The Eurasia Proceedings of
Educational & Social Sciences (EPESS)
ISSN: 2587-1730

The Eurasia Proceedings of Educational & Social Sciences (EPESS), 2021

Volume 21, Pages 1-14

IConSoS 2021: International Conference on Social Science Studies

The Effect of Digital Story-Supported Science Practices on the Scientific Attitudes of 7th-Grade Students

Imren CALIK
Eskisehir Osmangazi University

Munise SECKIN-KAPUCU
Eskisehir Osmangazi University

Abstract: This study aims to examine the effect of supporting science applications courses with digital stories on the scientific attitudes of 7th-grade students. In this study, a quasi-experimental design was used. The study was carried out in the 2020-2021 academic year, during the 7th-grade Science Applications course of a state secondary school affiliated to the Eskisehir Provincial Directorate of National Education. The study sample consisted of 93 students from four branches, 53 male and 40 female, taking the Science Applications course. The lessons were supported by digital stories in the experimental group during the implementation process, whereas the control group followed the current curriculum. The data collection process was completed in six weeks. The scientific attitude scale was applied in the first week of this six-week process as the pre-test. 12 digital stories were used in the second, third, fourth, and fifth weeks. The scientific attitude scale was applied in the last week again as the post-test. Descriptive statistics and t-test for dependent and independent groups were used to analyze the quantitative data obtained from the Scientific Attitude Scale. A significant difference was found between the pre-test and post-test mean scores of experimental and control group students regarding their scientific attitudes, the pre-test-post-test related to the scientific attitudes of control group students, and the pre-test-post-test mean scores of experimental group students' scientific attitudes. As a result of the statistical analysis, it was concluded that digital storytelling positively improved students' scientific attitudes in the applied group.

Keywords: Digital storytelling, Scientific attitude, Science applications course

Introduction

In the 21st century, the importance of qualified human resources is increasing day by day. Technological and scientific developments, which are constantly changing, play a significant role. The countries leading in technology and science have reformed their education systems to raise qualified individuals who can adapt to the current age requirements. For this reason, education is changing in line with the needs of the 21st century and students' expectations. The skills expected from individuals in the 21st century include collaborative working, information-media & technology literacy, communication & technology use skills, creative and critical thinking, problem-solving, producing, and learning to learn (ATC21S, 2019; ISTE, 2019; P21, 2019; OECD, 2019). On the other hand, the digital storytelling process meets most of the skills students should have in the 21st century (Jakes, 2006, p. 1). Being creative, taking risks, using cutting-edge tools to communicate engagingly makes digital storytelling a process that genuinely reflects 21st-century learning (Jakes, 2006, p. 1). Digital storytelling is an innovative approach that combines creativity and technology, offering the opportunity to integrate teaching and learning into technology-rich environments (Smeda et. al., 2010. p. 6).

- Selection and peer-review under responsibility of the Organizing Committee of the Conference

Digital Story

What is a Digital Story?

With their intercultural and international use from past to present, stories have been an effective tool in transmitting events that individuals have lived or designed. With the development of technology, stories that have shifted from oral transmission to written narrative have turned into digital story formats as digital technology is introduced into our lives. Digital storytelling is defined as follows: bringing together multimedia tools such as text, audio, and video of the determined subject (Robin, 2006, p. 709), presenting the subject aesthetically by including multimedia tools such as text, sound, image, and video through a computer (Chung, 2006, pp. 35-36), and combining written, verbal, visual and animated symbols into short videos of 3 to 5 minutes (Tatum, 2009, p. 7). To summarize, digital stories are short stories using visual, audio, audio-visual multimedia elements and created by combining text, images, voiceovers, video, and music around a specific theme, from a specific perspective.

The Emergence of Digital Storytelling

The starting point of digital storytelling is a series of workshops designed and conducted by Dana Atchley and Joe Lambert in the early 90s. In 1994, the San Francisco Digital Media Center was established with the participation of Nina Mullen. San Francisco Digital Media Center moved to Berkeley in 1998 and started to use the name Center for Digital Storytelling. Since 2015, the organization has continued to work under the name of StoryCenter (Story Center, 2018).

Types of Digital Storytelling

In digital storytelling, studies were initially carried out on personal storytelling, and with its widespread use, different genres emerged over time. Garrety (2008, p. 14) classified digital stories as traditional digital stories, didactic digital stories, project-based digital stories, social justice, and culture themed digital stories, and digital stories that reflect a person; Gregori-Signes and Pennock-Speck (2012, p. 3) divided them into two as social and educational digital stories; and Robin (2006, p. 710) classified them as personal, historical and instructive stories.

The Elements of a Digital Story

Seven elements that are accepted as a guide for starting digital story creation are expressed by Lambert (2010) as follows: A point of view, A dramatic question, Emotional content, The gift of your voice, The power of the soundtrack, Economy, Pacing.

Digital Story Making Process

The digital story preparation process must be planned correctly for the created story to reach its purpose and goal. Different researchers have expressed this process in different stages (Barrett, 2009; Jakes et. al., 2005; Kearney, 2011; Lambert, 2010; Lasica, 2006; Morra, 2013; Robin et. al., 2012; Robin, 2014; Tolisano, 2008). Robin (2014) described the digital story creation process as seven stages: writing a story script, creating a flowchart, researching images, sounding the story, preparing the digital story, evaluating the digital story, and publishing the digital story.

Various technological tools and software form an essential part of the story creation process in bringing the digital story to life. The transformation of stories into digital story formats and the design of how they will look and be heard is possible with technological tools and software.

Robin grouped technological tools & software that can add and combine elements such as text, picture, music, and sound in creating a digital story under three main categories (2016, pp. 25-26). These are; Software used in desktops and laptops (Microsoft Photo Story 3, OpenShot Video Editor, Imovie, Scratch), software used in the web environment (Animoto, Wevideo, ToonDoo, StoryBird, GoAnimate), and software used in smartphones and tablets (iMovie for iPad, Story Creator, Kids Story Builder).

