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EVALUATION OF THE GIFTED STUDENTS' DIGITAL STORY DESIGNS ON THE HISTORY OF GEOMETRY AND THEIR OPINIONS REGARDING THE PROCESS

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Abstract

Throughout history, storytelling has been used to share life experiences, values, cultural heritage, knowledge and wisdom. The history of mathematics may be used in mathematics lessons for many purposes such as giving students a distinct point of view, providing motivation and approaching the solutions of problems from a universal perspective. In this study, gifted students prepared digital stories about the scientists who left their mark in the history of geometry. Qualitative research methods were utilized in the study and a case study approach was used. The study group of the research is studying at the Science and Art Center in the province of Niğde. The study was conducted with 12 gifted students, six of whom were girls and six of whom were boys, studying in the special talent development program at the Science and Art Center. The study group was formed by purposive sampling method. Students' views on the digital storytelling processes were obtained through an opinion form and semi-structured interviews. Content analysis was used to analyze the data and the findings were presented. When the study was completed, the students stated that they enjoyed the digital storytelling study, that they initially thought the digital storytelling application was challenging, but at the end of the activity they found it quite comfortable and easy, and that they learnt new knowledge about the lives of the scientists in the history of geometry with the digital stories they prepared.

Key words: Gifted students, History of geometry, Digital story.

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1. Introduction

In the history of civilization, traditional storytelling has been seen as a powerful tool in transferring the beliefs, knowledge, traditions, values, cultures and histories of the communities to which individuals belong to each other and to future generations (Wang & Zhan, 2010). Storytelling has been used as a teaching tool and learning strategy at every stage of education and training since the beginning of education in community life. However, with the effect of the age of technology, there have been changes in how stories are created, the environments of use, the platforms where they are spread, and how individuals access stories. Van Gils (2005) stated that storytelling has transformed into various forms with the increase in various software and hardware and the widespread use of information technologies. In this way, storytelling has turned into a form enriched with audio and visual elements, including multimedia, rather than being just anoral narration (Wang & Zhan, 2010). Storytelling has changed in the process and has been named digital storytelling.

Digital storytelling method; photo editing software, digital camera, web 2.0 tools and authoring tools have become a new pedagogical endeavor with the spread and emergence of information technologies (Meadows, 2003). Technological developments that have shaped the development of 21st-century skills such as effective cooperation and communication, creativity, innovation, problem-solving, critical thinking, communication literacy, and information technology literacy have affected the education system and caused changes in the understanding of teaching (Saltık-Ayhanöz, 2021). In addition to these skills, digital stories offer the opportunity to develop cognitive skills by allowing both students and teachers to apply verbal and visual processes and (Baki, 2015). It is seen that digital storytelling yields meaningful results when it is applied collaboratively or in pairs. As a result of the collaborative applications, it is thought that students'attitudes towards writing and their self-efficacy skills will improve positively when writing activities are completed.

1.1 Definition of Digital Story

In the literature, there are many definitions of digital storytelling. Digital stories are few-minute works which are used to convey information on some subjects such as historical events and personal stories by combining various elements such as music, voice-overs, graphics, texts, and videos, and to teach these subjects (Robin, 2006). On the other hand, Ohler (2013) defines digital storytelling as the individual use of digital technology by combining several media with an appropriate story, while Chung (2006) defines digital storytelling as the presentation of digital items such as text, images, audio and video with multimedia via computer.

When the literature review was conducted, it was seen that various stages were used in the digital story creation process. Barret (2009) listed the digital storytelling process as creating the script, editing audios and recordings, scanning and editing the visuals, combining the audios and images, adding transitions and effects, and publishing the digital story. Jakes and Brennan (2005) organized the digital story creation process as the steps of writing a story, developing the script, preparing the storyboard, determining the multimedia tools, creating and

sharing of the digital story. Moreover, Lasica (2010) listed the steps of this process as deciding on the story, compiling the materials, creating the script, preparing the tools, creating the storyboard, digitizing the tools, audio recording, adding music, editing and sharing of the story.

Digital storytelling is significant in that it enables students to use technology as designers as active participants in the necessary process. (Bedir Erişti 2016). The creation of digital stories encourages students to become producers of media and interdisciplinary information rather than consumers of information. Because in story design, the student combines technology, performance and personal experiences (Loveless et al., 2017). Thus, it allows students to organize educational messages and participate in intercultural activities (Kozdras, Joseph & Kozdralar, 2015). By increasing students' interest, attention and motivation, it allows teachers to manage the classroom, concretize abstract concepts, and provide in-depth and long-term learning opportunities in the process of teaching activities (Bakar 2019; Demirbaş & Şahin 2020; Sarıtepeci, 2021). Digital storytelling also ensures the active participation of students in the learning process (Robin, 2006). Sharing digital stories, which are multidimensional learning-teaching tools, in the classroom environment can help students to develop new ideas (Al-Shaye, 2021). In addition, students' perspectives on subjects may change. It provides a better understanding of the subject. Studies have shown that students understand narrative texts better than informative texts (Niemi et al., 2014; Temizkan, 2011).

1.2 Use of Digital Story in Education

In digital storytelling, firstly the topics to be told are determined; the students choose a topic and do research on the chosen topic. Important points, appropriate images and music on the chosen topic are determined. Finally, students create their own digital stories (Bakar, 2019). This process encourages students to activate their imaginations. After the students have prepared their stories, they are allowed to watch their stories again and express their own thoughts about visualization and description and see their mistakes (Xu, Park & Baek, 2011).

