Pre-Service Teachers as Creators and Students as Viewers of Children's Literature-Related Digital Stories: A Formative Experiment

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Abstract

The goals of this formative experiment were to help pre-service teachers (PSTs) create children's literature-related original digital stories (DSs) and use these DSs to receive elementary school students' and in-service teachers' reflections. In this study, the Technological Pedagogical Content Knowledge (TPACK) framework was used. In total, 71 PSTs, 544 elementary school students, and 21 in-service teachers participated in the study. The results revealed that the PSTs wrote original stories that were mostly from their own personal experiences, drew illustrations, used their own voices by following the prosodic speaking rules, and, finally, created original DSs to convey to the students important didactic or informative messages. The digital storytelling creation process improved the PSTs' children's literature-related TPACK knowledge and practices. In this study, the majority of the PSTs tried to create parallel DS, which means that the pictures, texts, and recorded verbal messages told the same story for the same setting. In addition, the majority of the students gave viewer/reader-centered oral responses to the DSs. The results also showed that the PSTs, in-service teachers, and students had positive reflections about the DSs. These results confirmed that the goals of this formative experiment were achieved.

Keywords*:* Pre-Service Teachers, Digital Storytelling, Children's Literature, Formative Experiment, TPACK

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INTRODUCTION

Storytelling is one of the oldest and most ancient methods of human expression, communication, learning, and teaching (Menezes, 2012; Nguyen, Stanley, Stanley, Rank, & Wang, 2016; Ribeiro, 2017). It is a popular tool in education as people use storytelling to pass knowledge to new generations (Smeda, Dakich, & Sharda, 2014), as well as to share information (Maddin, 2012a, 2012b). Digital technologies allow people to create their stories by combining music, word, sound, and still or moving images, and to share these stories with a large audience. Lambert (2013) indicated in detail that the Center for Digital Storytelling's style of creating digital stories involves the use of seven key components—self revelatory, personal or first-person voice, lived experience of the author, photos rather than moving images, soundtrack, length and design, and intention (pp. 37–38). As Robin (2008a) indicated, different terms are used to describe digital storytelling "but, in general , they all revolve around the idea of combining the art of telling stories with a variety of multimedia, including graphics, audio, video, and Web publishing" (p. 429). Robin (2006) classified the major types of digital stories (DSs) as personal narratives, historical documentaries, and stories designed to inform or instruct viewers about a particular concept or practice.

A review of the literature showed that digital storytelling has many benefits for elementary school students. For example, digital storytelling helped to improve the writing skills of these students (Foley, 2013; Sarıca & Usluel, 2016), and instruction about digital storytelling helped elementary school students to develop their stories considering the story elements (Yamaç & Ulusoy, 2016). DSs also helped students to develop positive attitudes toward the lessons and listening activities (Ciğerci & Gultekin, 2017).

A review of the literature revealed that pre-service teachers (PSTs) also had positive opinions about digital storytelling (Kobayashi, 2012). The PSTs thought that students' learning can be increased with the use of digital storytelling in classrooms (Karakoyun & Yapıcı, 2016), and they perceived the digital storytelling development process as motivational, exciting, and fun (Kocaman-Karoglu, 2016). The PSTs appreciated the pedagogical value of digital storytelling (Shelton, Archambault, & Hale, 2017) and stated that they will use digital storytelling-related practices in their future careers (e.g., Harriman, 2011; Karakoyun & Yapıcı, 2016).

Technological Pedagogical Content Knowledge (TPACK) is a useful framework for instructors and teachers to acquire the required knowledge to effectively integrate technology into their teaching in a specific content area (Schmidt et al., 2009). The main idea of the TPACK framework is the complex, transactional, and dynamic relationships, connections, and interactions between content, pedagogy, and technology (Koehler & Mishra, 2005a, 2005b, 2009; Koehler, Mishra, & Yahya, 2007; Mishra & Koehler, 2006).

Previous studies showed that DSs improved PSTs' TPACK knowledge (Kildan & Incikabi, 2015; Sancar-Tokmak, Surmeli, & Ozgelen, 2014). There is a need for TPACK research in real practice settings and in different content areas (Angeli, Valanides, & Christodoulou, 2016). In addition, further research in the content-specific efforts regarding TPACK development and more TPACK-related studies in elementary teacher education settings are needed (Mouza, 2016). Harriman (2011) also pointed out that further studies should relate the PSTs, the TPACK framework, digital storytelling, and specific content areas, and teacher education colleges should conduct design-based projects using the TPACK framework.

As a specific content area, there are very few studies concerning teachers' practices using digital storytelling as an instructional approach (e.g., Maddin, 2013) or PSTs' practices in the design and use of DSs in language arts and children's literature-related areas. The review of the literature showed that the use of DSs and digital storytelling in children's literature improved the PSTs' understanding of content and pedagogy knowledge (Choo, Abdullah, & Nawi, 2017) and pedagogical content knowledge (Yee, Abdullah, & Nawi, 2018). In this present study, I aimed to enable the PSTs to create original DSs and to use them in their practicum courses with elementary school students in the context of children's literature. I followed the formative experiment and the TPACK framework to

design this study. To the best of my knowledge, the literature lacks research that investigates PSTs' skills regarding the design and creation of DSs in the area of children's literature by following the formative experiment and TPACK frameworks, and that explores the use of these DSs in elementary school classrooms.

Formative Experiment

Reinking and Watkins (1996, 2000) developed the formative experiment framework. The formative experiment is closely related to design experiment and design-based research (e.g., Bradley & Reinking, 2011a; Reinking & Bradley, 2008; Tracy & Headley, 2013). The formative experiment approach can be viewed as a bridge between research and practice in a dynamic and complex classroom environment (Bradley & Reinking, 2011b; Reinking & Bradley, 2008). In addition, this approach eliminates the limitations of both naturalistic methodologies (e.g., lack of focus on determining the enhancing-inhibiting factors of interventions and addressing how teachers manage these complexities to achieve specific instructional goals) and experimental methodologies (e.g., lack of focus on the dynamic features of classrooms, tightly controlled interventions) (Bradley & Reinking, 2011b, 2011c; Reinking & Bradley, 2008). Many scholars (e.g., Reinking & Watkins, 2000; Taboada & Rutherford, 2011) have used the formative experiment framework in the literacy field.

The following six questions were used as a framework for designing the formative experiment (Reinking & Watkins, 2000). I used these questions to conduct the present formative experiment study.

