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The Effect of Digital Storytelling on Secondary School Students' Perception of Environmental Behaviour and Affective Dispositions

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Abstract

This study was conducted to examine the effect of using digital storytelling in science education on middle school students' affective dispositions and behavioural perceptions towards the environment. Quasiexperimental design, one of the quantitative research methods, was used as the method. The study was conducted with middle school 5th grade students. The sample was divided into two groups as experimental and control groups, taking into account their academic achievement in science course. In the experimental process, "Human and Environment" unit teaching was carried out for 5 weeks through the activities in the curriculum book in the control group and through digital storytelling in the experimental group. The data were collected as pre-test and post-test with the help of Environmental Behaviour Test (EBT) and Environmental Affective Tendency Test (EATT). Data were analysed by using normality test, Wilcoxon signed-ranks test, dependent and independent t-test with Spss package programme. As a result of the findings, it was determined that there was a significant difference in the environmental behaviours of the students in both experimental and control groups in the "Human and Environment" unit teaching. When analysed in terms of affective disposition towards the environment, it was determined that there was a significant difference in the experimental group, while there was no significant difference in the control group. As a result, it was determined that the use of digital storytelling in "Human and Environment" unit teaching had a positive effect on 5th grade students' behavioural perceptions and affective dispositions towards the environment.

Keywords: Digital storytelling, science education, human and environment, environmental behaviour perception and affective disposition.

Introduction

Today, we have all the information we need at our fingertips quickly and easily (Çayak & Erol, 2023; Sürer, 2020). While in the past, information was a phenomenon that was acquired as a result of long efforts, today, with digitalisation, the boundaries of information have been overcome and thanks to smart devices people have the power to transform and share information (information) at any time (Gündüz & Odabaşı, 2004; Hamarat, 2019; Ortaş, 2018). As a result of this revolution, which is referred to as Industry 4.0 (Doğan & Baloğlu, 2020; Kagermann et al., 2011; Özdoğan, 2017; Özen, 2019; Yıldız Tonga & Tonga, 2022), living conditions are changing (Ayboğa & Görmüş, 2022; Mian et al., 2020); while many professions are losing their importance, new professions are emerging that require workers with more complex skills (Cengiz, 2019; Kaygın et al., 2019). In short, while building digital technology on the one hand, on the other, human beings need to adapt in order to survive in this universe they have created and to meet the expectations of the digital age (Ersöz & Özmen, 2020; Fadel et al., 2015; Kurtdaş, 2021; Yıldırım, 2020).

What is expected from the people in this age is to be able to make quick decisions by thinking analytically when faced with a problem, to work collaboratively with strong communication skills, to have an entrepreneurial spirit and critical thinking, to come up with innovative ideas/products by using their imagination, and to be an individual who not only has access to information, technology and media, which are the arguments of the day, but also actively uses them (having 21st century skills) s) (Doğan, 2020; Frolova et al., 2020; Gürsoy, 2021; National Research Council, 2012; Partnership for 21st Century Skills, 2004; Uçak & Erdem, 2020). Raising individuals with these skills depends on transforming the education system with the right approaches (Ayvaz Tunç, 2016; Baker, 2012; Cansoy, 2018; Gelen, 2017; Özdemir, 2011; Parlak, 2017; Prensky, 2001; Sever et al., 2018; Yücel et al., 2010).

Instead of passive approaches without functionality, education programmes should include methods that take into account individual differences, make students active and enable them to construct knowledge through virtual environments (Avcı, 2022; Çiftci et al., 2021; Çolak, 2018; Fadel et al., 2015; Saykılı, 2018; Taber, 2017). One of these methods is digital storytelling (Demirer, 2013; Kotluk & Kocakaya, 2015; Robin, 2008; Tatlı & Arzugül Aksoy, 2017). Digital storytelling (DS) is used for all age groups from pre-school to university (Garcia & Rossiter, 2010; Ulu, 2021; Xu et al., 2011). It is especially effective in the field of science education. Because science is a course based on abstract, scientific concepts, this can have a negative effect on the understanding of the course (Yağbasan & Gülçiçek, 2003), and it is possible to reverse this effect by making the abstract concrete (Çelik, 2009; Daşdemir & Doymuş, 2013; Sarıkaya et al., 2004). Since it contains visual and auditory (multimedia) tools together, it will be effective to concretise the concepts in this regard (Göçen Kabaran, 2022; Uyanık Balat et al., 2014).