Robin (2006) emphasized that teachers might benefit from digital stories to increase students' interest in the lesson and to develop new ideas. Digital stories can be used in accordance with the curriculum thanks to the integration of technology with teaching. The flexibility offered by digital stories and the use of various learning methods support students' acquisition of knowledge and skills compatible with the age of technology (Hett, 2012; Anderson & Wales, 2012). In educational environments, digital stories facilitate teaching, focus on the learning process and ensure that learning is individualized (Ceylan & Birinci, 2013). Additionally, studies in literature which conducted in various learning environments, where digital stories are used, prove that digital storytelling improves students' writing skills, increases self confidence and academic achievement, and enriches learning experiences (Çıralı, 2014; Yamaç, 2015). These results reveal the importance of including digital storytelling in education.

Through storytelling, students are enabled to have control over their own learning and increase their self-confidence; enhanced self-esteem and confidence are transmitted to other students (Miller, 2009; Robin & Mcneil 2019). Digital storytelling is a dynamic and powerful student-

centered pedagocical strategy (Kearney, 2009; Smeda, Dakich & Sharda, 2014).In terms of being student-centered, digital storytelling helps students to collaborate, develop critical thinkingskills and focus on important ideas (Kim, Coenraad & Park, 2021; Van Gils, 2005).

Digital storytelling is also an effective teaching tool for teachers. It does not require much preparation and has a high teaching capacity (Gürsoy, 2021). The inclusion of digital storytelling method in teaching provides diversity in the classroom environment, personalizes learning experiences, and encourages students to actively participate in the learning process. Students who write their own stories provide more permanent learning as they will take part in high level cognitive activities such as synthesis-evaluation (Turgut & Kışla, 2015; Niemi & Multisilta, 2016).

1.3 Definition of Gifted Student

Gifted students need special education due to their individual differences. Gifted students should be given the opportunity to transform their current potential into performance through appropriate educational activities and learning environments. These opportunities can only be provided by differentiating the education and training process depending on the learning characteristics of the gifted students. Gifted individuals are superior to 98% of randomly selected individuals of their peers (Ataman, 2004). Renzulli (1977) stated that giftedness emerges with the interaction of three basic clusters of human traits. The aforementioned clusters are;

i. Dedication to task commitment, high levels of motivation,

ii. Demonstrate a high level of creativity,

iii. Above-average general abilities.

MoNE (2007) defines gifted individuals as individuals who display higher performance than their peers in aspects such as intelligence, leadership, and art, and who are identified by experts. In the characteristics that require instant thinking, gifted students may also be defined as individuals who have much better high-level thinking skills, display higher performance, and have productive power than their peers.

Davaslıgil (1990) stated that as the segment of society that is considered to be superior has a great responsibility in yielding positive results regarding the development efforts of humanity requirement of providing adequate education of gifted individuals who have favourable effects. Furthermore, the reason for giving importance to the education of gifted individuals is that they are considered to produce different solutions to problems encountered in the future with their reasoning skills.

1.4 Gifted Students and Use of Digital Storytelling

Gifted students have higher cognitive capacity than their peers and need comprehensive education. Since this education cannot be provided with normal programs, it should be supported with different education programs apart from the curriculum (Clark, 2002; Levent & Bakioğlu, 2013). The education of these students requires specially trained personnel,

specially prepared programs, and educational environments with special tools and equipment. Providing such an educational environment enables gifted individuals to develop and reveal their innate extraordinary potential (Van Tassel-Baska & Brown 2007).

Digital story design in technology is actually a talent in itself. Although story design may seem like a simple task, it is quite difficult to convey the information to be shared in a way that can improve communication and critical thinking skills (Tong et al., 2018). Because digital storytelling requires original thinking, imagination and the use of intuition and reasoning in different ways (Moradi & Chen, 2019). Students studying in Science and Art Centers receive education in accordance with the Three-Stage Purdue Model, which is an enrichment model used in the education of gifted students. Accordingly, it is aimed to provide students with 21st century skills, including technology literacy, by using web 2.0 tools. For this reason, it is thought that gifted students can use their talents and skills actively and efficiently in the digital storytelling process.

Enriched, differentiated, and accelerated education is provided to gifted students. The enrichment and diversification of the activities in this education also shows that the program offered is different from standard programs. Differentiation of education for gifted students is to meet the needs of students with different learning needs at the same age by designing different learning activities (Kulik & Kulik, 1997). Various arrangements are carried out in the process, content, environment, and product in order for students to succeed in line with their differentiated characteristics (Tomlinson, 2013). The education offered to gifted students should differ in terms of enrichment, acceleration (Coşar et al., 2015), scope, complexity, and depth (Scott, 2014). Moreover, enrichment is the differentiation of activities in accordance with the student by establishing interdisciplinary relationships in the lessons instead of creating additional learning experiences (Norton, 1959; Şahin, 2018). Gifted students have a high level of creativity in their learning processes and have developed problem-solving skills. In addition, they have positive perceptions about the use of technology. In this sense, integrating technology into education helps to enrich the educational environment by offering different options, higher student productivity (Knobel & Shaughnessy, 2002) and helps students progress at their own pace and level (Alkan, 2019).