> (1) What is the pedagogical goal of the experiment, and what pedagogical theory establishes its value?
>
> (2) What is an instructional intervention that has potential to achieve the identified pedagogical goal?
>
> (3) As the intervention is implemented, what factors enhance or inhibit its effectiveness in achieving the pedagogical goal?
>
> (4) How can the intervention and its implementation be modified to achieve more effectively the pedagogical goal?
>
> (5) Has the instructional environment changed as a result of the intervention?
>
> (6) What unanticipated positive or negative effects does the intervention produce? (p.388)

THE EDUCATIONAL GOALS OF THE STUDY AND THEIR SIGNIFICANCE

The first goal of this study was to help the PSTs create original DSs in the area of children's literature and to organize activities using these DSs with elementary school students. A review of the literature revealed few studies focusing on DSs created by PSTs about children's literature or language arts (Choo et al., 2017; Yee et al., 2018; Yılmaz, Üstündağ, Güneş, & Çalışkan, 2017). In all these studies, the PSTs used passages from primary school textbooks to write their stories. In addition, only Yee et al. (2018) and Yılmaz et al. (2017) stated that the DSs produced by the PSTs were used in schools as an instructional tool, but there is no indication in these two studies that the authors followed the TPACK or formative experiment frameworks. In the present study, instead of the PSTs adapting stories from textbooks, I aimed to enable them to write their own original stories and to follow the formative experiment approach. This would allow them to see the effectiveness of the intervention developed to create the DSs by considering the TPACK framework, as well as to see the usefulness of these DSs in elementary school classrooms when they were used as instructional tools. Furthermore, the formative experiment approach allowed me to make adaptations to reach a more effective intervention and to enhance-inhibit the factors that the participants experienced during the design and

creation process and during the use of these DSs in elementary school classrooms. These results can make a valuable contribution to the literature and to the knowledge of teachers and instructors.

Since teachers and students can use digital storytelling as a reflection tool (Yuksel-Arslan, Yildirim, & Robin, 2016), the second goal of this study was to receive reflections on the DSs by the PSTs, classroom teachers, and elementary school students. Digital storytelling improves the process of reflection and gives teachers a chance to question their practices (Clarke, 2017). The literature showed that digital storytelling improved students' reflection skills (Yuksel, Robin, & McNeil, 2011) and helped PSTs to be self-reflective (Kocaman-Karoglu, 2016) and to make deep reflections (Long & Hall, 2018).

Ribeiro (2017) indicated that if there is interaction between the authors and audiences, or among the audiences, there will be discussion and further reflection. In this study, the PSTs reflected on their ideas through their DSs. Then, the audiences (in-service teachers and students) watched these DSs and reflected on their thoughts about the stories. It was hoped that the dialogue between the PSTs and audiences about these DSs in the authentic classroom environment would give the PSTs a chance to see the usefulness and quality of their creations. This process could also improve the PSTs' and elementary school students' reflection skills. Hopefully, the process and results of this reflection cycle will make an important contribution to the literature and provide important ideas to practitioners in the development and use of DSs in elementary schools.

THEORETICAL BASIS FOR INSTRUCTIONAL INTERVENTION

In this section, I will describe the rationale for this study, which is grounded in the TPACK and reflection frameworks.

The TPACK Framework

The TPACK framework (Mishra & Koehler, 2006) was built upon Shulman's (1986, 1987) studies, which described pedagogical content knowledge. There are three important kinds of knowledge in the TPACK framework—technology, pedagogy, and content. As Mishra and Koehler mentioned, there are complex interactions and connections between and among these components. To design the intervention of this study, the PSTs' integration of digital storytelling in the area of children's literature will be investigated by using the following seven components of the TPACK framework, which can be summarized as follows (Koehler & Mishra, 2005b, 2009; Mishra & Koehler, 2006; Schmidt, et al., 2009):

(1) Content Knowledge is the teachers' knowledge about a specific content area to learn or teach.

(2) Pedagogical Knowledge is the teachers' knowledge about the methods and practices to learn or teach.

(3) Technology Knowledge is the knowledge about low-tech or digital technologies.

(4) Pedagogical Content Knowledge is the knowledge of pedagogy that teachers can use to teach their specific content areas.

(5) Technological Content Knowledge is the knowledge about the reciprocal relations between technology and content.

(6) Technological Pedagogical Knowledge is the knowledge about various technologies that can be used in teaching and how these technologies can change teaching styles.

(7) Technological Pedagogical Content Knowledge (TPACK) is the knowledge that teachers need when they want to integrate technology into their content areas. There are complex and

dynamic interactions between content knowledge, pedagogical knowledge, and technology knowledge in specific content areas.

Reflection

Reflection is one of the key factors in creating and using DSs (Maddin, 2012b). As Lambert (2013) stated, "Digital Storytelling is a form of reflective practice" (p. 127). Even though many scholars (Dewey, 1933; Schön, 1983, 1987) have made important contributions to the framework of reflection, Ulusoy's (2016) review of the literature revealed that there is a lack of clarity about the definition of reflection. In this study, I used Hatton and Smith's (1995) definition of reflection, which is "deliberate thinking about action with a view to its improvement" (p. 40). I found this definition suitable to the framework of the formative experiment because making modifications to enhance the effectiveness of the intervention is a very important part of formative experiment studies. In addition, the PSTs can have a chance to enhance the quality of their DSs and the effectiveness of their teaching in the elementary school classrooms by reflecting on students', in-service teachers', and their own experiences.

THE INTERVENTION

Formative experiment researchers can conduct the interventions rooted in the literature or can design original interventions (Baumann, Dillon, Shockley, Alvermann, & Reinking, 1996; Reinking & Watkins, 2000). The literature about children's literature and digital storytelling helped me to design this intervention. In addition, my past experience as a classroom teacher and my current experience as a teacher educator and researcher in a major university in the area of children's literature assisted me in the intervention design.

I designed the intervention in cooperation with colleagues, teachers, and PSTs in the fall of 2013. First, semi-structured interviews were conducted with the PSTs to learn their knowledge and experiences about digital storytelling and children's literature-related topics. Second, I developed the intervention and received the opinions and suggestions of two in-service teachers and three colleagues who had expertise in both instructional technology and children's literature. Mainly, they offered small revisions on the sequence of the intervention sessions. The final intervention was modified to meet the needs of the PSTs (see Table 1). The intervention was designed considering the TPACK framework and was conducted in the 15-week spring semester of 2014.

Table 1. Intervention for the PSTs

TPACK Framework	Workshops & Discussion Topics	Data Collected from the Participants
1. Content Knowledge (CK)	Week 1 1. What is digital storytelling? Types of digital stories (DSs) (Robin, 2006; 2008a, b). 2. The seven components found in CDS digital stories (Lambert, 2013, pp. 37–38). 3. Robin's (2008b, p. 223) summarization of the seven elements of digital storytelling (point of view, a dramatic question, emotional content, voice, soundtrack, economy, and pacing). 4. Copyright issue Week 2 1. Literary elements (characters, plot, setting, theme, etc.) (Anderson, 2013; Glazer, 2000; Lukens, 2007). 2. The elements of design (line, shape, color, value, etc.) (Kiefer, 1993, 1995, 2008). 3. Ohler's (2008) description of the story elements and story mapping. 4. Brainstorming about the possible topics of the DSs, the type of storytelling (personal narratives, informative, etc.) (Robin, 2008b), and the targeted grade level. The PSTs were encouraged to broaden their knowledge about the content and topics of the DSs. For example, the PSTs who chose informative DSs searched the Internet. In addition, the PSTs who created personal DSs looked	The baseline data from the PSTs, including (a) the survey, (b) interviews with the PSTs, and (c) reflective journals.

