli olduğunu vurgulamıştır. Bunun yanında Matematik Dersi Öğretim Program'ında öğrencilerin bireysel ve kültürel farklılıklarının göz ardı edilmemesi ve öğrencilerin öğrenme farklılıklarını ortaya çıkaran uygun model ve yaklaşımların kullanılmasına dikkat edilmesi gerektiği vurgulanmaktadır (MEB, 2018). Sınıf öğretmenleri matematik öğretimine yönelik dijital öykü oluştururken dersin hangi aşamasında kullanılacak ise içeriğin ona göre düzenlenerek araç-gereç seçimine dikkat edilmesi gerektiğini ve öğrencilerin dil özellikleri, öğrenme düzeyleri, özel durumları gibi bireysel farklılıklarının dikkate alınarak dijital öykülerin oluşturulması gerektiğini önermektedir.

Araştırma sonucunda elde edilen veriler incelendiğinde sınıf öğretmenlerinin matematik öğretiminde dijital öykülerin uygulanması sırasında, öğrencinin soyut kavramları somut olarak algılayabilmesi için sürecin materyallerle desteklenmesi gerektiğini ifade etmektedir. Bunun yanında öğretmenler matematik öğretiminde dijital öykülerin uygulanması sürecinde öykünün içeriğine paralel olarak hazırlanan sınıf etkinliklerinin çoğaltılmasının etkili ve kalıcı öğrenmeye katkı sağlayacağını düşündükleri görülmektedir. Wang ve Zhan (2010) üniversite öğrencileri ile yaptıkları araştırmada dört farklı dersi dijital öykü ile işlemiş ve bunun sonucunda öğrencilerin konuyu daha iyi kavradıklarını, derse olan ilgi, istek ve güdülerinin arttığını vurgulamıştır. Dijital öykülerin izlenmesinin tek başına etkili öğretim için yeterli olmayacağı vurgulanmakta ve öğretmenin sınıf ortamını hazırlaması, dijital öykü sürecini etkinlikler ve materyaller ile desteklemesi ve söz konusu etkinliklerin günlük hayattan örnekler taşıması gerektiğini belirtilmektedir. (Yürük, 2015). Bu öneriler ve görüşler doğrultusunda öğretmenlerin dijital öykü oluşturmasına ve etkin kullanmasına, ders planı, etkinlik ve materyaller hazırlamasına yönelik hizmet içi eğitim sunulabilir.

Araştırmada sınıf öğretmenleri dijital öykü ile matematik öğretiminin daha kalıcı olabilmesi için öğrencinin de dijital öykü hazırlama sürecini deneyimlemesi önerisinde bulunmaktadır. Kutlucan ve diğerleri (2019) öğrencilerin sürece bire bir katıldıkları için öğrenmenin daha kalıcı olduğu sonucuna ulaşmıştır. Kotluk ve Kocakaya (2015) lise öğrencilerinin fizik öğretimine yönelik dijital öyküler hazırlamasının 21. yüzyıl becerilerinin gelişmesinde etkili olduğunu belirtmiştir. Benzer şekilde Küçükokka ve diğerlerinin (2022) çalışmalarında içinde bulunulan salgın hastalık sebebiyle teknolojinin öneminin arttığını vurgulayarak dijital becerilerin geliştirilmesi gerektiği hakkında öneride bulundukları görülmektedir. Matematik Dersi Öğretim Programı incelendiğinde dijital yetkinliğin öğrencilerin teknolojik araç gereçlerin güvenli ve sorgulayarak kullanılmasını, bilgiye ulaşmayı sağlamasını ve internet ile sanal ortama katılarak iletişim becerilerinin gelişmesine katkı sağlamasını kapsadığı görülmektedir (MEB, 2018). Bu bilgiler doğrultusunda, öğrencilerin dijital öykü oluşturma sürecine dahil edilmesi, kalıcı öğrenme sağlanması, temel becerilerin geliştirilmesi, dijital ortamlarda bilginin hazırlanması, sunulması ve paylaşılması açısından fayda sağlayacaktır.

Öneriler

Matematik öğretim sürecinde dijital öykünün kullanılmasına ilişkin ortaya çıkan bulgular ve sonuçlar dikkate alınarak dijital öykünün uygulama sürecine ve gelecek çalışmalar için araştırmacılara yönelik öneriler olmak üzere iki bölümde incelenmiştir.

Dijital Öykünün Uygulama Sürecine Yönelik Öneriler

- Araştırmada öğretmenler matematik öğretim sürecinde dijital öykülerin içeriğinde öğrencilerin günlük yaşantısından örnekler olmamasından dolayı öğrencilerin öğrenmelerini yaşamlarına aktaramadıklarını belirttikleri görülmektedir. Bu nedenle dijital öyküler oluşturulurken öğrencinin yaşamından kesitler içermesi önerilmektedir.
- Araştırmada öğretmenlerin dijital öykülerin her konu için hazırlanması gerektiğini, diğer derslere de entegre edilebileceğini ve öğretmenlere kaynak olması adına yaygınlaştırılması gerektiğini önerdikleri görülmektedir. Bu doğrultuda çoğu ders, konu ve öğrenci seviyesi için hazırlanmış dijital öykülerin, ders planlarının ve materyallerin Eğitim Bilişim Ağı [EBA] gibi çevrim içi bir platformda paylaşılması ve yaygınlaştırılması önerilebilir.

Gelecek Çalışmalar İçin Araştırmacılara Yönelik Öneriler

- Gelecek çalışmalar için ilkokul 1, 2, 3 ve 4. sınıf öğrencileri ile öğretmenlerin matematik öğretiminde dijital öykü oluşturma sürecine yönelik beceri ve görüşlerinin incelenmesi önerilebilir.
- Gelecek çalışmalarda dijital öykü temel alınarak planlanan ve uygulanan matematik derslerinin ilkokul 1, 2, 3 ve 4. sınıf öğrencilerinin özellikle problemler, basamak kavramı, geometrik cisimler ve kesirler konularına ilişkin akademik başarıları üzerindeki etkisinin incelenmesi önerilebilir.