First of all, educators' understanding of the value of technology in teaching increases meaningful learning experiences in schools (Ostashewski & Reid 2013). Because technology-enriched learning tools significantly facilitate students' meaningful learning (Niemi et al., 2019). In this sense, digital storytelling can be a useful educational tool to combine digital media with the required subject in terms of high-level learning of gifted students (Smeda, Dakich & Sharda 2010). The design of activities that prioritize development is important for the development of in-depth reasoning, higher-order thinking skills and creativity of gifted students. Defined as an effective teaching method, digital storytelling is an influential teaching method that combines the problem-solving skills of individuals with their creativity, supports higher order thinking skills and project production (Keiler, 2010). Also, digital storytelling is a useful learning method for students to improve their technical skills. In addition, the purpose of digital storytelling is to focus on and improve students' information literacy (Smeda et al., 2014). Digital storytelling has different features such as increasing motivation, enriching teaching, increasing creativity, problem-solving skills, communication and social skills

(Coutinho, 2010). These are thought to attract the attention of gifted students according to their characteristics (Alkan 2019; Çoban, et al. 2019).

Renzulli (1988) suggests that activities for gifted children should focus on higher-order thinking. In this respect, it is important to utilise different teaching methods that can improve meta-cognitive abilities (Knobel & Shaughnessy 2002). Digital storytelling is a skill that enables the use and regulation of high-level mental skills (Sadık, 2008; Yamaç, 2015). In this context, it is thought that the digital stories identified in the relevant literature will have a positive effect on the education of gifted students.

Although there is a growing interest in digital storytelling as a teaching tool, studies show that there is still a lack of research on the use of digital storytelling in gifted education. The information presented in this study is likely to lead to future research on the use of digital storytelling in gifted education to create richer and more creative environments.

1.5 Studies on Digital Storytelling

When literature was examined, it was seen that there were not enough studies on digital storytelling with gifted student, and there is a need for studies in the field of mathematics education in which digital stories are included in our country. When the literature on digital storytelling is reviewed, it is seen that the studies conducted in pre-school education in mathematics teaching (Casey, 2004; Casey et al., 2008; Casey et al., 2004), studies conducted with primary schools, secondary schools, and high schools (Albano & Pierri, 2014; İncikabı, 2015; Küçükoğlu & İncikabı, 2020a; Küçükoğlu & İncikabı, 2020b), and studies conducted with teachers and pre-service teachers (Gordon, 2011; İncikabı & Kildan, 2013; İnan, 2015; Kildan & İncikabı, 2015; Sancar, Tokmak & İncikabı, 2013; Istenic Starčič et al., 2016). In these studies, the digital stories prepared by the participants, the opinions of the participants and the effects of digital storytelling on 21st-century skills were examined. Moreover, when the studies on digital storytelling in the field of mathematics are examined, it is seen that Özpınar (2017) examined the views of pre-service teacherson the process and use of digital storytelling; Küçükoğlu and Incikabı (2020 a, 2020 b) examined the digital stories prepared by secondary school students and the preparation process; Saltık Ayhanöz (2021) the use of digital stories in mathematics education; Dinçer and Yılmaz (2019) the effect of digital storytelling in teaching the concept of range in mathematics; and Aldemir Engin (2022) the digital stories prepared by pre-service teachers. When the digital storytelling studies carried out for the gifted students are examined, it is seen that Demir and Kılıçkıran (2018) studied the effects of digital stories prepared by gifted students on their literacy skills, and Alkan (2019) examined the views of gifted students on the digital storytelling process on cyber-bullying.

1.6 Research Problem –Research Goal- Purpose of the Study

In this study, based on the necessity of planning and providing differentiated and enriched educational environments to gifted students, gifted individuals were included in the digital storytelling process that supports 21st-century skills. With the engagement of gifted students, a digital storytelling study was conducted on the lives of scientists who had contributed to the history of geometry. Based on the obtained findings, the aim of this research is to analyze the

digital storytelling process on the history of geometry which is carried out with gifted students and the digital stories created and to determine the reflections of the digital story design process on the students' thoughts.

The research question sought to be answered in line with this purpose is as follows;

1) In the process of digital storytelling the history of geometry, what features do the digital stories prepared by gifted students have?
2) What are the reflections on the thoughts of the gifted students regarding the process of digital storytelling about the history of geometry?

2. Methodology

The study is a case study from qualitative research methods. According to Creswell (2007), in a case study, the researcher explores a case or multiple bounded systems over time by interpretation of multiple data. Qualitative research is a method that approaches the problem situation in an interrogative and interpretive way and tries to understand the problem in its natural environment (Guba & Lincoln, 1994; Klenke, 2016) and provides more descriptive and detailed information by using methods such as observation, interview and document analysis by examining the problem in depth. Case study, one of the qualitative research methods, "how?" and "why?" It can be expressed as a method that offers an in-depth opportunity to a phenomenon or event that the researcher cannot control on the basis of questions. The case study method was chosen because the purpose of this research is to examine the digital storytelling process on the history of geometry conducted with gifted students and the digital stories created, and to examine the reflections of the digital story design process on the students' thoughts.

2.1 Study Group

The population of the study consists of gifted students. The study was conducted with 12 gifted students, 6 of whom are girls and 6 of whom are boys, who were studying in the special talent development program at the Science and Art Center in Niğde. The students who participated in the study were individuals who volunteered to take part in the study and could express themselves well. The students participating in the study differ in terms of their demographic characteristics. It is considered that this difference will be effective in ensuring that useful results are obtained in the research.