	at their family photograph albums to refresh their memories and to enrich their stories. Week 3 1. I adapted Agosto's (1999) *parallel* and *interdependent storytelling* terms for picture storybooks to the digital storytelling process to help the PSTs create their DSs. Agosto indicated that texts and pictures tell the same story simultaneously in parallel storytelling. I adapted this to digital storytelling as pictures, texts, and recorded verbal messages tell the same story simultaneously for the same setting. Agosto also stated that readers must examine both texts and illustrations concurrently to understand the interdependent storytelling. I also adapted this sentence as follows: "In interdependent digital storytelling, viewers use pictures, texts, and recorded verbal messages concurrently to comprehend the settings. If we separately examine these different messages, we may not fully comprehend the DSs." 2. Principles of making pictures (Bang, 2000). 3. Rubrics to evaluate DSs (e.g., Barrett, 2005)	
2. Pedagogical Knowledge (PK)	Week 4 1. The use of DSs in a language arts lesson. 2. How to receive teachers' and students' reflections (oral/written responses, retelling, etc.) (Hancock, 2008). 3. Introducing prosody, which is described as the "rhythmic and tonal features of speech" (Dowhower, 1991, p.166), and introducing the prosodic speaking principles for the PSTs (Ulusoy, Ertem, & Dedeoğlu, 2011). Week 5 1. The length of texts that are included in language arts textbooks in elementary schools: The PSTs can use this knowledge to decide the average length of their stories for the targeted grade levels. 2. Discussing the themes and messages of the PSTs' stories.	
3. Technological Knowledge (TK)	Week 6 Introducing the use of Microsoft Photo Story 3 for Windows software.	1.Reflective journals 2. Interviews with the PSTs to learn their expectations and needs
4. Pedagogical Content Knowledge (PCK)	Week 7 1. The discussions were conducted around the following items: (a) choosing the types of digital storytelling to convey intended messages, (b) deciding on the style of storytelling (parallel, interdependent, or a mix). 2. The PSTs were encouraged to create initial drafts of their stories and storyboards, considering the literary, design, and digital storytelling elements and the students' grade levels. Week 8 – Spring Break Week 9 The PSTs came to the workshop with their initial drafts and received their peers' and my reflections on the stories.	
5. Technological Pedagogical Knowledge (TPK)	Week 10 Before the workshop, the following preparations were made. The PSTs (a) edited their stories considering the reflections they received in the previous week, (b) recorded their voices by using the prosodic speaking principles, and (c) drew pictures and scanned them or took their photographs. During the workshop: 1. The PSTs received their peers' and my reflections on their pictures/photographs and voices (prosodic speaking skills, quality, etc.) 2. Discussion Topic: Which before, during, and after viewing DSs-related activities can be conducted with elementary school students?	The PSTs evaluated their peers' and their own prosodic speaking skills by listening to the recorded stories.
6. Technological Content Knowledge (TCK)	Week 11 1. Thinking about the harmony of verbal messages, images, texts, and music. 2. The qualities of the recorded voices and images (sound quality, resolution, etc.). 3. Editing the storyboards.	

7. Technological Pedagogical Content Knowledge (TPACK)	Between the 12th and 15th Weeks 1. Music, pictures, and recorded verbal messages were combined using the Photo Story software, and the children's literature-related DSs were produced. 2. The PSTs received their peers', classroom teachers', and elementary school students' reflections about the DSs. 3. The PSTs were encouraged to check the quality of their final DSs by using the aforementioned rubrics and to write their reflections about the qualities of these DSs. 4. The PSTs were encouraged to share their DSs on the Internet.	1. Video recordings of the 71 PSTs' activities in the elementary schools 2. Interviews with the 8 classroom teachers and 60 elementary school students to learn their opinions about the DSs and the activities. 3. Post-intervention data gathered from the PSTs: (a) the survey, (b) interviews with the PSTs, and (c) reflective journals.

METHODOLOGY

Researcher Perspective

As suggested by the TPACK framework (e.g., Koehler & Mishra, 2005a, 2009), teacher education institutions should give their teacher candidates solid content knowledge, content-specific pedagogical methods, and deep knowledge about how to integrate technology in specific content areas. In this way, the PSTs can see and experience the dynamic interactions of the TPACK framework and recognize the opportunity it affords them to improve their future students' learning levels. To do this, the teacher educators should help the PSTs to produce low-tech or digital instructional tools and give them realistic goals to reach in field experience classrooms in the use of these tools in their instruction. In so doing, the PSTs can see the effectiveness of their products in a real classroom environment and receive the teachers' and students' reflections on their products. This teaching cycle gives the PSTs realistic and first-hand experiences for their future careers. In addition, both the teachers and students can benefit from this process. For example, there can be an improvement in students' learning levels, and in-service teachers can have the chance to learn new methods. It is hoped that this formative experiment study will offer the PSTs opportunities to create children's literature-related DSs and to use them in their instruction in a real classroom environment.

In formative experiment studies, researchers can play the double role of researcher and instructor (e.g., Duffy, 2001; Garfield, 2000, Ulusoy, 2019). In this study, I was the instructor of the PSTs to help them produce their DSs and conduct activities using these DSs in field experience classrooms. I also played the role of researcher by gathering data from the students, in-service teachers, and PSTs.

Participants

The PSTs, classroom teachers, and elementary school students were the participants of the study. The PSTs were enrolled in the Turkish Instruction course (n =84) in a major university in the city of Ankara. They were informed about the study, and 71 of them (51 female and 20 male) voluntarily participated in the study in order to learn theoretical knowledge and to gain practical experience in digital storytelling. In the spring of 2014, third-year PSTs (average age: 20.5) were registered in this course to learn how to teach literacy-related skills—reading, writing, listening, and speaking—to elementary school students. In the same semester, seven or eight PSTs acted as a team

and visited various elementary schools for their practicum course. The PSTs visited 21 different classrooms in 11 state-sponsored schools and used their children's literature-related DSs in these schools. Twenty-one in-service teachers (18 female and 3 male), who had 11 to 32 years of teaching experience, and 544 elementary school students (278 female and 266 male) were also participants in the study. I delivered the workshops to the PSTs twice each week in a classroom environment that included all the necessary technologies (computer, projector, etc.).

In Turkey, students between 6 and 10 years old receive a four-year elementary school education and all the teachers follow the same curricula (Ulusoy, 2019). The DSs produced by the PSTs were used in the Turkish course in the elementary schools because the children's literature-related activities—reading, writing, listening, and speaking—were covered in this course. The in-service teachers and I supervised the PSTs in their implementation of the digital storytelling-related activities.

Procedures

The PSTs participated in workshops of approximately 70 minutes each (see Table 1 for details) during the 15 weeks. In the first week, the baseline data was collected from the PSTs and interviews were conducted with them to determine their needs and expectations. During the intervention, the PSTs learned how to create their DSs. These DSs were also used to conduct activities in the elementary school classrooms in which the PSTs acted as a team and helped each other. Each PST shared their DS with the students and conducted the activities. Other PSTs video recorded the whole process. First, the students watched the DSs. Then, the PSTs conducted a discussion session to receive the students' reflections on the DSs. Finally, the PSTs received the classroom teachers' reflections and critiques about both the DSs and the activities. Throughout the intervention, the PSTs wrote three reflective journal entries. I observed the PSTs' activities and conducted interviews with the classroom teachers and elementary school students. In the 15th week, I collected the post-intervention data from the participants, including the survey and interviews.