There are national (Büyükcengiz, 2017; Çiçek, 2018; Demirer, 2013; Kahraman, 2013; Karataş et. al., 2016; Kotluk et. al., 2015; Toprak, 2019; Torun, 2016; Ulum, 2017; Ulum et. al., 2018; Ulusoy, 2019) and international (Hung et. al., 2012; Kim, 2019; Robin, 2007; Titus, 2012) studies in the literature discussing different aspects of digital storytelling in science courses. Kim (2019) investigated the effects of digital storytelling on the motivation and scientific attitudes of 5th-grade students towards science courses and reported that digital storytelling had a statistically significant effect on their motivation and scientific attitudes towards science learning. In addition, the digital story had a positive effect on students' discovery of scientific principles. Büyükcengiz (2017) also stated that digital storytelling contributes positively to the achievement and attitudes of students in secondary school science courses and lets them develop positive attitudes towards the course.

The review of the studies showed no study addressing the effect of digital story applications on the scientific attitudes of 7th-grade students in the science applications course. The study is thought to be a source for future researches to be carried out in this field.

Scientific Attitude

Attitude is the behavior of individuals in the face of any situation (İnceoğlu, 2010. p. 7). It is a directive tendency that is the primary determinant of an individual's feelings, thoughts, and behaviors. They are the tendencies emerging with learning; they reveal behaviors that cannot be seen directly but can be observed and examined (Şimşek et. al. 2013, pp. 133-134).

On the other hand, scientific attitude is defined as the individual's ability to find solutions and interpret the problems they encounter by supporting them with logical data from an objective point of view. In short, scientific attitude is investigative thoughts and behaviors that facilitate transferring the competencies in research to experience (Başaran, 1978; Jayasree et. al., 1999). According to Başaran (1988, p. 300), individuals with a scientific attitude are willing to identify and solve the situation or problem they face; they design various ways to solve it, begin to question these ways, and evaluate the result. The scientific attitudes and behaviors that individuals should possess are, being open-minded, logical, and skeptical, being objective in thoughts and observations, making decisions based on evidence, and being patient in their studies (Karasar, 2014, p. 48).

Regarding the studies on scientific attitude in the literature, the ones in science teaching and learning were carried out with students at different education levels (Çanak, 2017; Demirbaş et. al., 2008; Demirbaş et. al., 2011; Gültekin, 2019; Kılıç, 2011; Moore et. al., 1997; Pearson, 1993; Pitafi et. al., 2012; Click, 2021). The studies addressing the subjects similar to this study are as follows: Demirbaş et. al. (2008) investigated the effect of social learning theory on the development of scientific attitudes. They showed that employing social learning theory-based activities in teaching the lesson increased students' scientific attitudes. Çanak (2017) investigated the effect of science applications courses on the scientific attitudes of secondary school students and reported a significant and strong difference in the scientific attitudes of the students at the end of eight weeks.

In our era where technology is developing rapidly, education methods are carried out with technical support. Along with the 2018 curriculum, eight key competencies are mentioned in the Turkish Qualifications Framework; competency in science/technology and digital competence are two of them. Digital competence means the critical use of information and communication technologies necessary in daily life and business life (MoNE, 2018, p. 6). Ferrari et. al. (2012, p. 84) defined digital competence as awareness in tasks such as solving problems, communicating, taking responsibility, and sharing information while using information and communication technologies. According to the constructivist teaching approach and the eight key competencies in the Turkish Qualifications Framework, using technology in teaching environments provides students with an enriched learning environment. The digital story is one of these methods contributing to it.

The literature review revealed that the studies on the use of the digital story in the science applications course (Valkanova et. al., 2007) and the studies investigating the effects on the scientific attitudes of the students (Kim, 2019) are insufficient. Funny and exciting stories can positively contribute to science learning (Rowcliffe, 2004). Scientific theories and concepts may become more meaningful with concrete examples and facilitate students' understanding (Abrahamson, 1998; Klassen, 2006; Weber, 1990). In addition, scientific stories cause students to develop positive attitudes towards science and science learning (Avraamidou et. al., 2009; Sadler, 2009). The digital stories included in this study tell real-life stories of scientists and scientific studies. In addition, the digital stories discussed in the study emphasized what science is, how scientific knowledge is produced, and how scientists work. These emphases are made through the characters used in the digital stories. Digital stories help today's youth, who was born and raised with technology, in learning. So, in this study, the effect of digital stories, which is a technological tool, on scientific attitude is discussed. The difference of the study is revealing the effect of science applications courses supported by digital stories on 7th-grade students' scientific attitudes. This study will show the necessity and benefits of digital stories for science applications courses and students, contributing to the literature on this subject.

Purpose of the study

This study aims to examine the effect of science applications courses supported by digital stories on the scientific attitudes of 7th-grade students and their views on the nature of science. For this purpose, the following questions were addressed:

- Is there a significant difference between pre-test scores of experimental and control group students?
- Is there a significant difference between pre-test and post-test scores of control group students?
- Is there a significant difference between pre-test and post-test scores of experimental group students?
- Is there a significant difference between post-test scores of experimental and control group students?

Method

Research Model

An experimental design was used in this study, in which the effect of digital story-supported science applications courses on the scientific attitudes of 7th-grade students was examined. Experimental designs aim to test the cause-effect relationship between variables (Fraenkel et. al., 2006, p. 261). In this study, a quasi-experimental design with a pre-test-post-test control group was used. The quasi-experimental design is preferred when it is impossible to control all variables (Cohen et. al., 2007, p. 275). Therefore, it is frequently preferred in the field of education.

Study Group

After obtaining the necessary permissions, this study was carried out in the 2020-2021 academic year, in the 7th-grade science applications course of a state secondary school affiliated to the Eskişehir Provincial Directorate of National Education. The determination of control and experimental groups was based on the guidance of the classroom teacher. Four branches with similar characteristics were selected from fourteen branches. The 2019-2020 science course grades of these four branches were equal, and their attitudes towards science applications were similar. Besides, the same teacher teaches the science applications course of the four branches. The data of 93 students, 53 boys and 40 girls, were evaluated in the study. The independent groups t-test results of the 6th-grade science passing grades, used to determine the experimental and control groups, are given in Table 1.