As a matter of fact, when we look at the studies related to DS for science course; Titus (2012) concluded in his study on the subject of 'food chain' that thanks to DS, students understand science concepts correctly and contribute to peer education by explaining them to their friends.

Büyükcengiz (2017) concluded that the positive effects of DS on students' academic achievement, scientific process skills and attitudes towards the course, Ulum and Ercan Yalman (2020) reported that students learnt the subjects better and more permanently by having fun with the help of DS, Kasap and Say (2023) found that the DS method had positive effects on students' attitudes towards science course, digital literacy and critical thinking skills, Gürsoy (2020) concluded that DS had a positive effect on pre-service science teachers' 21st century skills in his study with pre-service science teachers.century skills of pre-service science teachers, Demir (2023) found that the DS used in the subject of 'Circulatory System' had positive effects on students' positive attitudes towards the course and increased achievement, and Korucu (2020) found that DS facilitated learning, increased retention, supported cooperation, increased students' interest and motivation, improved inquiry skills and made the course fun, Aktaş (2022) and Göçen Kabaran (2022) examined the effect of the use of digital storytelling on academic achievement in science education in parallel with each other in their separate simultaneous meta-analysis studies and confirmed that the use of DS had a positive effect on students' academic achievement, Köroğlu and Avgın (2022) stated that the digital story method positively reduced students' misconceptions about cell division and had an increasing effect on their academic achievement. Based on the researches, it is seen that digital storytelling is not only used to transfer knowledge but also contributes to the development of various skills of students.

When we examined the literature, it was seen that almost all of the studies on the use of digital storytelling in science education were examined by considering variables such as attitude, motivation, academic achievement, etc. towards the process, skill, course. In daily life, no study has been found to answer questions such as "Has there been a change in behaviour perception and affective disposition with the help of digital storytelling?". When we look at the studies conducted in the field of science education in Turkey, it is seen that the studies related to the environment cover a small portion of 5% (Bahar & Kiras, 2017). These shortcomings were effective in the use of digital storytelling with an approach that focuses on the dimensions of behaviour perception and affective disposition, taking into account the environmental issue. As the subject content, the subject of 'Human and Environment', which is suitable for digital storytelling among socioscientific subjects and sheds light on the problems of current life, was preferred.

Environmental problems, which have been growing for years as a result of the negative interaction of human beings with the environment, are one of the most important problems of our age. Today, our natural resources are under threat due to unconscious overconsumption. Environmental problems such as global warming, climate change and consequent natural disasters (Akalın, 2013; Görgülü Arı, 2019) continue to affect human life exponentially. It is necessary for humanity to take measures in this regard and to take steps towards the implementation of international environmental policies in order to develop a conscious human-environment interaction cycle (UN, 1972). Awareness movements such as various projects, symposiums, congresses, etc. related to environmental education around the world have started to increase individually or socially (Dere & Çinikaya, 2023). In order to prevent environmental threats, basic education given to children with the support of the state,

especially during school years, will make a great contribution to the spread of environmental awareness (MEB, 2018; Öztürk Samur, 2018). Presenting these trainings, which will contribute to the awareness-raising movement, to students with various methods and techniques will enrich the lessons and make them efficient. In our study, it was aimed to investigate whether there is any effect on students' perception of environmental behaviour and affective tendencies towards the environment when the human-environment subject in the science course curriculum is carried out using digital storytelling, one of the popular teaching tools.