2.2 Data Collection Tools

In this study, the "Digital Storytelling Rubric" was used to determine the quality of the products created by the students in the digital storytelling process. Digital Storytelling Rubric in the Educational Context, developed by Sarıca and Usluel (2016), consists of three sections and 30 criteria. These sections are defined as "story", "storyboard" and "digital story". The criteria for each section is as follows: 8 criteria for "Story" section (purpose, clarity, language and grammar usage, originality, emotion, sincerity, economy, fluency), 4 criteria for

"Storyboard" section (organization, content, integrity, fluency), and 18 criteria for "Digital Story" section (purpose, language and grammar usage, clarity, duration, originality, emotion, economy, image/video relevancy, image/video effectiveness, voice relevancy, voice pacing, voice quality, music relevancy, music pacing, music-voice volume relevancy, integrity, fluency, copyright).

The validity of this rubric was conducted by the experts in terms of content, structure, and criterion dimensions. For the reliability of the rubric, the interrater weighted kappa coefficient for each criterion was calculated. It is stated that at least .60 value should be sought for reliability (Şencan, 2005: 485). Accordingly, when the Kappa Coefficient was analyzed for the reliability of the rubric, the results showed that the interrater agreement were good and very good in all criteria (Sarıca & Usluel, 2016).

An open-ended semi structured interview form was prepared by the researchers to be applied to the students after the study. The prepared form was consulted by three academicians who are field experts and final version of the questions was finalized with some corrections in the structure of the interview questions and the theme selection, in line with the feedbacks of the experts. As the study was carried out during the pandemic, interviews were conducted with distance education tools. While conducting interviews with students, the necessary consents for the use of a voice recorder during the interviews were obtained, and the interviews lasted approximately 15-20 minutes.

2.3 Data Collection Process

The implementation process is presented in Table 1 in the form of week, subject and practices:

Table 1. Implementation process

Weeks	**Subjects**	**Practices**
1	General information	• General information on the history of science was given.
2-3	Steps to be followed in the creation of digital stories	• Selection of the topic, • Creation and structuring of the script of the story, • Selection of the audio-visual materials to be used in the digital storytelling, • Required information on creating digital stories with one of the digital storytelling tools was given.
4-5	Programs that can be used for digital stories	• Sample digital stories in the field of mathematics were shown. • The programs to be used in the digital storytelling process were introduced to the students. • The choice of the program to be used was made together

		with the students. • It was jointly decided to use the Book Creator computer program.
6	Scientists who have contributed to the history of geometry	• Students were asked to choose one of the scientists who have contributed to the history of geometry to create the theme of the digital story. • They were also told to conduct detailed research and take notes on the characteristics of the period in which the chosen scientist lived and their contributions to geometry and other fields.
7-8	Creating a draft text and giving feedback	• Students were asked to prepare and submit a draft text for the stories about the chosen scientist.
9- 10	Creation of the storyboard and giving feedback	• Story scripts were told to be divided into sections. • Storyboards were presented and necessary improvements were made.
11	Presentation of the Digital Story	• The storyboards were transferred to the digital environment and presented.

Figure 1 displays some screenshots of the digital stories prepared by the gifted students at the end of the 11-week implementation process.

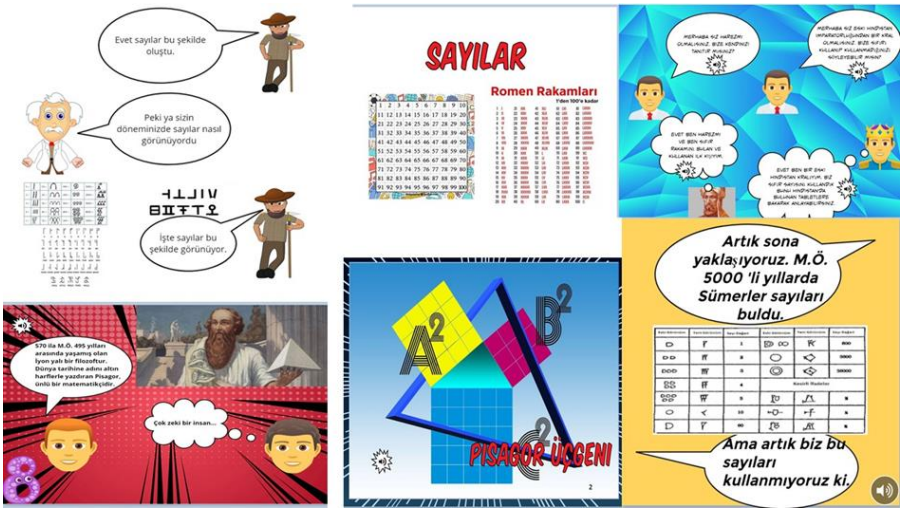

Figure 1. Some screenshots of the digital stories prepared by the students

2.4 Data Analysis

In the current study, Digital Storytelling Rubric in the Educational Context, developed by Sarıca and Usluel (2016), was used to determine the quality of the digital stories created by the students. Digital stories were evaluated by two independent raters on a scale of 1 to 3 in the context of the rubric used. Content analysis was used to analyze the data obtained from the interview form. With the help of content analysis method, data obtained from the interview form were categorized and organized. The students participating in the study were entitled as S1, S2 ... S12. The data was coded by the researchers who conducted the study. The consistency of the comparisons by the researchers was checked. In the comparisons, numbers of agreements and disagreements were determined, and the reliability of the research was measured using Miles and Huberman's (1994) Reliability=agreement/(agreement+disagreement) formula. Authors expect the intercoder agreement to be at least 80%. In this study, the agreement (reliability) of codes 82% was achieved.