Table 1. Comparison of students' passing grades

Group	n	$\bar{X}$	SD	t	sd	p
Experimental	46	94.5435	5.76	0.002	91	0.998
Control	47	94.5460	4.75			

There is no statistically significant difference between the t-test results of 6th-grade science course passing grades of experimental and control group students (t=0.002; p>.05). There is no significant difference between the average scores of the students regarding the 6th-grade science course passing grades. Therefore, students' readiness levels in the experimental and control groups were similar before the experiment. 7/A and 7/I classes were randomly selected to form the control group, and 7/H and 7/M classes to form the experimental group.

Data Collection Tools

Scientific Attitude Scale (SAS)

In the study, the Scientific Attitude Scale developed by Moore et. al. (1997) and adapted into Turkish by Demirbaş et. al. (2006) was used to investigate the effect of digital stories on students' scientific attitudes. The scale's original consisted of 60 items, but it was reduced to 40 items while adapting to Turkish. The 40 items in the scale are structured to explain the nature of science, how scientists work, and how students feel about science. The scale consists of 40 items of 5-point Likert type (20 positive, 20 negative). In addition, it is divided into six subscales. Five subscales are about the nature of science and how scientists work; one subscale includes items about how students feel about science. The answers given by the students are scored as "Strongly Agree-5", "Agree-4", "Neither Agree, Nor Disagree-3", "Disagree-2", and "Strongly Disagree-1". Therefore, the highest and lowest score obtained from the scale varies between 200-40. The reliability coefficient of the scale was calculated as 0.76. In this study, the reliability coefficient was 0.54 for the pre-test and 0.69 for the post-test.

In addition, in line with the expert opinion, the researcher preferred to use the expression "Scientist" in the scale instead of "Man of Science"; "Neither Agree nor Disagree" was preferred instead of "I am undecided" in the agreement level to the items.

Data Collection

Digital stories to be used in the lessons and the link of the data collection tools were sent to the teacher by e-mail before implementation. At the beginning of the implementation process, the students were explained that this study was for research purposes. At the same time, they were also informed that this study would not affect their grades and their personal information would be kept confidential. Every stage of the implementation process was carried out in the online distance education process over the digital education platform. Pre-test and post-test were prepared electronically, and students were requested to fill them.

The study started in the fall semester of 2020-2021 academic year, with the 7^{th}-grade students of a secondary school in Eskişehir. Experimental and control groups were randomly assigned from equivalent groups (determined regarding 6^{th}-grade science course passing grades and the guidance received from the course teacher). After performing the pre-test in both experimental and control groups, the implementation was started. After the four-week application, the post-test was applied to both groups.

Implementation

The study was carried out with 7^{th}-grade students of a secondary school located at the city center of Eskişehir in the fall semester of the 2020-2021 academic year. The classes with similar academic achievement levels in science courses were selected as the study group and randomly assigned as experimental and control groups. In the study, digital stories prepared by science teacher candidates within the scope of another scientific research project for the Special Teaching Methods II Course were used (Seckin Kapucu et. al., 2020). These stories were examined by field education experts (science education and educational technology experts) in terms of the characteristics of scientific knowledge and creating digital stories. The study was carried out by the teacher of the course with the participation of the researcher. Every implementation stage was carried out by the teacher, researcher, and students as online distance education over the digital education platform. Before starting the implementation, the students in the experimental and control groups were informed that the study would not affect their grades, their names would be kept confidential, and the study was conducted for research purposes. The implementation was completed in a total of eight course-hour in four weeks, covering two course hours each week. The application took two course hours (30+30=60 minutes) per week. Digital story applications were made in the first hour, and the activities related to the current course program were carried out in the second.

The implementation was carried out with 46 students, 28 boys, and 18 girls, in the experimental group. A total of 12 digital stories were used, as three digital stories each week. These digital stories talked about striking examples of the scientists' life stories who worked on the subjects included in the secondary school science curriculum (solar system and beyond, cell and divisions, force and energy, pure matter and mixtures, the interaction of light with matter and electrical circuits units). The data collection process was completed in six weeks. SAS was applied to the experimental group as a pre-test in the first week. Digital stories were used in the second, third, fourth, and fifth weeks. SAS has been applied again as a post-test in the last week, and the study data were collected.

On the other hand, SAS was applied as a pre-test and post-test in the first and last week of the six-week period in the control group; no other action was taken. The science applications course was taught to 47 students, 25 boys and 22 girls, following the current curriculum. The same teacher carried out the lessons in the experimental and control groups. While using digital stories in the experimental group, control group students were informed about important scientists (Neil Armstrong, Ali Kuşçu, Yuri Gagarin, Hans Lippershey, Galileo, Robert Hook) mentioned in the units of space, cell, mitosis, meiosis, work, energy conservation, and friction and related questions were answered. Brief information is given about one of the 12 digital stories used in the experimental group below. A section from Edwin Powel Hubble's Digital Storyboard, the second digital story named “The Man who Expanded the Universe,” is shown in Table 2.

Digital story 2: This digital story talks about the astronomer Edwin Hubble. It includes the topics of universe and galaxy, Hubble's work on the light spectrum, and the Hubble-Humason Law. In addition, the nebula and galaxy pictures displayed by Hubble are also included. The story lasts 03.31 minutes.

Table 2. Digital storyboard of "The man who expanded the universe."

Scene	Text
	Character 3: The man who expanded the universe
	Character 2: Ever since humankind began to contemplate the universe's structure, it has generated ideas about its dimensions. However, an American astronomer would solve the riddle of the possible limits of the universe.
	Character 3: The name of this American astronomer is Edwin Hubble. He was born in the USA in 1889. Hubble has had an affinity for the sky since he was young.
	Character 2: Hubble graduated from the University of Chicago with a Bachelor of Science.
	Character 3: He studied law at Oxford University in England. He worked as a lawyer for a while and then started studying on the sky.
	Character 2: At Hale Observatory in California, he tried to solve the mystery of the universe and proved many issues that scientists before him could not explain.
	Character 3: Most astronomers thought that the universe consisted of solely the Milky Way galaxy. Hubble saw a constellation and concluded that it was in another galaxy because it was so far away. He proved that the Andromeda Galaxy is another galaxy, so there are other galaxies besides ours.