Digital Storytelling

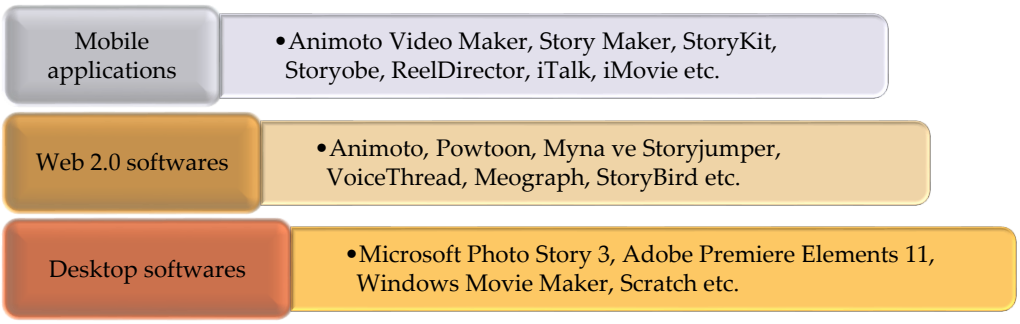
Digital Storytelling (DS) is actually a synthesised version of the classical story (Alexander, 2017; Chung, 2021; Çıralı, 2014; Malita & Martin, 2010; Nguyen, 2011) enriched with sound, music, image, video and text (Haliloğlu Tatlı, 2016; Reinders, 2011; Robin, 2008). DS is the presentation of a certain subject to the audience for a period of 2-10 minutes by narrating it around a remarkable plot using computer software (Menezes, 2012; Robin, 2006). The fact that it offers students an efficient learning experience in such a short time explains why it has become one of the most popular methods of recent times.

Robin (2006) states that teachers' preparing and using DS in the classroom enriches the lesson, provides comfort to create a discussion atmosphere and facilitates the expression of abstract concepts. In his study, Karataş (2020) concluded that teaching using DS statistically significantly increased academic achievement and was more permanent. In addition, the students stated that they had fun in the lessons, learnt new concepts more easily and wanted it to be used in other lessons. Ayvaz Tunç and Karadağ (2013) think that the DS approach has the characteristics that can be an education-teaching model in line with the expectations of the age we are in; it will contribute to raising individuals who have mastered the process, equipped with individual qualities appropriate to the age, and who can analyse and interpret the audiovisual outputs they are exposed to. They stated that this approach is a different, creative and functional approach for the new generation that will shape the future in the field of education.

According to Van Gils (2005), the benefits of DS are that it offers diversity, individualises learning, makes learning more fun, is useful, low cost and contributes more to the learning process than traditional methods. What is meant by being useful is that it can be created anytime and anywhere with free and quickly accessible online applications. DS is prepared with the help of web 2.0 applications (Cao et al., 2008; O'Reilly & Battelle, 2009), one of the outputs of the digital age. Web 2.0 is a term used to describe the second generation of the world wide web (www) (Kekeç Morkoç & Erdönmez, 2014). All kinds of android applications that we use in the natural flow of our lives, websites where we shop, social media platforms that we interact with can be given as examples (İşlek, 2012). Web 2.0 is an interactive network system where many people can interact globally at the same time (Erkul, 2009; Özgür, 2019). It is frequently preferred in education due to its easy access, convenience in content creation, collaboration and communication (Atıcı & Yıldırım, 2010). Applications can be divided into three groups according to the type of

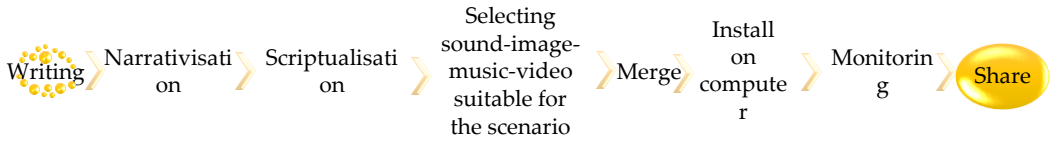
device used, as shown in figure 1 (Gabel, 2011; Kocaman Karaoğlu, 2015; Moralı & Göçer, 2020; Robin & McNeil, 2012).