3. Findings

In this section, the findings related to the research questions asked in line with purpose of the study were organized under sub-titles. Firstly, students were asked to choose any of the scientists who contributed to the history of geometry with their free will, and to prepare a digital story by doing research on it. Information about the scientists on whom the students conducted research and prepared digital stories is presented in Table 2.

Table 2.

Information about the scientists researched

Student	Scientist	Gender of Students
S1	Atatürk	Girl
S2	Euclid	Girl
S3	Pythagoras	Boy
S4	Plato	Girl
S5	Archimedes	Boy
S6	Descartes	Boy
S7	Thales	Girl
S8	Johannes Kepler	Girl
S9	Eudemus	Girl
S10	Aristeaus	Boy
S11	Hipparchus	Boy
S12	Apollonius Pergaeus	Boy

3.1 *Evaluation of Digital Stories of the Students based on the Digital Storytelling Rubric*

In this part of the study, the qualities of the digital stories created by the students were examined in line with the expert opinions. Table 3 displays the scores given by the experts for the digital stories. The scores given in Table 3 are the average of the scores given by the two raters who performed the scoring.

Table 3.

Evaluation of Digital Stories of the Students based on the Digital Storytelling Rubric

Theme	**S1**	**S2**	**S3**	**S4**	**S5**	**S6**	**S7**	**S8**	**S9**	**S10**	**S11**	**S12**
Purpose	2	2	2,5	2	2	3	2	3	2	1,5	2	3
Clarity	2	1	3	2,5	2	3	3	1	2	3	2	3
Length	2	3	3	3	3	2	3	3	2	2	2	3
Language	2	2	2	2	2	3	2	2	1	2	2	3
Originality	2	1,5	3	2	3	3	2	3	2,5	3	3	3
Plainness	1,5	3	2,5	3	2	3	2	1,5	2	2	2	3
Affect	3	3	2,5	3	2	1,5	3	3	2	3	1	3
Effective visuals	2	1,5	3	1	2	3	1	2	3	2	2,5	2
Proper visuals	2	1	2	2,5	2	3	2	1,5	1	2	2	3
Proper audio	2	1,5	3	3	2	2	2	3	2,5	2	2	2
Audio quality	3	3	2,5	3	2	3	2	3	2	1	2	3
Audio speed	2	2,5	2	3	1	2	2	1	2	2	1,5	2
Proper music	2	3	3	2,5	3	2	2	3	1,5	2	2	3
Fluency	1	2	2	1,5	2	3	2	2	1,5	2	3	2
Music level	2,5	2	3	3	2	2	2	2	2	2	2	2
Integrity	2	2	2	2,5	2	3	2	2	2	2	2	3
Copyright	1,5	2	1	2	2	3	1,5	2	2	1	2	1
Music speed	2	3	2	1,5	2	2	2	1	2,5	2	2	3
Total	36,5	40,5	43,5	43	38	46,5	37,5	39	35,5	36,5	37	47

When Table 3 is analyzed S1 scored 36,5 points; S2 40,5 points; S3 43,5 points; S4 43 points; S5 38 points; S6 46,5 points; S7 37,5 points; S8 39 points; S9 35,5 points, S10 36,5 points; S11 37 points and S12 47 points from the Digital Storytelling Rubric. In Table 3, it is seen that S12 received the highest score and the students generally completed the stages of their digital stories with full or medium scores.

Digital stories prepared by gifted students were evaluated according to 18 criteria in line with the rubric. In the purpose criterion, it is expected that the digital story is prepared for a

purpose, that this focus is maintained during the reading of the digital story, and that it is fully understood why it was created after reading it. In the language criterion, the use of language and grammar is expected to be accurate, clear and unambiguous. In the length criterion, it is sought that the digital story should be 3-5 minutes long in terms of duration and make the reader feel that it is the right time. In the clarity criterion, it is sought that the words in the story are well chosen, that there is no word with an unknown meaning, and that what is meant to be told is easily understood by the reader. In the originality criterion, the idea of the digital story is required to be original-creative and to be equipped with the original content used. In the affect criterion, it is sought that the digital story has the desired effect on the reader in line with the determined purpose. In the copyright criterion, it is expected that the content used in the digital story is original or that the permissions for the content used from elsewhere are obtained and referenced correctly. In the fluency criterion, it is sought that the digital story is in harmony and harmony with the content used, and that the contents progress in the right order, in an impressive and immersive manner. In the integrity criterion, it is required that all contents be in harmony with each other, consistent and that all contents complement each other. In the audio quality criterion, the sound of the digital story is sought to be at the appropriate volume, tone, consistent with the flow of the story and visuals, at an appropriate speed and easy to understand. In the audio speed criterion, the sound speed is expected to be compatible with the story flow. The proper audio criterion requires the quality of the sound to be clear, unambiguous and consistent with the flow of the story. In the music level criterion, it is expected that the music does not overshadow the speaker's loudness, the background music is at a level that can be heard even though the speaker's loudness is more dominant, and the music and loudness of the digital story does not disturb the audience. In the criterion of proper music, the music should be compatible with the visuals, be consistent, add meaning and be easy to understand by the audience; in the music speed criterion, it is sought that the speed of the music is compatible with the flow of the story. In the proper visuals criterion, the visuals are expected to reflect and support the story, to be compatible with the flow of the story, to match, and to create a different atmosphere. In the criterion of effective visuals, the visuals must be of high quality, interesting and original; it is sought to leave an emotional impact on the audience and create a different atmosphere in the story. By the measure of plainness, the story is expected to have the right amount of detail and the story to be of ideal length.