	Character 2: With his friend Humason, they explained the speed of galaxies, and they introduced the famous Hubble-Humason Law. They came up with the theory that the universe is expanding.
	Character 3: Hubble has also worked on the light spectrum. He realized that for a redshift to occur, the stars should be moving away from us.

Data Analysis

In the study, SAS was applied as a pre-test and post-test to determine the effect of supporting science applications courses with digital stories on the scientific attitudes of the students. SPSS 20 was used in the analysis of the data obtained from SAS. Descriptive analysis was used to calculate the frequency, arithmetic mean, minimum and maximum, standard deviation, skewness and kurtosis, and Kolmogorov-Smirnov normality values of the data obtained from the experimental and control groups.

First of all, the normality of the data was checked. Usually, the Shapiro Wilk test is used in groups with less than 29 students, and the Kolmogorov-Smirnov test is used in groups with more participants (Kalaycı, 2008, p. 13). Since the number of students in the study group was over 29, the Kolmogorov-Smirnov normality test was employed in this study. As the data showed normal distribution, dependent groups' t-test and independent groups' t-test were used to determine whether the difference between the pre-test and post-test results is significant or not. For significant differences, eta squared (η2) was calculated to determine the effect of the independent variable on the dependent variable. The coefficients were interpreted as follows; 0.01 - small effect size, 0.06 - medium effect size, and 0.14 - large effect size (Cohen, 1988, p. 25).

Internal and External Validity of the Study

The factors that affect internal and external validity and the measures taken are explained below. Regarding internal validity, pre-experimental measurement factors were minimized with the following measures: selecting the students who form the study group among those who take 7^{th}-grade science applications course, selection of students of the same age and grade level, the maturation of the participants after six-week study, the use of the same measurement tool in both groups, the performance of the implementation by the course teacher, leaving four weeks between pre-test and post-test applications, which is considered to be sufficient to prevent the recall of pre-test items.

Regarding the factors affecting external validity, the effect of variable interaction is minimized with the following measures: the sample of the study consists of 93 participants (sampling effect), no information (tests to be applied and experimental conditions) was given to the participants about the experimental process (expectation effect), and the same measurement tool was applied as pre-test and post-test to the experimental and control groups (pre-test experimental variable interaction effect).

Findings

Descriptive Statistics

The mean score, standard deviation, Skewness&Kurtosis values, and Kolmogorov-Smirnow normality test results obtained from the experimental and control group students by applying SAS as pre-test and post-test are given in Table 3. Experimental and control groups' pre-test and post-test scores show normal distribution regarding skewness, kurtosis, and Kolmogorov-Smirnov values ($p>.05$). It can be said that the mean score of experimental group students ($\bar{X}$ = 148,934) and control group students ($\bar{X}$ = 147,234) were similar before the implementation (Table 3).

Table 3. Descriptive statistics obtained from SAS

Tests	Groups	N	X̄	SD	Skewness	Kurtosis	Kolmogorov-Smirnow
Pre	Experimental	46	148.934	10.339	-.240	-.226	.200
	Control	47	147.234	8.369	-.390	-.278	.193
Post	Experimental	46	151.021	9.212	.580	-.236	.200
	Control	47	144.702	12.529	-.510	-.365	.200

Findings of the First Sub-Problem of the Study

Pre-test scores of the students in the experimental and control groups were examined to answer the sub-problem "Is there a significant difference between pre-test scores of experimental and control group students?" Since pre-test scores showed normal distribution, independent groups t-test was applied to determine whether the mean scores differed. The results are given in Table 4.

Table 4. Analysis results of experimental and control groups' pre-test scores

Group	X̄	SD	t	sd	p
Experiemntal	148.934	10.339	-.873	91	.385
Control	147.234	8.369			

Regarding Table 4, there is no statistically significant difference between experimental and control group students' pre-test scores (t=-.873; p>.05). As there is no significant difference between SAS pre-test scores, it was concluded that the control and experimental groups were similar. Accordingly, it can be said that the sample was divided into two equivalent groups before the implementation. The lack of difference between experimental and control groups' pre-test scores is an expected positive finding since the study groups were divided into similar groups.

Findings of the Second Sub-Problem of the Study

Pre-test and post-test scores of the students in the control group were examined to answer the sub-problem "Is there a significant difference between pre-test and post-test scores of control group students." Since the scores of both tests showed normal distribution, dependent groups t-test was applied to determine whether the mean scores differed. The results are given in Table 5.

Table 5. Analysis results of control groups' pre-test and post-test scores

Test	X̄	SD	t	sd	p
Pre-test	147.234	8.369	1.564	46	.125
Post-test	144.702	12.529			

There is a slight decrease in the post-test scores of control group students. However, test results show that this decrease is not statistically significant (t=1.564; p>.05) (Table 5).

Findings of the Third Sub-Problem of the Study

Pre-test and post-test scores of the students in the experimental group were examined to answer the sub-problem "Is there a significant difference between pre-test and post-test scores of experimental group students." Since the scores of both tests showed normal distribution, dependent groups t-test was applied to determine whether the mean scores differed. The results are given in Table 6.

Table 6. Analysis results of experimental groups' pre-test and post-test scores

Test	X̄	SD	t	sd	p
Pre-test	148.934	10.339	-1.572	45	.123
Post-test	151.021	9.212			

Although there is no statistically significant difference between the pre-test and post-test scores of experimental group students (t=-1.572; p>.05), there is an increase in the post-test score (Table 6).

Findings of the Fourth Sub-Problem of the Study

Post-test scores of the students in the experimental and control groups were examined to answer the sub-problem "Is there a significant difference between post-test scores of experimental and control group students?" Since post-test scores showed normal distribution, independent groups t-test was applied to determine whether the mean scores differed. The results are given in Table 7.