Figure 1. Digital Story Software



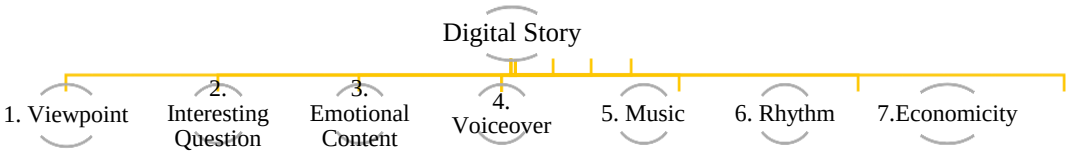
In addition to the aforementioned software, one can create the image scenes to be used in the storyboard by drawing them oneself (Balaman, 2016), or design them from image design applications (toondoo, glogster, bitstrips, bitmoji, powtoon, animato, creaza, goanimate) (Uslupehlivan & Kurtoğlu Erden, 2016). To create a digital story, it is necessary to follow the steps (Barret, 2009; Tolisano, 2008) in Figure 2 below.

Figure 2. Digital Story Preparation Steps



The story, which is completed with the sharing step, will reach large masses after this stage (Standley, 2003), establish an emotional bond with the audience, pass through the filter of different perspectives and thus create a global information wave (Bedir Erişti, 2016; Küngerü, 2016). According to Tolisano (2008), DS is about developing skills rather than being a tool, about creating meaning rather than creating media, about contributing in collaboration rather than directly telling the story, about enriching knowledge rather than merely transferring it, about transforming rather than changing. In short, the use of DS contributes to the spread of knowledge among different societies by deepening it (Behmer, 2005; Jakes & Brennan, 2005). In addition, when they share their stories on interactive platforms, they have the chance to improve their work based on the feedback from their peers. Digital storytelling has seven interrelated components (Lambert, 2010; Robin, 2006), which are shown in Figure 3.

Figure 3. Digital Story Components



The features given in Figure 3 make digital storytelling subjective (Liu et al., 2014). Because the person harmoniously combines these components

in the digital environment by using his/her own perspective and emotions (Craig et al., 2001). The resulting product quality and communication ability are directly proportional to the designer's imagination, aesthetic understanding, analysis-synthesis skills, holistic approach, digital and technology literacy (Demirer, 2013; Robin, 2008; Standley, 2003). According to the research conducted by Barret (2006), this learning experience includes four important strategies; student-centredness, reflective thinking (Matthews DeNatale, 2013), technology integration and project-based learning (Karakoyun, 2014).

Purpose of the Study

In this study, it was aimed to determine whether the use of digital storytelling has an effect on students' affective disposition and behavioural perceptions towards the environment in the 5th grade science course.

The problem statement of the research was determined as "Does the use of digital storytelling in teaching the subject of Human and Environment within the scope of science course have an effect on students' affective disposition and behaviour perception towards the environment?". Based on the problem statement, the sub-problems to be answered are;

1. Is there a significant difference between the pre-test and post-test scores of the experimental group in the Environmental Behaviour Test when the 'Human and Environment' unit is conducted using digital storytelling?
2. Is there a significant difference between the pre-test and post-test scores of the Environmental Behaviour Test of the control group when the 'Human and Environment' unit is carried out for the science programme curriculum book?
3. Is there a significant difference between the pre-test and post-test scores of the affective dispositions towards the environment test of the experimental group when the 'Human and Environment' unit is conducted using digital storytelling?
4. Is there a significant difference between the pre-test and post-test scores of the affective dispositions towards the environment test of the control group when the 'Human and Environment' unit is carried out for the science programme curriculum book?