Data Collection

Survey. A survey (see Appendix A) was developed to test the PSTs' knowledge levels and skills about digital storytelling and to determine their progress during the intervention. The content validity of the survey was achieved by receiving feedback from three experts who were studying both children's literature and instructional technology. I refined and revised two items in which the experts detected wording problems. The final survey included 13 questions, and all the PSTs (n =71) answered it as a baseline and post-intervention instrument.

Interviews. Before, during, and after the intervention, semi-structured interviews were conducted with all the PSTs (n =71) to learn their perceptions and the modification needs of the intervention. The PSTs were asked to evaluate the pros and cons of the workshop sessions, their own efforts in the DS production process, the effectiveness of their activities in the elementary school classrooms, and the lessons they learned from this experience. In addition, between the 12th and 15th weeks, I observed 10 PSTs' activities in the elementary schools and conducted semi-structured interviews with these 10 PSTs, 8 classroom teachers, and 60 elementary school students. As I spent a significant amount of time with the PSTs, my role was a participant-as-observer (Gold, 1958) for them. In addition, as Gold indicated, my position was an observer-as-participant for the elementary school students and the in-service teachers because I only spent a brief amount of time with them. In the interviews, the participants were first asked general questions to learn their ideas about the DSs, followed by specific questions about the components of DSs (content, voice, images, etc.).

Reflective journals. At the beginning, in the middle, and at the end of the intervention, the PSTs (n =71) wrote three reflective journal entries. They reflected on their needs and expectations from the workshops, on the quality of DSs and DS-related activities conducted in the classrooms, and on the place of digital storytelling in their future professional careers.

The prosodic speaking rubric. The PSTs (n =71) evaluated their peers' and their own recorded voices by using the Prosodic Speaking Rubric. The literature was reviewed (Keskin, Baştuğ, & Akyol, 2013; Rasinski, 2004; Ulusoy et al., 2011; Zutell & Rasinski, 1991) to develop the rubric. Then, three experts who were studying children's literature and literacy provided feedback on the rubric items. The final rubric contained 10 Likert-type items.

Oral responses. The students' oral responses about the DSs were received by adapting and using the experiential, aesthetic, cognitive, and interpretive prompts developed by Hancock (2008), as follows:

(1) What message did this DS have for you? (Interpretive)

(2) If you were (name of a character), what would you do in this situation? (Cognitive)

(3) How did this DS make you feel? (Aesthetic)

(4) How did you relate this DS to your own life? (Experiential) (pp. 278–279)

Data Analysis

In this study, the data collected from the teachers, PSTs, and students were analyzed constantly to judge the effectiveness of the intervention. After the intervention was over, a retrospective analysis (Cobb, Confrey, diSessa, Lehrer, & Schauble, 2003) was conducted, and the data set was analyzed again to check the accuracy and to increase the trustworthiness of the initial data analysis procedure. I used open, axial, and selective coding procedures (Strauss & Corbin, 1998, pp.101–161) to analyze the interviews, reflective notes, and surveys (see Appendix B).

In cross-comparisons, I used the following constant comparative analysis steps created by Ulusoy (2019, p.757) by adapting from Boeije's (2002, p.395) analysis procedure.

(1) Comparisons within the same data collection method for the same subject (comparing the paragraphs or passages within the same PST's interviews and comparing the same PST's interviews in different time periods, etc.).

(2) Comparisons between the different subjects within the same data collection method (comparing the students' interviews with each other, etc.).

(3) Comparing the different data collection methods with each other (comparing the results of student interviews, surveys, etc.).

(3a) Comparing the different baseline data collection methods with each other.

(3b) Comparing the different post-intervention data collection methods with each other.

(4) Comparisons between the baseline and post-intervention data.

The baseline and post-intervention surveys, content analysis of the DSs, and reflective journals were presented by using the frequency and percentage scores. The paired-samples t-tests were also performed to compare the PSTs' scores on their own and on their peers' prosodic speaking skills. I analyzed all the PSTs' (n =71) recorded activity videos to assess the students' oral responses to the DSs and used Wollman-Bonilla and Werchadlo's (1995, pp. 564–565) categorization to analyze the frequencies of their responses.

A second coder holding a PhD degree in the literacy field independently coded 20% of the randomly selected interviews, surveys, activity videos, and reflective journals. Before the analysis, a three-hour training session was provided to the coder. As Miles and Huberman (1994, p. 64) stated,

intercoder agreement scores higher than 90% demonstrate the reliability of the coding procedure. We discussed the differences with the coder and reached intercoder agreement scores of at least 94% for the teacher interviews and at most 100% for the reflective journals. These scores showed that the data analysis of this study was reliable.

Rigor

In this study, I followed Reinking and Bradley's (2008, pp. 54–61) seven benchmarks to ensure the methodological rigor of formative experiments. For example, I collected multiple sources of data; used multiple theories; included all of the defining characteristics of formative experiments (intervention-centered, theoretical, goal-oriented, etc.); and left adequate time for the research, which was 15 weeks.

IMPLEMENTATIONS AND MODIFICATIONS OF THE INTERVENTION TO ACHIEVE THE PEDAGOGICAL GOALS

In this section, I investigated the third and fourth questions of the formative experiment. In addition, pre-and post-test results are compared, and the implementation process of the intervention and analysis of the DSs are presented.

Modifications of the Intervention

In the first week of the intervention, I conducted a discussion session with the PSTs about copyright-related issues. I intended to help them understand the fair use of materials (images, photos, etc.) created by other people. During the discussion, nearly all the PSTs (n =69) saw the images downloaded from the Internet as a major copyright-related issue. For instance, one female PST explained in an interview:

> I thought that I could use some images and pictures from the Internet, but I had many questions after gaining knowledge about the copyright and fair use of Internet sources. The images downloaded from the Internet may adversely affect the authenticity and originality of my DS.

The majority of the PSTs (n =62) also stated that as the DSs developed in this intervention were about children's literature, it was difficult to find images from the Internet that were well-suited to the context and theme of their stories. In addition, the PSTs (n =54) indicated that the continuity of the characters—the similarity of the physical properties of the characters in different settings—is very important in the DSs developed for children. In one of the interviews, a male PST explained:

> If I use a hand-drawn picture of a character in one setting and use a photo from the Internet to represent this character in a different setting, the students cannot follow the character and her/his actions. In addition, the students find it ridiculous if the physical properties of the characters change. It is very difficult to find pictures or images to depict the settings of my DS. I have to create my own images and pictures to give the correct messages and to depict the settings effectively.

As a result of the discussion of the copyright issue, the first modification of the intervention was the use of original pictures and images created by the PSTs themselves. We decided that the PSTs would draw pictures, or, especially for the landscape settings, they would take their own photos by using their smart phones or digital cameras. The analysis of the 71 DSs revealed that the PSTs used 741 images in total, and 569 of them were hand-drawn pictures created using crayon, pencil, colored pencils, markers, or the collage technique (see Appendix C for sample screenshots from the DSs). The other images were (n =172) generally the landscape photos that were taken by the PSTs themselves. Only one PST did not draw images and only used the photographs he took. These results show that the PSTs embraced the modification about using original images for their DSs.