Table 7. Analysis results of experimental and control groups' post-test scores

Group	X̄	SD	t	sd	p	η2
Experiemntal	151.021	9.212	-2.766	91	.007	.077
Control	144.702	12.529				

Table 7 shows that the post-test score of the experimental group is higher than the control group. There is a statistically significant difference between experimental and control group students' post-test scores (t=-2.766; p<.05). The effect size of the difference is 0.077, implying a moderate effect (Cohen, 1988, p. 25). As a result, a significant difference with a moderate effect size was found.

Results

Regarding the results of the sub-problems, there is no significant difference between SAS pre-test scores of experimental and control group students in the first sub-problem. This finding shows that the experimental and control group students' scientific attitudes were similar at the beginning of the study.

In the second sub-problem, a decrease was observed in the control group's post-test scores compared to the pre-test. However, the difference between the scores was not significant. This finding shows that the instruction of the subjects according to the current curriculum did not cause a change in students' scientific attitudes.

In the third sub-problem, there was an increase between pre-test (148.934) and post-test (151.021) scores of experimental group students, but this difference was not statistically significant. According to this result, digital story-supported science application courses affected students' scientific attitudes positively. However, pre-test and post-test scores of the experimental group students did not differ significantly, showing that digital story applications do not have a statistically significant positive or negative effect on scientific attitude levels.

In the fourth sub-problem, a significant difference was observed between experimental and control group students' post-test scores in favor of the experimental group. This significant difference shows that digital story applications in science applications course significantly affect students' scientific attitudes. In addition, supporting science applications courses with digital storytelling was more effective on scientific attitude than instructing it by adhering to the current curriculum. According to the calculated eta square effect sizes, approximately 8% of the observed variance of students' scientific attitude scores was related to digital storytelling.

Conclusion

The role of digital technology applications and tools in our daily life has become increasingly important day by day. Digital technologies can be defined as all kinds of hardware and software devices that facilitate communication, access, transmission, and storage of information in the digital environment (Mercader et. al., 2020, p.1). Digital technologies are of vital importance in our lives and many organizations, such as educational institutions. Digital technology provides flexible, ubiquitous, on-demand, and online access in education, especially in this challenging period. The pandemic has re-emphasized the importance of digital technologies in our lives, increasing the use of technology-mediated environments. This situation requires us to make radical changes in our education and training systems. The transition to online and digital education formats, distance education, and learning processes became critical. The competencies and skills expected from the learners and teachers have changed due to the developments in technology. Digital storytelling is thought to be one of the methods that will enrich the learning environments of 21st-century students and contribute to the development of the educational process with digital technology.

In the current study, post-test scores of the control group students showed a slight decrease compared to the pre-test scores, but this decrease was not significant. It was concluded that the instruction of the science applications course according to the current curriculum and with the traditional method did not affect students' scientific attitudes. Similarly, Baran (2013), Emren et. al. (2019), and Mutlu (2012) concluded that traditional methods did not cause any change in students' scientific attitudes.

Considering that both environmental and individual factors are influential in the development of scientific attitude, the use of the existing potential of people, institutions, and opportunities that constitute an individual's environment will encourage them to do science and help them to look at what is happening around them from the lenses of science (Şan et. al., 2013, p. 438). The change in students' environmental factors that occurred with the pandemic may have prevented control group students' scientific attitudes from increasing. Regarding the difference between experimental group students' pre-test and post-test scores, it can be said that supporting science applications courses with digital storytelling positively affected students' scientific attitudes. However, it did not cause a statistical difference. It is thought that total score analyzes were insufficient to explain the reasons underlying this result, and a more detailed analysis of the sub-dimensions may be more meaningful.

Finally, the review of post-test total scores of experimental and control group students showed a significant difference in favor of the experimental group. This difference arose from the decrease in the post-test scores of control group students and the increase in the post-test scores of experimental group students. Similarly, Kim (2019) found that digital storytelling had a statistically significant effect on students' scientific attitudes. This study's conclusion that digital storytelling positively affects students' scientific attitudes overlaps with the literature.

In this study, the implemented digital stories had a positive effect on the scientific attitudes of the students. Regarding the studies in the related literature, many studies concluded that digital storytelling affects students' attitudes positively (Bilen et. al., 2019; Demirer, 2013; Dinçer, 2019; Hung et. al., 2012; Yang et. al. 2012; Yoon, 2013). However, the number of studies in the literature investigating the relationship between digital stories and scientific attitude is very deficient (Kim, 2019). The literature includes some studies concluding that STEM applications (Admawati et. al., 2018; Setiawaty et al., 2018) and science applications courses (Çanak, 2017; Öner, 2015) improve students' scientific attitudes. In line with the findings obtained from the current study, digital story application is thought to improve the scientific attitude.

The study's limitations can be outlined as follows: it is limited to the science applications course opened in the fall semester of the 2020-2021 academic year, with experimental and control groups from 7th-grade students of a state secondary school in Eskişehir province Odunpazarı district. It is limited to the Scientific Attitude Scale (SAS) and digital stories used in the study.

Recommendations

Based on the results obtained from the study and the researcher's experiences, the following suggestions are submitted to be beneficial for the researchers in future studies on digital storytelling.

- There was no significant difference between the pre-test and post-test scientific attitudes scores of control group students. It is recommended to review existing programs for improving scientific attitude.
- There was a significant difference between the post-test scores of experimental and control group students. In this study, the digital story application process was carried out in a total of eight lesson hours in four weeks, using two lesson hours a week. The effect of the application may further be analyzed by extending this process.
- In this study, twelve digital stories involving the units of the solar system and beyond, cell and divisions, force and energy, pure matter and mixtures, the interaction of light with matter, and electrical circuits were prepared and used on 7th-grade students. Different digital stories can be prepared for different units and applied at different grade levels. Studies examining the effects of digital stories in different courses, at different grades, and with different variables can be conducted.

Acknowledgments or Notes

This study, named "The Effect of Digital Story-Supported Science Practices on the Scientific Attitudes of 7th-Grade Students," was produced from a part of the thesis written by the first author under the supervision of the second author.