3.2 Reflections of the Students on the Digital Storytelling Process of Geometry History

In line with the purpose of the study, an interview form was prepared to determine the reflections of gifted students regarding the digital storytelling process about the history of geometry. The findings obtained from the answers given to the questions in the interview form are presented below under subtitles.

A. Findings Related to Student Opinions on Digital Storytelling Tool

Regarding to the purpose of the study, gifted students were asked about their opinions on the digital storytelling tool they used in the research process. The codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject are presented in Table 4.

Table 4. Codes Related to the Digital Storytelling Tool

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Enjoyable	**X**		**X**	**X**	**X**		**X**		**X**	**X**	**X**	**X**
Useful/Beneficial	**X**	**X**	**X**	**X**		**X**		**X**	**X**			**X**
Instructive	**X**		**X**	**X**	**X**		**X**	**X**	**X**	**X**	**X**	**X**
Remarkable		**X**		**X**	**X**	**X**		**X**		**X**	**X**	
Internalizing knowledge			**X**				**X**		**X**			

Table 4 demonstrates that 9 students found the digital storytelling process enjoyable; 8 useful/beneficial; 10 instructive; and 7 remarkable. Three students considered that they had internalized knowledge. When the table is scrutinized, it is seen that the students expressed several opinions about the digital stories. Some of the students' opinions are presented below with direct quotations:

> "*This digital storytelling tool was very enjoyable and useful for me. I have learned the history of mathematics in a permanent way by using this tool*." (S2)

> "*This application attracted my attention very much. I have understood the subject very well*." (S7)

B. Findings Related to the Student Opinions on the Aspects Considered in the Digital Storytelling Process

The gifted were asked about their opinions on the aspects they considered in the digital storytelling process. The codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject are presented in Table 5.

Table 5. Codes regarding the Aspects Considered in the Digital Storytelling Process

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Using Attractive Elements			**X**	**X**			**X**		**X**		**X**	
Using Audio		**X**		**X**		**X**		**X**	**X**			**X**
Inclusion of Instructive Information	**X**		**X**		**X**		**X**	**X**		**X**		**X**
Getting the Teacher's Opinion	**X**	**X**		**X**	**X**	**X**		**X**		**X**	**X**	**X**
Entertaining			**X**		**X**		**X**		**X**			
Being Instructive	**X**	**X**		**X**		**X**	**X**		**X**	**X**	**X**	

The aspect considered most by the gifted students in the digital storytelling process is getting the teacher's opinion, while the aspect considered the least is it is being enjoyable. Nine students declared to have considered getting the teacher's opinion, and right after, 8 students said to have considered the process enjoyable. Table 5 demonstrates that students expressed several opinions. Some of the students' opinions are presented below with direct quotations:

"*In order for the digital story that we created to achieve its purpose, we should pay attention to some issues. We should include attractive elements in the digital story. The story should be entertaining and instructive*" (S11)

"*I think it would be useful to use audio in the digital stories. At the end of the process, we should have it checked by consulting a proficient person, such as a teacher*." (S4)

C. Findings Related to the Student Opinions on the Problems Encountered in the Digital Storytelling Process

The gifted were asked about their opinions on the problems they encountered in the digital storytelling process. The codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject are presented in Table 6.

Table 6. Codes Related to the Problems Encountered in the Digital Storytelling Process

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Audio recording		**X**	**X**	**X**		**X**	**X**		**X**			
Creation of the story	**X**		**X**			**X**		**X**	**X**	**X**	**X**	**X**
Selection of the appropriate image	**X**			**X**		**X**		**X**	**X**	**X**		
Organizing of the obtained information		**X**	**X**		**X**	**X**	**X**		**X**		**X**	

Regarding the problems encountered in the digital storytelling process, 4 codes were determined according to the students' answers. Table 6 demonstrates that students encountered problems mostly in the story creation process and rarely in audio recording and selection of the appropriate image. Table 6 shows that students expressed several opinions on codes. Some of the students' answers are presented below with direct quotations:

"*I had some difficulty in writing the story. In the beginning, I could not imagine how to create a story. Also, I could not record audio. Later on, I realized that the problem was with my computer*." (S5)

"*I could not organize the information at first. I also had a problem in choosing the images as I considered the copyrights*." (S9)

D. Findings Related to the Student Opinions on the Solutions to the Problems Encountered in the Digital Storytelling Process

The question of how gifted students solve the problems they encountered in the digital storytelling process was asked. Table 7 displays the codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject.

Table 7. Codes Related to the Solutions to the Problems Students Encountered in the Digital Storytelling Process

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Consulting my friends		**X**		**X**		**X**	**X**		**X**		**X**	
Consulting my teacher			**X**	**X**								**X**
Researching	**X**									**X**		
Examining the sample studies		**X**			**X**	**X**						
Through trial and error	**X**		**X**		**X**		**X**	**X**	**X**	**X**	**X**	

Table 7 demonstrates that students mostly solved problems they encountered by trial and error. They stated they found the solution by consulting their friends after that. Moreover, they tried to solve the problems by consulting their teacher and researching and examining the sample studies. However, only 3 students resorted to one of these. Table 7 presents that a student resorted to several ways of solutions. Direct quotations from some of the students' opinions are as follows:

"*I tried to solve the problems I encountered by asking my friends and our teacher*." (S1)

"*I watched videos on how the application that we conduct is used. I also examined the sample studies on the site*." (S6)

E. Findings Related to the Student Opinions on the Use of Digital Storytelling in Different Lessons

Gifted students were asked the question "Should the digital storytelling practice be included in the other courses?" Table 8 presents the codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject.