After the DSs were created, the PSTs needed to receive opinions on their prosodic speaking skills, so the second modification was about leaving time to receive their peers' assessments of these. In weeks 9 and 10, the PSTs read aloud their stories by following the prosody rules and recorded their voices. Then, they assessed at least one of their peer's and their own prosodic reading skills of the stories using the Prosodic Speaking Rubric (see Table 2). All the PSTs found this process very useful to improve the speaking quality of their DSs. For instance, one PST recorded in her reflective journal, "My friends watched my DS and found my speaking speed too fast. Then, I decided to edit my DS. Mainly, I decreased my speaking speed. My friends helped me to increase the quality of my DS."

The paired-samples *t*-tests were performed to compare the prosodic speaking scores of the DSs produced by the PSTs themselves and by their friends (see Table 2).The results revealed only one significant difference between the PSTs' scoring of their own (M =3.44, SD =0.63) and one of their peer's prosodic speaking (M =3.62, SD =0.57) for the fifth item, which is "speaking by considering the punctuation and spelling rules of the text," t (70) = -2.84, $p < .05$. When the PSTs' own (M =34.10, SD =4.15) and their peer's (M =34.45, SD =4.38) total prosodic reading scores were compared, the results revealed that there was no significant difference, t (70) = -.77, $p > .05$. Considering the maximum possible score of the rubric, which is 40, the PSTs assessed their own and their peers' prosodic speaking skills as very high. The interviews with the PSTs revealed similar results, and the PSTs evaluated their own and their peers' prosodic speaking skills as very good.

Table 2. The PSTs' Paired Samples t-Test Scores on the Prosodic Speaking Rubric

Items	My own prosodic speaking		My peer's prosodic speaking			
	M	SD	M	SD	t	p
1. Producing appropriate stress and intonation patterns while speaking	3.38	0.66	3.39	0.69	-.16	.871
2. Using a clear and understandable voice	3.61	0.55	3.49	0.73	1.11	.270
3. Adjusting the speed of one's speech to the meaning of the text	3.30	0.70	3.39	0.75	-.88	.382
4. Reflecting on the emotional state of the characters (joy, enthusiasm, etc.)	3.32	0.82	3.24	0.76	.77	.442
5. Speaking by considering the punctuation and spelling rules of the text	3.44	0.63	3.62	0.57	-2.84	.006
6. Speaking with appropriate pronunciation and accents	3.39	0.67	3.38	0.80	.13	.890
7. Controlling the volume of one's voice while speaking	3.44	0.69	3.54	0.58	-1.22	.226
8. Producing error-free speech	3.46	0.71	3.51	0.71	-.55	.581
9. Projecting self-confidence by one's tone of voice	3.49	0.61	3.52	0.63	-.36	.718
10. Reading the stories with a rhythm like natural talking	3.27	0.70	3.37	0.72	-1.18	.239
Total	34.10	4.15	34.45	4.38	-.77	.442

Note: A five-point Likert scale was used: 0 = Never, 1=Rarely, 2= Sometimes, 3= Often, 4= Always N=71. df =70. Maximum possible score is 40.

These two modifications motivated the PSTs in the development of their DSs. The idea of creating fully original stories and images, using their own DSs to conduct activities in authentic classroom settings, and receiving students' and teachers' critiques on these products motivated the PSTs and helped them to stay on task and to increase the quality of their DSs. These modifications also helped me to achieve the educational goals of this formative experiment. For example, the first and second goals—helping the PSTs to create DSs and to conduct activities in the elementary schools, and receiving the students' and teachers' reactions to these products—were achieved. The results showed that none of the PSTs left the intervention. At the end of the study, all 71 PSTs were able to create original DSs and to use them as educational tools in the elementary school classrooms.

Comparing the Baseline and Post-Assessment Data

Baseline data. The baseline survey, interviews, and reflective journals revealed that none of the PSTs had theoretical knowledge and practical experience in digital storytelling. For example, they

could not answer the DS-related questions of the survey. As the PSTs had already taken the courses Children's Literature and Emergent Literacy, they had basic knowledge about the story elements, quality indicators of the stories, and prosody, but they had very limited knowledge and experience about the artistic elements of the stories. The PSTs stated that they had minimal authoring experience for elementary school students, but they did not have any teaching experience using these written products as instructional tools. The PSTs also did not have any theoretical knowledge about the types of oral responses.

Post-assessment data. The post-assessment survey, interviews, and reflective journals revealed that the PSTs increased their TPACK knowledge and experience.

Content knowledge. In individual interviews, most of the PSTs (*n* =69) stated that they improved their content knowledge, such as the story and artistic elements and types of DSs. The PSTs also had a chance to use the story elements in creating an original story. For instance, one female PST said in an interview:

> I already had prior knowledge about the story elements from my previous course in Children's Literature, but this intervention gave me a chance to improve my theoretical knowledge about the stories. I had a chance to use this theoretical knowledge in creating an original DS. This intervention allowed me to build a bridge between theory and practice.

Table 3 reveals that the average length of the DSs, 3.85 minutes, is consistent with the time periods indicated in the literature. As Robin (e.g., 2008a, 2016) stated, most of the DSs are between 2 and 10 minutes. As seen in Table 3, the PSTs' average length of time to conduct the digital storytelling activities in the elementary school classrooms is 16.75 minutes.

Table 3. The Length of the DSs and PSTs' Activities

Length	n	Min.	Max.	M	SD
The length of the DSs in minutes	71	1.17	11.00	3.85	1.71
The length of the PSTs' classroom activities in minutes	71	4.11	41.14	16.75	7.16

The analysis of the DSs revealed that the most frequent characters were children (*n* = 49), animals (*n* =33), mothers (*n* =25), fathers (*n* =11), and friends (*n* =7). The most frequent animal characters were dogs (*n* =5), birds (*n* =5), and fishes (*n* =4). The analysis of the DSs showed that 22 DSs (30.99%) included three main characters, 48 DSs (67.61%) included two main characters, and one DS (1.41%) included only one main character. These results show that the PSTs tried to use the theoretical knowledge learned from the workshops on their DSs. For example, as indicated by Lynch-Brown, Tomlinson, and Short (2014), the majority of the PSTs included one or two main characters in their stories, and they most frequently chose the characters that were similar in age and physical appearance to the target audience of the DSs, which were children aged 6–10, or they chose personified animals for their DSs.

In addition, "a theme is more easily understood if it is stated in a complete sentence" (Anderson, 2013, p.39). Table 4 reveals the themes of the DSs as complete sentences. The table shows that the PSTs most frequently chose themes about listening to the advice of their parents (*n* =12) and treating animals well (*n* =10). The PSTs stated that these themes were inspired by their own life experiences (*n* =45), from the picturebooks they had read before (*n* =10), and from the experiences of their friends (*n* =9) and relatives (*n* =7).