Method

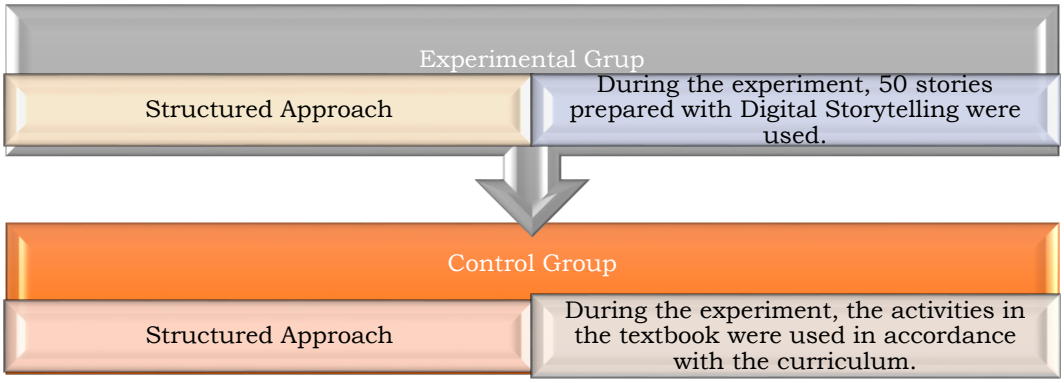
Research Design

In our study, quasi-experimental design with pretest-posttest control group, which is one of the quantitative research methods, was used. In experimental studies, the effect of the independent variable (method, tool, teaching method, etc.) on the dependent variable is tried to be determined (Büyüköztürk et al., 2014). The symbolic representation of the experimental design used in our research is given in Figure 4 below.

Figure 4. Working Group

Two different tests were applied to the experimental and control groups in order to determine the effect of using digital storytelling in 'Human and Environment' unit education on affective disposition and behaviour perception towards the environment. These are; Environmental Behaviour Test (EBT) and Environmental Affective Tendency Test (EATT). These tests were applied to both experimental and control groups before the experimental procedure. During the experimental process; while the constructivist approach supported by digital storytelling method was applied to the experimental group, the activities in the textbooks prepared within the framework of the curriculum were applied to the control group. At the end of the experimental process, EBT and EATT, which were previously applied to the control and experimental group students, were applied again as a post-test and data were collected.

Figure 5. *Experimental and Control Group*



Working Group

The study group was determined by convenience sampling method, one of the purposeful sampling methods. In convenience sampling method, the researcher will save time by choosing a close and easy-to-reach situation (Yıldırım & Şimşek, 1999). Although it is convenient for the researcher, it is a method that provides practicality and speed (Merriam, 2013).

Our research was carried out with 5th grade students studying in a public school in a province in the Southeastern Anatolia Region. Among the 5th graders, one experimental group and one control group were determined. While determining the groups, students' academic achievement in science education was taken into consideration. Although there was no significant difference between the two groups in terms of achievement averages, it was decided that the class with a slightly lower achievement average

would be the experimental group. The sample consists of 56 students. The frequencies of the participants are given in Table.1.

Table 1. Frequency and Percentage

Group	Frequency (f)	Percentage (%)	Valid %	Stacked %
Control group	28	50,0	50,0	50,0
Experimental group	28	50,0	50,0	100,0
Total	56	100,0	100,0	

As it can be understood from the table, it is seen that the sample group was equally distributed and 28 (50%) of the distribution consisted of the control group and 28 (50%) of the experimental group.

Data Collection Tools

Two Likert-type scales were used as data collection tools. These scales are Environmental Affective Tendency Test and Environmental Behaviour Tests, which were developed by (Sontay, 2013) and for which the necessary permissions were obtained, applied as pre-test-post-test in the collection of quantitative data.

Environmental Affective Tendency Test (EATT)

In order to ensure the validity of this measurement tool, which was developed to evaluate students' affective dispositions towards the environment and consisted of 15 items, face and content validity were examined. For the content and face validity of EATT, the opinions of a total of 6 faculty members (3 experts in science education, 1 expert in measurement and evaluation and 2 experts in statistics) and 12 science teachers were consulted. It was accepted that the measurement tool had face validity because it was appropriate for the purpose for which it was used, it was in a position to collect the necessary data, and it seemed to measure the desired features. In order to determine the content validity of the EATT, the scale items were analysed by the same experts. It was stated by all experts that the test represents the subjects that it aims to measure in a balanced way.