Scientific Ethics Declaration

The authors declare that the scientific ethical and legal responsibility of this article published in EPESS journal belongs to the authors.

References

Abrahamson, C. E. (1998). Storytelling as a pedagogical tool in higher education. *Education, 118*(3), 440-452.

Admawati, H., Jumadi, J., & Nursyahidah, F. (2018). The effect of STEM project-based learning on students' scientific attitude based on social constructivism theory. In Rooselyna Ekawati, M. Si., Ph. D (Ed), *Mathematics, Informatics, Science, and Education International Conference (MISEIC 2018)* (pp. 270-273). Atlantis Press. doi:10.2991/miseic-18.2018.65

ATC21S. (2019). Assessment and Teaching of 21st Century Skills. Retrieved from http://www.atc21s.org

Avraamidou, L., & Osborne, J. (2009). The role of narrative in communicating science. *International Journal of Science Education*, *31*(12), 1683-1707.

Baran, B. (2013). *Bilim tarihi ve felsefesi öğretim metodunun fen bilimlerine yönelik tutum ve motivasyon üzerine etkisi* [Yayınlanmamış yüksek lisans tezi]. Gaziosmanpaşa Üniversitesi.

Barrett, H. C. (2009). *How to create simple digital stories*. Retrieved from https://electronicportfolios.com/portfolios/SITEStorytelling2006.pdf

Başaran, İ. E. (1978). *Eğitim psikolojisi*. Bilim Matbaası.

Başaran, İ. E. (1988). *Eğitim psikolojisi modern eğitimin psikolojik temelleri* (2. Baskı). Ayyıldız Matbaası.

Bilen, K., Hoştut, M., & Büyükcengiz, M. (2019). The effect of digital storytelling method in science education on academic achievement, attitudes, and motivations of secondary school students. *Pedagogical Research, 4*(3), 1-12.

Büyükcengiz, M. (2017). *Dijital öyküleme metodunun ortaokul öğrencilerinin fen bilimleri dersi akademik başarı, bilimsel süreç becerileri ve derse yönelik tutumlarına etkisi* [Yayınlanmamış yüksek lisans tezi]. Akdeniz Üniversitesi.

Chung, S. K. (2006). Digital storytelling in integrated arts education. *The International Journal of Arts Education, 4*(1), 33-63.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Earlbaum Associates.

Cohen, L., Manion, L., & Morrison, K. (2007). *Research methods in education* (6th ed.). Routledge Falmer.

Çanak, S. (2017). *Bilim uygulamaları dersinin ortaokul öğrencilerinin bilimsel tutum üzerine etkisi* [Yayınlanmamış yüksek lisans tezi]. Kırıkkale Üniversitesi.

Çiçek, M. (2018). *Dijital hikayeleme yöntemini kullanmanın altıncı sınıf fen bilimleri dersindeki etkisinin incelenmesi: Bir karma yöntem araştırması* [Yayınlanmamış doktora tezi]. Orta Doğu Teknik Üniversitesi, Ankara.

Demirbaş, M. ve Yağbasan, R. (2008). İlköğretim 6. sınıf öğrencilerinin bilimsel tutumlarının geliştirilmesinde sosyal öğrenme teorisi etkinliklerinin kullanılması. *Fırat Üniversitesi Sosyal Bilimler Dergisi, 18*(1), 105-120.

Demirbaş, M. ve Yağbasan, R. (2011). 2005 fen ve teknoloji öğretim programının, ilköğretim öğrencilerindeki bilimsel tutumların gelişimine etkisi. *International Online Journal of Educational Sciences, 3*(1), 321-342.

Demirer, V. (2013). *İlköğretimde e-öyküleme kullanımı ve etkileri* [Yayınlanmamış doktora tezi]. Necmettin Erbakan Üniversitesi.

Dinçer, B. (2019). *Dijital hikâye temelli matematik öğretiminin ortaokul öğrencilerinin kavram öğrenmeleri üzerine etkisi* [Yayınlanmamış doktora tezi]. Dokuz Eylül Üniversitesi.

Emren, M., İrez, S. ve Doğan, Ö. (2019). Bilim tarihi destekli işlenen "canlılarda enerji dönüşümleri" ünitesinin, öğrencilerin bilime ve biyoloji dersine olan tutumları ve bilimin doğası anlayışları üzerine etkisinin incelenmesi. *Trakya Eğitim Dergisi, 9*(3), 527-548.

Ferrari, A., Punie, Y., & Redecker, C. (2012). Understanding digital competence in the 21st century: an analysis of current frameworks. In A. Ravenscroft, S. Lindstaedt, C. Delgado, & D. Hernández-Leo (Eds.), *EC-*

TEL'12 Proceedings of the 7th European Conference on Technology Enhanced Learning (pp. 79-92). Springer-Verlag. doi:10.1007/978-3-642-33263-0_7

Fraenkel, J., R., & Wallen, N. E. (2006). *How to design and evaluate research in education* (6th Edition). McGraw-Hill Book Company.

Garrety, C. M. (2008). *Digital storytelling: An emerging tool for student and teacher learning* [Unpublished doctoral dissertation]. Iowa State University.

Gregori-Signes, C., & Pennock-Speck, B. (2012). Digital storytelling as a genre of mediatized self-representations: An introduction. *Digital Education Review*, *22*, 1-8.

Gültekin, M. (2019). *Ortaokul yedinci sınıf öğrencilerinin bilimsel tutum düzeylerinin incelenmesi* [Yayınlanmamış yüksek lisans tezi]. Yıldız Teknik Üniversitesi.

Hung, C. M., Hwang, G. J., & Huang, I. (2012). A project-based digital storytelling approach for improving students' learning motivation, problem-solving competence and learning achievement. *Educational Technology & Society*, *15*(4), 368-379.

International Society for Teaching Education. (2019). *ISTE standarts for student*. Retrieved from https://www.iste.org/standards/for-students

İnceoğlu, M., (2010). *Tutum, algı, iletişim.* Beykent Üniversitesi Yayınları.