Table 4. The Themes of the DSs

Themes	n
1. We should listen very carefully to the advice of our parents.	12
2. We should treat animals well.	10
3. We should help people when they need our help.	8
4. As students, we must meet our responsibilities.	3
5. We should take good care of our teeth.	3
6. Balanced and adequate nutrition is important for our health.	3

Note. Frequencies below 3 were not included in the table.

The analysis of the DSs showed that 25 (35.21%) had on-screen written texts, whereas 46 (64.79%) did not. Half of the PSTs (*n* =23) who were creating the DSs for second and third graders used on-screen written messages. These PSTs indicated in individual interviews that written messages can improve the students' comprehension of the DSs. The other PSTs (*n* =46) indicated that the students' listening skills were enough for them to understand the messages, and the on-screen written texts might distract their attention or hinder their joy of watching the DSs.

The PSTs were asked to state their choice of storytelling style—parallel or interdependent (Agosto, 1999). The majority of the PSTs (*n* =57, 80.28%) stated that they tried to improve the students' comprehension by creating parallel DSs, in which the pictures, texts, and recorded verbal messages tell the same story simultaneously for the same setting. The other PSTs (*n* =14, 19.72%) who used the interdependent storytelling style indicated that readers have to consider all kinds of messages (textual, pictorial, or verbal) concurrently to comprehend the settings, because if the students separately examine pictures, texts, and recorded verbal messages, there is a chance they may not fully understand the DSs. The PSTs also stated that they wanted to develop the students' inference skills by using the interdependent storytelling style. Twelve out of 14 PSTs created their interdependent DSs for third and fourth graders. For instance, one female PST said in an interview:

> My target audiences were fourth graders. The parallel storytelling style would be very simple for them...I used the interdependent storytelling style so that these students could make inferences and bring together pictures and sounds to extract meaning. My aim was to improve their comprehension skills.

The PSTs used colored pencils (*n* =41), pencils (*n* =32), real photos (*n* =29), markers (*n* =19), crayons (*n* =17), and the collage technique (*n* =9) to create the illustrations. Nearly half of the PSTs (*n* =35, 49.30%) stated that they wanted to illustrate important settings, 22 (30.99%) wanted to illustrate all settings, and 14 (19.72%) preferred to illustrate settings with speech dialogues. The PSTs stated that the illustrations helped them to portray the characters' gestures, facial expressions, and emotions, such as joy and sadness (*n* =64), and that the illustrations helped the students to visualize the different settings in their minds (*n* =55). The PSTs also indicated that the illustrations helped to improve the students' comprehension of the DSs (*n* =52) and to relate to the similar feelings of the characters (*n* =29).

The PSTs were asked to consider the rubrics (e.g., Barrett, 2005), to evaluate the DSs, and to grade them. When the arithmetic mean was calculated, it was observed that they gave themselves 96.61 out of 100. Drawing pictures (*n* =35) and writing stories (*n* =10) appropriate to the students' grade levels were the two most frequently stated content and pedagogical knowledge-related difficulties that the PSTs experienced during the digital storytelling creation process.

Pedagogical knowledge. In the reflective journals, the PSTs stated that, during the intervention, they gained important pedagogical knowledge and experience. For example, they learned how to use the principles of prosodic speaking (*n* =71), how to conduct activities using the DSs in authentic classroom environments (*n* =68), how to assess students' oral responses (*n* =65), and how to create literary stories suitable to the comprehension levels of the students (*n* =48). One PST recorded the following entry in her journal:

> The intervention topics helped me to improve my theoretical knowledge, but I developed my real pedagogical knowledge by using my own DS in the elementary school classrooms. I learned a lot from the classroom teacher's and the students' reactions to my DS. I also learned important pedagogical experiences and inferences for my future career. For example, I learned that combining voice, pictures, and written messages in a movie-like story increases students' motivation, interests, and achievements.

The interview results (*n* =71) and reflective journals (*n* =70) revealed that the PSTs saw the DSs as very useful and efficient pedagogical tools that can be used to improve students' comprehension in an enjoyable way. The PSTs (*n* =68) stated that during the activities, most of the students could talk about the literary elements (plot, characters, etc.), retell the DS content in the right sequence, participate in discussions, and comprehend the themes and main ideas of the DSs. The reflective journals written at the end of the intervention revealed that the PSTs (*n* =71) saw learning how to create effective DSs as the most important contribution of this intervention. They felt confident in their skills to create DSs and to conduct effective activities using the DSs in classroom environments. All the PSTs (*n* =71) stated that the digital storytelling creation process was an enjoyable and fun experience for them and that they will use DSs in their future classrooms.

***Technology knowledge*.** In the individual interviews, all the PSTs stated that the intervention helped them to increase their technological knowledge. None of the PSTs had prior experience in creating DSs. During the intervention, they learned how to use the Microsoft Photo Story 3 for Windows software to create DSs and how to create storyboards. In addition, the PSTs put their theoretical knowledge into practice creating their DSs, and they realized the importance of quality voice recordings and of creating attractive images. In one of the interviews, a male PST said:

> By participating in the workshops and by creating a DS, I could increase my technological knowledge and experience. For instance, I learned how quality pictures made a difference and how good and poor quality microphones affected the sound quality of my DS...I will use Photo Story software in my future teaching career.

Classroom Teachers' and Students' Perceptions of and Reactions to the DSs and Activities

The reflective journals revealed that the PSTs received comments from the 21 teachers. For instance, as positive comments, the classroom teachers found that the PSTs' prosodic speaking skills were very efficient (*n* =19) and that the DSs used in their classrooms were excellent instructive tools to develop students' content and aesthetic skills (*n* =19). In addition, the in-service teachers thought that the illustrations were impressive and beautifully drawn (*n* =17), that the DSs were very useful to develop students' empathy skills (*n* =10), and that the themes of the DSs were suitable to the students' grade levels (*n* =9). As for negative comments, the in-service teachers thought that the speaking speeds of the PSTs were too fast (*n* =2) and that the durations of the DSs were too long (*n* =2). The PSTs' reflective journals (*n* =71) showed that all the in-service teachers liked to watch the DSs, and they asked the PSTs many questions about the production phases of the DSs. All the interviewed in-service teachers (*n* =8) also found the digital storytelling-related activities as very useful for the students. For example, one in-service teacher said in an interview:

> I watched two PSTs' DSs and found them very useful and instructive. The story, illustrations, sound, and movie-like products attracted the students' attention. They watched them with a high concentration. The students were very eager to participate in the discussions.

During the activities, the PSTs asked the students whether they liked the DSs or not. The analysis of the PSTs' journals and video records revealed that most of the students (*n* =523, 96.14%) liked to watch the DSs. They liked the stories (*n* =478), illustrations (*n* =462) and the PSTs' prosodic speaking skills (*n* =436). Nearly half of the PSTs (*n* =34) stated that the students felt very special when the PSTs said the DSs were created for them and that they asked the PSTs many questions about how to create the DSs, how to create the illustrations, how to record voices, and which software to use. Most of the students (*n* =492) asked these questions to learn how to create their own DSs. For instance, one fourth grader stated in an interview, "I really liked to watch the DS. I especially liked the hand-drawn animal characters... I would like to create a DS about spaceships. The most difficult part is to draw pictures, but I can easily draw spaceships."