Cronbach Alpha (α) internal consistency coefficient was calculated for the reliability of EATT and this value was determined as 0.860. Cronbach Alpha coefficient is frequently used especially when the answers are obtained from a rating scale (Likert Type Scales) (Büyüköztürk et al., 2008). According to Büyüköztürk (2011), a reliability coefficient of 0.70 and above is sufficient.

Environmental Behaviour Test (EBT)

Environmental Behaviour Test (EBT) was used as the second measurement tool. It is a 7-point Likert-type test consisting of 12 items, including students' perceptions of positive behaviour towards the environment. The students are expected to mark the number of times they have performed the specified statements so far. For the content and face validity of the EBT, the opinions of 6 faculty members (3 science education experts, 1 measurement and evaluation expert, 2 statistics experts) and 12 science teachers were consulted. It was determined by the experts that the measurement tool was appropriate for the purpose for which it was

used, that it was in a position to collect the necessary data, and that there was face validity because it seemed to measure the desired feature. For the content validity of the EBT, the scale items were analysed by the same experts. It was stated by all experts that the items represented the subjects that the measurement tool aimed to measure in a balanced way.

For reliability, Cronbach's Alpha (α) internal consistency coefficient was calculated and this value was found to be 0.773. According to Büyüköztürk (2011), a reliability coefficient of 0.70 and above is sufficient, and it can be said that the reliability analysis result of the scale is sufficient for the real application.

Data Collection Process

The research was carried out for a period of five weeks over 7 acquisitions within the scope of 'Biodiversity / Human and Environment Relationship / Destructive Natural Events' topics in the 5th grade Science Course "Human and Environment" unit. At the beginning of the process, pre-tests were applied and then the experimental phase was started. In the experimental group and the control group class where the existing curriculum was applied, the subjects were started to be taught at the same time and finished at the same time. The application was carried out in both classes under the supervision of the researcher. The data were collected in the classroom environment and the science course was taught with two different methods for five weeks in the experimental and control groups; while the "Human and Environment" unit was taught to the students in the experimental group with the digital storytelling method, the activities in the curriculum book were used with the control group students.

Table 2. Summary of Lesson Plan (Experimental Group)

Week 1 Biodiversity
➢ At the beginning of the lesson, digital storytelling was introduced to the students. The necessary information for preparing a digital story was given in detail and students were informed about the process. ➢ Introduction to the Topic: In order to draw attention, 2 digital stories about biodiversity were watched ➢ A digital story about the subject concepts was watched. Students exchanged ideas about what biodiversity is. ➢ F.5.6.1.1. Questions the importance of biodiversity for natural life. The questions he/she had in mind were discussed. The acquisition was tried to be internalised through stories, and an environment was created where students could actively express their ideas and feelings. ➢ For activity purposes, 5 digital stories suitable for the learning outcome were used. Guidance was given to enable the students to construct the subject in themselves through the DS's in interaction with each other.

Week 2

- F.5.6.1.2. Discusses the factors threatening biodiversity based on research data. 6 digital stories were used for the acquisition.
- Activity: Based on scientific data, 3 digital stories about the toxic gases emitted from car exhausts, the threat to living life posed by garbage in the seas and the impact of environmental pollution on biodiversity were shown.
- Thus, a discussion environment was created among the students about the factors threatening biodiversity.
- Assessment: Techniques such as project, concept map, diagnostic branched tree, structured grid, six hat technique, puzzle, multiple choice were used where appropriate.

Week 3

Human and Environment Relationship

- Two digital stories were used to draw attention to environmental pollution caused by human impact on the environment.
- F.5.6.2.1. Expresses the importance of interaction between human and environment,

F.5.6.2.2. Offers suggestions for solving an environmental problem in his/her neighbourhood or in our country. For the acquisitions, a digital story containing the dialogue between Gül and her grandmother on this issue was watched. And an environment was created for the students to express their ideas on the subject and present their own suggestions.