Jakes, D. (2006). Standards-proof your digital storytelling efforts. Retrieved from http://mcgeef.pbworks.com/f/Standards-Proof+Your+Digital+Storytelling+Effor ts.pdf

Jakes, D., & Brennan, J. (2005). Digital Storytelling, visual literacy and 21st century skills. In *Online Proceedings of the Tech Forum New York.* Retrieved from http://d20digitalstorytelling.pbworks.com/f/storytelling+and+visual+literacy.pdf

Jayasree, K., & Rao, D. B. (1999). *Correlates of socialisation*. Discovery Publishing House.

Kahraman, Ö. (2013). *Dijital hikâyecilik metoduyla hazırlanan öğretim materyallerinin öğrenme döngüsü giriş aşamasında kullanılmasının fizik dersi başarısı ve motivasyonu düzeyine etkisi* [Yayımlanmamış yüksek lisans tezi]. Balıkesir Üniversitesi.

Kalaycı, Ş. (2008). *SPSS uygulamalı çok değişkenli istatistik teknikleri.* Asil Yayın Dağıtım.

Karasar, N. (2014). *Bilimsel araştırma yöntemi* (26. Baskı). Nobel Yayınevi.

Karataş, S., Bozkurt, Ş. B. ve Hava, K. (2016). Tarih öğretmeni adaylarının öğretim ortamlarında dijital hikâye anlatımı etkinliğinin kullanımına yönelik görüşleri. *International Journal of Human Sciences*, *13*(1), 500-509.

Kearney, M. (2011). A learning design for student- generated digital storytelling. *Learning, Media and Technology*, *36*(2), 169-188. https://doi.org/ 10.1080/17439884.2011.553623

Kılıç, B. (2011). *İlköğretim 8. sınıf öğrencilerinin bilimsel yaratıcılık ve bilimsel tutum düzeylerinin belirlenmesi* [Yayınlanmamış yüksek lisans tezi]. Eskişehir Osmangazi Üniversitesi.

Kim, S. S. (2019). The effects of situation-based class using digital-storytelling on elementary school students' science learning motivation and scientific attitude. *Journal of the Korean Society of Earth Science Education, 12*(3), 174-183. doi: 10.15523/JKSESE.2019.12.3.174

Klassen, S. (2006). Does a science story have heuristic power to promote learning? paper presented at the *First International Conference on Story in Science Teaching,* Munich.

Kotluk, N. ve Kocakaya, S. (2015). 21. yüzyıl becerilerinin gelişiminde dijital öykülemeler: Ortaöğretim öğrencilerinin görüşlerinin incelenmesi. *Eğitim ve Öğretim Araştırmaları Dergisi*, *4*(2), 354-363.

Lambert, J. (2010). *Digital storytelling cookbook*. Digital Diner Press. Retrieved from https://wrd.as.uky.edu/sites/default/files/cookbook.pdf

Lasica, J. D. (2006). Digital storytelling: A tutorial in 10 easy steps. Retrieved from https://www.socialbrite.org/2010/07/15/digital-storytelling-a-tutorial-in-10-easy-steps/

MEB (2018). *Fen bilimleri dersi öğretim programı (ilkokul ve ortaokul 3, 4, 5, 6, 7* ve 8. Sınıflar). Milli Eğitim Bakanlığı Yayınları.

Mercader, C., & Gairín, J. (2020). University teachers' perception of barriers to the use of digital technologies: the importance of the academic discipline. *International Journal of Educational Technology in Higher Education, 17,* 4. doi: 10.1186/s41239-020-0182-x

Moore, W. R. ve Foy, R. L. H. (1997) The scientific attitude inventory: A revision (SAI-II). *Journal of Research in Science Teaching, 34*(4), 327-336. doi:10.1002/(SICI)1098-2736(199704)

Morra, S. (2013). 8 Steps to great digital storytelling. Retrieved from https://samanthamorra.com/2013/06/05/edudemic-article-on-digital-storytelling/

Mutlu, S. (2012). *Bilimsel süreç becerileri odaklı fen ve teknoloji eğitiminin ilköğretim öğrencilerinin bilimsel süreç becerileri, motivasyon, tutum ve başarı üzerine etkileri* [Yayımlanmamış yüksek lisans tezi]. Trakya Üniversitesi.

OECD. (2019). *OECD future of education and skills 2030.*conceptual learning framework. Concept note: OECD learning compass 2030 (Paris, OECD Publishing). Retrieved from https://www.oecd.org/education/2030-project/teaching-and-learning /learning/learning-compass-2030/OECD_Learning_Compass_2030_concept_not e.pdf

Öner, A. (2015). *Seçmeli bilim uygulamaları dersinin 7. sınıf öğrencilerin fen ve teknoloji dersindeki bsb, tutum ve motivasyonlarına etkisi* [Yayınlanmamış yüksek lisans tezi]. Ağrı İbrahim Çeçen Üniversitesi.

Partnership for 21st Century Learning. (2019). Framework for 21st century learning. Batelle for Kids. Retrieved from http://static.battelleforkids.org/documents/p21/P21_Framework_Brief.pdf

Pearson, E. M. (1993). *Effects of teachers ınstructional method of the nature of scientific knowledge and scientific attitudes on students understanding of the nature of scientific knowledge and scientific attitudes* [Unpublished doctoral dissertation]. University Of Massachusetts Lowell.

Pitafi, A. I. ve Farooq, M. (2012) Measurement of scientific attitude of secondary school students in Pakistan. *Academic Research International*, *2*(2), 379-391. Retrieved from http://www.savap.org.pk/journals/ARInt./Vol.2(2)/2012(2.2-43).pdf

Robin, B. (2006, March). *The educational uses of digital storytelling.* In Society for Information Technology & Teacher Education International Conference (pp. 709-716). Association for the Advancement of Computing in Education (AACE). Retrieved from http://faculty.coe.uh.edu/brobin/homepage/Educational-Uses-DS.pdf

Robin, B. (2007). The convergence of digital storytelling and popular culture in graduate education. In R. Carlsen, K. McFerrin, J. Price, R. Weber & D. Willis (Eds.), *Proceedings of SITE 2007-Society for Information Technology & Teacher Education International Conference* (pp. 643-650). San Antonio, Texas, USA: Association for the Advancement of Computing in Education (AACE).