Table 8. Codes Related to the Use of Digital Storytelling in Other Lessons

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Should be included	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**

Table 8 demonstrates that all of the students think that the use of digital storytelling should be included in other lessons. Direct quotations from some of the students' opinions in this regard are as follows:

"It should definitelybe included. It was very good." (S2)

"*I believe that it should be given a place*." (S7)

F. Findings Related to the Student Opinions on the Digital Storytelling Process

Gifted students were asked the question "How did you find the digital storytelling process? Can you list the aspects you like and dislike?" Table 9 shows the codes obtained as a result of the data analysis on the participants' opinions regarding the relevant subject.

Table 9. Codes Related the Favorite Features of the Digital Storytelling Process

Opinions on the Subject	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
Adding audio	**X**		**X**		**X**			**X**		**X**		**X**
Learning new information		**X**		**X**		**X**	**X**					
Creating script and e-books	**X**		**X**		**X**			**X**		**X**	**X**	**X**
Researching		**X**			**X**	**X**	**X**		**X**		**X**	
Adding images	**X**		**X**	**X**	**X**		**X**	**X**	**X**	**X**		**X**

Table 9 displays that in the digital storytelling process, the students liked adding images the most and then creating e-books. Moreover, it is seen that the students also liked to make research, add audio and learn new information. Direct quotations from some of the students'opinions in this regard are as follows:

"*At the end of the work, creating a helpful e-book was very enjoyable for me. I have learned brand new information*." (S6)

"*It was very fun to add audio and images to the digital stories*." (S12)

All of the students stated that the digital storytelling process did not have any aspect that the students did not like.

4. Discussion

In this study, gifted students were involved in the digital storytelling process about the history of geometry for the first time. Goral and Gnadinger (2006) stated that storytelling in mathematics education is a versatile and enjoyable tool that enables students to write, discuss, listen and read mathematical ideas, as well as to comprehend and deepen difficult concepts. Studies in the literature revealing that digital stories improve students' learning and media skills (Ohler, 2006; Robin, 2008). This study was conducted based on the idea that due to the high level of technology integration, digital storytelling can be utilized as an effective tool to teach the history of geometry which is found difficult by the students; thus, in the study, the quality of the digital stories created in this process by the gifted students was defined, and their opinions on the process were taken.

The features that should be in the digital story developed individually by students with special abilities were evaluated using the Digital Storytelling Graded Scoring Key in an Educational Context consisting of 17 items. The weighted Kappa coefficients of the rubric categories developed by Sarıca and Usluel (2016) were found to have a significant or almost perfect fit between the two scorers in most of the criteria. This compliance allows us to reach the conclusion that the results obtained with the rubric used in product evaluation are valid and reliable. In more than half of digital stories, it has been concluded that the products prepared by specially talented students are at a high quality level. Kapucu and Avci (2020), who conducted a digital storytelling study with pre-service science teachers, obtained similar results for the prepared products.

İncikabı (2015) stated that the use of technology in education is effective in attracting the attention of the students, especially in complex and challenging mathematics learning. Studies have shown that students enjoy producing their own digital stories, show more desire to study, and increase their grades (Tobin & Blanton, 2014; Campbell, 2012). It has been stated by Torres et al. (2012) that digital storytelling increases students' interest and attention levels, and it is an educational tool for educators. In the light of the findings, gifted students expressed that digital storytelling process is fun, useful, beneficial, instructive, attention-grabbing and internalizes information. The findings are consistent with the findings on digital storytelling presented by İnan (2015), Goral and Gnadinger (2006), Torres et al. (2012), Campbell (2012), Tobin and Blanton (2014), and İncikabi (2015). Karataş et al. (2016) conducted a study with pre-service history teachers, and emphasized that digital storytelling has several advantages, such as facilitating learning, being interesting, and enabling active and permanent learning. The findings obtained by Karataş et al. (2016) show similarities with the findings of current research.

In the interviews with gifted students, the students stated that, they paid attention to the use of remarkable elements, audio, and instructive elements, getting ideas from the teacher, being instructive and entertaining in the digital storytelling process. In the research findings, as stated in the study of Karadağ and Ayvaz-Tunç (2013), it was concluded that the active participation of students in the learning process through digital storytelling is important in

gaining different perspectives, learning new information and ensuring the permanence of the information.

In the interviews, gifted students stated that they encountered some problems in creating audio recordings, creating stories, selecting the appropriate image, and editing the information obtained. Koltuk and Kocakaya (2015) conducted a study with high school students. They stated that students had some difficulties while creating the developed digital stories. There are also different studies that support the difficulty of writing a story (Çetin, 2021; Özüdogru and Çakır, 2020; Uslupehlivan et. al., 2017). Similarly, in the study conducted by Özpınar (2017) with the pre-service teachers, it was stated that the participants had difficulties in the story creation process and encountered technical problems in the preparation of the digital stories. Moreover, Robin (2007) and Morra (2013) declared the most challenging stage in digital storytelling as writing a story. In this digital storytelling process, students stated that they solved the problems by consulting their friends and teachers, researching, examining sample studies, and by trial and error. In this study, problems encountered by the students were eliminated by informing the students every week during the implementation process. In many studies, it was stated that the success of the process can only be ensured in this way (Behmer, 2005; Ohler, 2008; Robin, 2006; Wang & Zhan, 2010; Yang & Wu, 2012).