- Activity: 8 digital stories about environmental pollution and environmental protection were used. The effect of environmental pollution on people's health was mentioned. Separately, 2 digital stories were used.
- The ground was prepared for the students to obtain indirect experiences by using their imagination with fictionalised digital stories and to internalise the subject by interacting with each other on the reactions and behaviours they can give as a result of the indirect experience.
- Assessment: Different questioning techniques such as two-stage tests were used where appropriate.

Week 4

- F.5.6.2.3. Makes inferences about environmental problems that may occur in the future as a result of human activities.
- At the beginning of the lesson, 2 digital stories about environmental pollution and global warming were watched.
- F.5.6.2.4. Discusses benefit and harm situations in human-environment interaction on examples.
- Sample digital stories about preventing environmental pollution and solutions to global warming were shown. Students were asked to diversify these benefit and harm situations and share them with the class.

- Activity: 4 digital stories related to these acquisitions were watched. The students discussed the benefits and harms of human beings to the environment. The teacher explained the negative consequences of environmental pollution on human health with 3 digital stories.

Week 5

Destructive Natural Events

- At the beginning of the lesson, a digital story was shown to attract attention and to check students' prior knowledge.
- F.5.6.3.1. Explains the destructive natural events caused by natural processes. For the acquisition; 5 digital stories about natural events caused by global warming, earthquakes, floods and volcanic eruptions were used.
- Activity: Students were shown 4 stories about what destructive natural events are and how they damage our lives and the environment. Students exchanged ideas about their direct or indirect experiences on these issues. It was tried to be acquired by using the discussion technique through digital stories.
- Assessment: Multiple-choice, open-ended, true-false, two-stage test, etc. question techniques were used where appropriate.

Appendix 1. *Excerpts from the Digital Stories Used*

1. Protect our environment

2. Environmental awareness

3. Earthquake

6. Biodiversity

The Human and Environment unit was taught for a total of 20 lesson hours in five weeks, four hours a week, in accordance with the curriculum. The experimental group lesson plan was taught with constructivist techniques with the students in the digital stories centre as shown in Table 2. Through digital stories, students were asked to empathise by putting themselves in the shoes of the story heroes and to

exchange ideas with their peers on this subject through situations encountered in daily life or sample 'virtual experiences' created in the imagination. In the control group, firstly, the relationship of the subject with daily life was tried to be established. Then the teacher explained the basic information about the subject. At this stage, sometimes lecture presentations were utilised and sometimes unit topics were explained by using direct expression and question-answer. After the teacher completed the explanations, the activities in the textbook were applied. At the end of the fifth week, the post-test of Environmental Affective Tendency Test (EATT) and Environmental Behaviour Test (EBT) were applied to the experimental and control groups.

Data Analyses

Statistical package programme was used to interpret the data collected with the help of scales. The data were analysed by converting them into Z values and it was determined that the Z values were between +3 and -3. Before making comparisons between variables, normality analysis was performed. Skewness and Kurtosis values were analysed to determine whether the data showed normal distribution. The normality test results of two different scales are given in Table 3 and Table 4.

Table 3. Pre-Test-Post-Test Normality Test Results of the Groups' EBT (Environmental Behaviour Test)

Groups	Skewness	Kurtosis	Kolmogorov-Smirnov Sig.	Shapiro-Wilk Sig.
Control group	0,349	-0,396	0,200	0,667
Experimental group	-1,188	1,861	0,102	0,013

When Skewness and Kurtosis and Shapiro-Wilk values are analysed, it is seen that the difference between the pre-test and post-test of the control group is normally distributed, while the difference in the experimental group is not normally distributed (sig.<0,05). Since skewness and kurtosis (skewness and kurtosis) values were between -2 and +2, it was assumed that the variables were normally distributed (George & Mallery, 2010).

Since the difference between the pre-test and post-test results of the experimental group did not show normal distribution, the nonparametric dependent Wilcoxon Signed-Ranks Test was applied. Wilcoxon Signed-Ranks Test is used in intergroup studies with few subjects in social sciences (Uzunsakal & Yıldız, 2018). In addition, since the group size is more than 50 people, it is also seen that the calculated one-sample Kolmogorov-Smirnov value is significant (p>.05), that is, the sample distribution is normally distributed. Paired Sample T-Test, one of the parametric tests, was applied to the control group.