The students' oral responses during the activities were analyzed using Wollman-Bonilla and Werchadlo's (1995, pp. 564–565) reader-centered and text-centered categories (see Table 5). Wollman-Bonilla and Werchadlo developed their classification to analyze students' responses to books. In the current study, because the students watched the DSs and, at the same time, read the written on-screen messages, if the DSs had any, I renamed Wollman-Bonilla and Werchadlo's reader-centered responses category as the viewer/reader-centered responses and renamed the text-centered responses category as the DS-centered responses. The analysis of the video records of the PSTs' activities revealed that the majority of the students gave viewer/reader-centered oral responses (76.52%), meaning that the students made explicit connections between their personal experiences and the DSs. The most frequently given viewer/reader-centered response type related to experience (37.43%), which implies that the students made connections between the events depicted in the DSs and their similar and different experiences. In addition, questions (13.54%) were the most frequent DS-centered responses. This means that the students had questions about the characters, themes, or illustrations (see Table 5).

Table 5. The Students'Oral Responses to the DSs

Responses to the DSs	n	%
DS-centered responses	170	23.48
Retelling	25	3.45
Understanding characters	40	5.52
Question	98	13.54
Prediction	7	0.97
Viewer/reader-centered responses	554	76.52
Personal reaction	180	24.86
Relating to experience	271	37.43
Self in story	103	14.23
Total	724	100

CHANGES IN THE INSTRUCTIONAL ENVIRONMENT

The reflective journals and the video records revealed that 19 PSTs changed the seating arrangement of the classrooms. In the individual interviews, the PSTs stated that the U-shaped classrooms improved the communication between the students because they could see both the DSs and their friends' oral and nonverbal reactions easily.

UNANTICIPATED EFFECTS OF THE INTERVENTION

The analysis of the reflective journals revealed that nearly all the PSTs (n =70) expressed their appreciation of participating in the workshops and learning how to create a DS, which may be considered an expected result. However, the elementary school students' and in-service teachers' questions to the PSTs and to me, and their efforts to create their own DSs were the unanticipated effects of the intervention. As Laughlin and Winkley (2007) indicated, the teachers and students had a story to tell, and they thought that the DSs were a suitable medium with which to organize and share their messages. Individual interviews with the PSTs revealed that, even though it was not an intended aim of this study, many elementary school students (n =49) learned from the PSTs how to use Microsoft Photo Story 3 for Windows and to create their own personal DSs. In addition, four in-service teachers requested help from the PSTs to conduct digital storytelling projects with their students.

DISCUSSION

The results showed that the educational goals of this study were achieved. First, all the PSTs participated in the workshops and created original DSs in the area of children's literature. They wrote their own stories, used their own voices, and drew their own illustrations or used their own photos to make the DSs original. The PSTs evaluated the digital storytelling creation process as an enjoyable experience and were eager to use the DSs in their future classrooms, which is congruent with the literature (e.g., Karakoyun & Yapıcı, 2016; Kobayashi, 2012; Shelton et al., 2017). The results also

showed that the students and the teachers liked to watch the DSs. This result is consistent with the previous studies because it is well-documented in the literature that students and in-service teachers have positive opinions about digital storytelling (e.g., Smeda et al., 2014; Yılmaz et al., 2017) and that the DSs provide fun for both the PSTs and students (e.g., Demirer & Baki, 2018; Kocaman-Karoglu, 2016; Yee et al., 2018). The results of this study revealed that the students could comprehend the main ideas, talk about the literary elements (characters, plot, etc.), and participate in the discussions. Parallel to this result, the in-service teachers also found the DSs very useful and instructive tools. Many scholars (e.g., Dogan & Robin, 2008; McLellan, 2006; Morgan, 2014) have also stated that educators and teachers can use digital storytelling in different content areas and that these tools are valuable to teach students 21st century skills, which Robin (2008b) listed as digital, global, technology, visual, and information literacy.

Second, as planned, the DSs were used as a tool to receive PSTs', students', and teachers' reflections. Previous studies showed that digital storytelling could be used as a reflection tool by teachers, students, and PSTs (e.g., Demirer & Baki, 2018; Yuksel-Arslan et al., 2016). In this study, during the production phase of the DSs, the PSTs reflected on their ideas and thoughts about their own and their peers' DSs. The dialogue among the PSTs helped them to stay on task and to increase the quality of their DSs. It is interesting to note that the PSTs combined Robin's (2006) two different storytelling styles—personal narratives and stories that inform or instruct—in their DSs. They most frequently narrated their own experiences or the key events of their own lives in their DSs in order to give the students important didactic or informative messages, such as listening to the advice of their parents and treating animals well. The students were very eager to watch the DSs and to talk about them. The majority of the students also gave viewer/reader-centered responses to the DSs, which meant the students responded to the PSTs' sharing of their personal experiences and stories by making connections with their own lives and experiences. The results confirmed that, as Ribeiro (2017) indicated, the interaction between the PSTs as the authors and creators of the DSs and the students as the audience, or the interaction among the students about the DSs, fostered the discussions and reflections. It can therefore be concluded that the DSs helped the PSTs to build a bridge between their own and the students' personal experiences and interpretations of the events depicted in the DSs.

The previous studies (Harriman, 2011; Kildan & Incikabi, 2015) showed that the digital storytelling creation process can help PSTs enhance their TPACK knowledge. Similarly, the intervention of this formative experiment helped the PSTs to increase not only their TPACK knowledge but also their practices. The PSTs used the children's literature-related TPACK knowledge in practice. For example, as indicated by the scholars studying in the area of the children's literature (e.g., Lynch-Brown et al., 2014; Russell, 2005), the PSTs most frequently chose child characters that were similar to the target audience or animal characters to arouse the students' interest in the DSs. In addition, they generally followed the time limits of the DSs indicated by the scholars (e.g., Robin, 2008a), created the storyboards, and used the suggested software to generate the DSs.

As mentioned previously, Agosto (1999) named the storytelling styles as parallel and interdependent. In this study, the majority of the PSTs chose parallel storytelling. The results also showed that 14 PSTs selected interdependent storytelling, and 12 of them created their DSs for the third and fourth grades. These PSTs expected these younger students to interpret the pictorial, textual, and verbal messages to make meaning. It can thus be concluded that the PSTs took into consideration the students' grade levels and cognitive potentials while planning the combination of pictures, texts, and verbal messages for the settings of the DSs.

A review of the literature did not reveal any research studies that used the TPACK and formative experiment frameworks to create DSs and used these products in authentic classroom environments. The results of this study therefore make important contributions to the practitioners and to the literature. First, the results extend the literature by providing important empirical evidence about the PSTs' knowledge and practices in creating DSs in the area of children's literature. For example, this study revealed the PSTs' preferred storytelling style and their efforts to create original DSs. Second, the formative experiment approach allowed me to present the modifications of the intervention. These modifications and the intervention topics can provide important and useful hints

for teacher educators to enable their PSTs to create original DSs in the areas of children's literature and language arts. Finally, the theoretical framework of this study can give scholars important ideas for developing digital storytelling-related interventions in other content areas.