All of the gifted students agreed on the use of digital storytelling in different lessons. This finding is similar to the results of Doering et al. (2007), Sadık (2008) and Karataş et al. (2016) in their studies conducted with teachers and pre-service teachers, where the participants were willing to include digital storytelling in their teaching environments in which they would take part. Moreover, in Long's (2011) study, pre-service teachers stated that the digital storytelling process was a valuable and motivating experience, and this result aligns with this study's findings.

In the interviews, gifted students stated that their favorite features of the digital storytelling process are adding audio, learning new information, creating script and e-books, doing research, and adding images. Yang and Wu (2012) concluded that digital storytelling has a positive effect on students' motivation and achievement, facilitates learning, and increases the desire to learn and explore. In İnan's (2015) study conducted with pre-service teachers, it was stated that the participants would use digital storytelling in their teaching lives and that they liked this implementation. The findings obtained by İnan (2015) correspond to the findings of this study. Students participating in the digital storytelling application conducted by Erişti (2016) stated that they like to prepare scenarios, add sound and pictures, and have fun during the application process.

5. Conclusion

As a result, digital stories prepared by gifted students from the data is at the "high" or "medium" quality level. This finding coincides with the findings obtained from student opinions. Looking at the products prepared, the participants stated that they used scientific concepts related to the history of Mathematics in their stories. It has been observed that the scientific knowledge related to the branch of mathematics has transferred its features to the

digital environment and scenarios. Scenarios and digital stories examination, this finding is confirmed.

Studies have shown that gifted students' experiences with digital storytelling are fun, exciting and having different perspectives. In addition, in studies evaluating the impact of digital storytelling on education, affective learning motivation (Hung, Hwang & Huang, 2012; Usluel, Sarıca & Tekeli, 2018), self-confidence (Robin & Mcneil, 2019), critical thinking in the areas of understanding and evaluation (Gözen & Cırık, 2017; Yang & Wu, 2012), conceptual understanding (Brace, Finkelstein & Sealy, 2016), creativity (Burke & Kafai 2010; Çoban et al., 2019), problem solving skills (Lin et al., 2013; Gözen & Cırık, 2017) and social development (Robin & Mcneil, 2019). When these results obtained in the literature are evaluated in term of the results obtained from this study, it gives the idea that the study yielded better results than expected. In addition, the process also gives gifted students the chance to discover their competencies and interests (Bedir Erişti, 2016). In the literature, there are studies in which it was determined that digital storytelling activates the cognitive, emotional and psychomotor skills of students (Peñalver & Urbieta, 2021; Marshall, 2021; İnan, 2015; Robin, 2006; Yılmaz & Sığırtmaç, 2020; Van Gils, 2005; Demirbaş & Şahin, 2020). When the relevant literature was examined, similar results to the results of this study were found. In the digital storytelling process, it is thought that students gain 21st century skills in the digital storytelling application process and develop these gains depending on their experiences. As a result, it can be said that the digital storytelling approach is an effective teaching tool that makes the learning experience more active for gifted students.

Analyzing the scores given by the experts for digital stories, it has been concluded that digital stories are generally successful. It is seen that there are minor problems in the digital stories on the history of geometry that can be corrected with a little effort. It is considered that the differentiated and technology-supported education provided to the gifted students in Science and Arts Centers (BILSEM) has contributed to the achievement of the purpose of the study. Moreover, it is thought that the fact that digital storytelling is an effective method for active learning (Van Gils, 2005), that computers and the internet can be used easily in daily life, and the activities arouse curiosity and interesting are the reasons for the success of digital storytelling.

6. Suggestions-Recommendations

According to the results of the research, it can be said that the case study conducted was successful. In this direction the following recommendations can be given. It is considered that including digital storytelling in mathematics education will be effective in keeping students' motivation high and in transferring information about mathematics education. In mathematics education, importance should be given to the use of technology supported approaches in in-school and out-of-school activities, and digital storytelling should be included in the topics that students have difficulty in internalizing in educational environments.

In the current study, the students individually prepared their digital stories. Collaborating with students to develop and produce digital stories enables them to become more aware of their own stories, to have knowledge and experience that they can reflect on and share with others

(Wu & Chen, 2020). This study can also be carried out cooperatively by dividing into groups. In this sense, it is possible to look at the development of communication skills and social skills by making digital stories in cooperation (Di Blas, 2016; Ribeiro, 2016; Schmoelz, 2018; Smeda et al., 2014)

To enable the use of digital storytelling tools more efficiently and effectively in mathematics lessons, pre-service teachers should be given training on "digital storytelling and technology-based modern learning activities" in undergraduate education; and teachers should be given through in-service seminars. The use of digital storytelling applications in teaching by the Ministry of National Education. Computer programs that can be used to popularize the use of activities that can be done can be determined and trainer trainings can be given to volunteer teachers. In digital story applications, pre-design of instruction is required in this context. Methods and techniques to be used in accordance with the individual differences of the students. It can be suggested to increase the success of the applications by making a pre-determined.

In this study, digital storytelling was used in teaching the history of mathematics in mathematics education. This study can also be carried out to teach different subjects in different branches. Moreover, the target group of this study is gifted students, and it is considered that different results might be obtained if applied to a different sample group.

Declaration of Conflicting Interests and Ethics

The authors declare no conflict of interest.

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