Robin, B. R. (2014). The effective uses of digital storytelling as a teaching and learning tool. James F., Shirley B. H., & Diane L. (Ed.) *Handbook of research on teaching literacy through the communicative and visual arts: Volume II* (pp. 429-440). MacMillan.

Robin, B. R. (2016). The power of digital storytelling to support teaching and learning. *Digital Education Review*, 17-29.

Robin, B. R., & McNeil, S. G. (2012). What educators should know about teaching digital storytelling. *Digital Education Review*, *22*, 37-51.

Rowcliffe, S. (2004). Storytelling in science. *School Science Review, 86*(314), 121-126.

Sadler, T. D. (2009). Situated learning in science education: Socio-scientific issues as contexts for practice. *Studies in Science Education, 45*(1), 1-42.

Seckin Kapucu, M. & Yurtseven Avci, Z. (2020). The digital story of science: Experiences of pre-service science teachers. *Journal of Education in Science, Environment and Health (JESEH), 6*(2), 148-168. doi:10.21891/ jeseh.689444

Setiawaty, S., Fatmi, N., Rahmi, A., Unaida, R., Fakhrah, Hadiya, I., Muhammad, M., Muliana, Rohantizani, Alchalil, & Sari, R. P. (2018). Science, technology, engineering, and mathematics (STEM) learning on student’s science process skills and science attitudes. In *Proceedings of MICoMS 2017,* (Vol. 1, pp. 575-581). Emerald Publishing Limited. doi:10.1108/978-1-78756-793-1-00036

Smeda, N., Dakich, E., & Sharda, N. (2010). *Developing a framework for advancing e-learning through digital storytelling* [Conference presentation]. In IADIS International Conference e-learning (pp. 169-176).

Story Center. (2018, Ekim). How It All Began. Story Center. Retrieved from https://www.storycenter.org/history

Şan, İ. ve Boran, A. İ. (2013). Üstün yetenekli öğrencilerin bilimsel tutum düzeyleri (Malatya Örneği). *Journal of Theoretical Educational Science*, *6*(3), 434-454.

Şimşek, A. & Eroğlu, Ö. (2013). *Davranış Bilimleri*. Eğitim Yayınevi.

Tatum, M. E. (2009). *Digital storytelling as a cultural- historical activity: effects on information text comprehension* [Unpublished doctoral dissertation]. University of Miami.

Tık, M. (2021). *Tarihsel yaklaşımın 7. sınıf öğrencilerinin bilimsel tutumlarına ve bilimin doğası görüşlerine etkisi* (Yayınlanmamış yüksek lisans tezi). Necmettin Erbakan Üniversitesi, Konya.

Titus, U. B. (2012). *Digital storytelling in a science curriculum: theprocess of digital storytelling to help the needs of fourth grade students understand the concepts of food chains* [Unpublished master’s thesis]. University of Hofstra.

Tolisano, S. (2008). *Digital storytelling part II.* Langwitches [Blog mesajı]. Retrieved from http://langwitches.org/blog/2008/04/25/digital-storytelling-part-ii/

Toprak, F. Ö. (2019). *Dijital öyküleme yöntemiyle hazırlanan etkileşimli kısa tarihsel hikâyelerin öğrencilerin bilimsel bilgiye yönelik görüşlerine etkisi* [Yayınlanmamış yüksek lisans tezi]. Cumhuriyet Üniversitesi.

Torun, B. (2016). *Ortaokul 6. sınıf hücre konusunda dijital öykü kullanımının öğrenci başarısı, tutumu ve bilimsel süreç becerileri üzerine etkisi* [Yayınlanmamış yüksek lisans tezi]. Kastamonu Üniversitesi, Ulum, E. (2017). *Yedinci sınıf öğrencilerinin fen bilimleri konularında dijital öykü hazırlama deneyimleri* [Yayınlanmamış yüksek lisans tezi]. Mersin Üniversitesi.

Ulum, E. & Yalman, F. E. (2018). Fen bilimleri dersinde dijital hikâye hazırlamanın ders başarısı düşük ve bilgisayarla fazla vakit geçiren öğrenciler üzerindeki etkisinin incelenmesi. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, 12*(2), 306-335. doi: 10.17522/balikesirnef.506446

Ulusoy, S. (2019). *Dijital hikâye destekli örnek olaya dayalı öğrenme ortamlarının fen öğrenme üzerindeki etkisi* [Yayınlanmamış yüksek lisans tezi]. Uşak Üniversitesi.

Valkanova, Y., & Watts, M. (2007). Digital story telling in a science classroom: reflective self-learning (RSL) in action. *Early Child Development and Care, 177*(6-7), 793-807.

Weber, S. (1990). The teacher educator's experience: Cultural generativity and duality of commitment. *Curriculum Inquiry, 20*(2), 141-159.

Yang, Y. T. C., & Wu, W. C. I. (2012). Digital storytelling for enhancing student academic achievement, critical thinking, and learning motivation: A year-long experimental study. *Computers & Education, 59*(2), 339-352.

Yoon, T. (2013). Are you digitized? Ways to provide motivation for ELLs using digital storytelling. *International Journal of Research Studies in Educational Technology, 2*(1), 1-10.

Author Information

Imren CALIK
Eskisehir Osmangazi University
Büyükdere Meşelik Yerleşkesi, 26040 Odunpazarı/Eskişehir
Contact e-mail: i*mren3225@hotmail.com*

Munise SECKIN-KAPUCU
Eskisehir Osmangazi University
Büyükdere Meşelik Yerleşkesi, 26040 Odunpazarı/Eskişehir

To cite this article:

Calik, I. & Seckin-Kapucu, M. (2021). The effect of digital story-supported science practices on the scientific attitudes of 7th-grade students. *The Eurasia Proceedings of Educational and Social Sciences, 21,* 1-14.