LIMITATIONS

In this study, the in-service teachers and students did not participate in the workshops and only watched the final products. The future formative experiments should include them as designers of the DSs.

CONCLUSION

This study helped the PSTs to increase their TPACK knowledge and practices. The PSTs told their own original stories with their own prosodic voices and mostly hand-drawn illustrations and conveyed to the students didactic and informative messages with these children's literature-related DSs. Even though the PSTs experienced some difficulties in the different phases of the digital storytelling creation process, such as writing the stories and drawing the illustrations, considering the students' grade levels, the idea of creating original DSs for the students gave the PSTs motivation and encouragement to do their best. In the end, the students and teachers had very positive reflections on and responses to these original DSs. As teacher educators, we should help PSTs tell their stories by creating original DSs and encourage them to share these valuable products with students and teachers in authentic classroom environments.

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APPENDIX A

SURVEY

1. What is digital storytelling? Please explain.

2. Please list the types of DSs.

3. Please list the literary and artistic elements of the stories.

4. How do you judge the quality of stories created for the students? Please explain.

5. Do you have the ability to write stories for elementary school students?

6. Do you have the ability to draw pictures?

7. What are parallel and interdependent storytelling?

8. How can the qualities of the DSs be evaluated? Please explain.

9. How can teachers assess students' comprehension levels of the stories?

10. How and for what purpose do teachers assess students' retellings, reflections, and responses?

11. What is prosody? Please explain.

12. Have you ever used the software Microsoft Photo Story 3 for Windows? *

13. Have you ever created a DS? If your answer is yes, please explain how and for what purpose you created it.*

12. Do you think that you have the ability to create a quality DS? **

13. Do you have an intention to teach the digital storytelling creation process to your future students? **

To avoid repetition:

*These questions were not included in the post-survey.

**These questions were not included in the baseline survey.

APPENDIX B

Table 1. An Example of a Coding Table

Codes	Baseline Survey	Interviews with the PSTs	Interviews with the In-service Teachers	Interviews with the Students	PSTs' Reflective Journals	Researcher's Observation Notes	Post Intervention Survey
The continuity of the characters	✓	✓			✓	✓	✓
Creating original pictures and images	✓	✓	✓	✓	✓	✓	✓
PSTs' own prosodic speaking skills	✓	✓	✓	✓	✓	✓	✓
Their peers' prosodic speaking skills		✓			✓	✓	✓

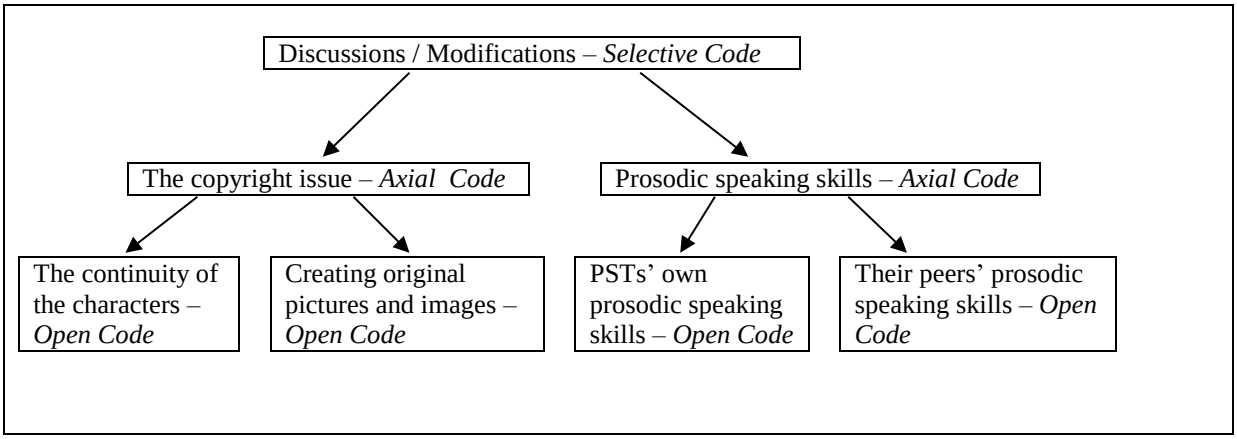
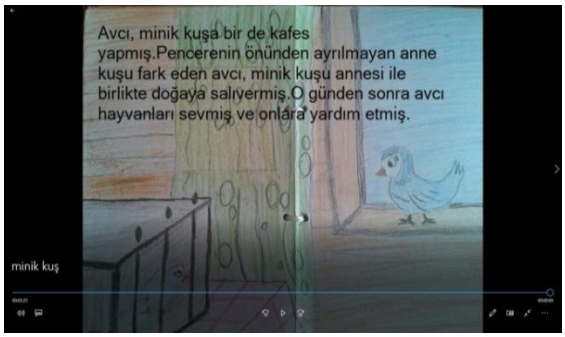


Fig 1. An Example of a Coding Diagram

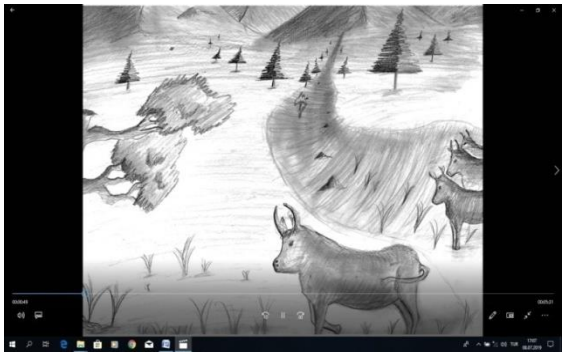
APPENDIX C

Sample screenshots from the digital stories



1) The name of the DS is *The Little Birdie (Minik Kuş)*. A female PST used colored pencils to create the drawings. The DS included typed texts.

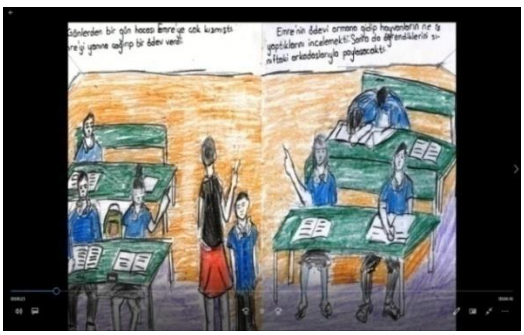
2) The name of the DS is *Aleyna's Dream (Aleyna'nın Rüyası)*. A female PST used markers and crayons to draw the pictures. In addition, she used a collage technique and glued the materials onto the pages.



3) The name of the DS is *Water Buffalos (Mandalar)*. A male PST used a pencil to draw the pictures.

4) The name of the DS is *If We Are Determined (Azimli Olursak)*. A female PST used a pencil to draw the pictures.

5) The name of the DS is *A Herd Without a Shepherd (Çobansız Sürü)*. A female PST used a collage technique to create the illustrations.



6) The name of the DS is *Emre's Homework (Emre'nin Ödevi)*. A male PST used a pencil and crayons to draw the pictures. The DS included handwritten texts.