For EATT; the averages of 6, 24, 10, 43, 12 participants in the pre-test and 6, 20, 31, 37 participants in the post-test were replaced with the general average of the group. For normality test, skewness and kurtosis values were analysed by taking the difference between the pre-test and post-test scores of the groups. The results are shown in Table 4.

Table 4. Pre-Test-Post-Test Normality Test Results of the Groups' EATT (Environmental Affective Tendency Test)

Groups	Skewness	Kurtosis	Kolmogorov-Smirnov Sig.
Control group	0,0406	-0,912	0,175
Experimental group	0,588	-0,283	0,004

When Skewness and Kurtosis and Shapiro-Wilk values are analysed, it is seen that the difference between the tests of the experimental and control groups is normally distributed (sig.>0,05). Dependent t-test was applied in both control and experimental groups due to the normal distribution of the data for both groups.

Independent t-test, one of the parametric tests, was used to determine whether there was a significant difference between the pre-test mean scores of the students in the control and experimental groups for EBT and EATT. This test was conducted to determine whether there was a difference between the groups in terms of behavioural perception and affective tendencies towards the environment. The independent t-test results of the scales are given separately in Table 5 and Table 6.

Table 5. Independent T-Test Results of Pre-Tests of Control and Experimental Groups for EBT (Behaviour Perception Test)

Variable	Groups	N	X	ss	t test		
					t	*sd*	*p*
Pre-test	Control group	28	3,73	1,34	0,61	54	0,95
	Experimental group	28	3,71	1,57			

According to the pre-test scores, there was no statistically significant difference between the control and experimental groups (p>0.05) and the groups were homogeneously distributed.

Table 6. Independent T-Test Results of Pre-Test Scores of Control and Experimental Groups for EATT (Affective Tendency Test)

Variable	Groups	N	X	ss	t test		
					t	*sd*	*p*
Pre-test	Control group	28	3,55	0,28	-0,124	54	0,90
	Experimental group	28	3,56	0,29			

According to the pre-test scores, there was no statistically significant difference between the control and experimental groups (p>0.05) and the groups were homogeneously distributed.

Since the prerequisite analyses (normality test and independent t-tests) expressed in tables in the data analysis section meet the appropriate conditions, in the next stage, the data obtained as a result of testing the sub-problems will be interpreted in the findings section.

Findings

In this section, the findings related to the 4 sub-problems of the research are presented. The findings obtained from the scales are organised and explained in tables.

Findings Related to the First Sub-Problem

Necessary tests were conducted to answer the question "Is there a significant difference between the pre-test and post-test scores of the experimental group in the Environmental Behaviour Test when the Human and Environment unit was conducted using digital storytelling?". The normality test was applied by taking the difference between the pre-test and post-test scores of the groups and the results are shown in Table 3 above. Since the data of the experimental group were not normally distributed, Wilcoxon signed-ranks test, one of the nonparametric systems, was applied. The results of the analysis are given in Table 7.

Table 7. Experimental Group Pre-Test-Post Test Wilcoxon Signed-Ranks Test Results

Pre-test-post-test	N	Rank mean	Rows total	z	p
Negative rows	9	9,78	88,00		
Positive rows	19	16,74	318,00	-2,620	0,009
Equal rows	0				
Total	28				

As can be seen from the table, there is a significant difference between the pre-test and post-test scores of the experimental group students in the Environmental Behaviour Test (p=,000<,05). When the rank differences are analysed, it is seen that a significant portion of the students are in positive ranks. There is a statistically significant difference between the test scores applied to the experimental group (z=-2,620; p<0,05). When the effect size of the significance is calculated according to the Pearson correlation coefficient r value, it is seen that it has a high effect value (r=,4951). The findings obtained; it can be concluded that after the digital storytelling experience, a change in perception was achieved in students through the behaviours expected to be exhibited in daily life towards the environment. It can also be concluded that the lessons conducted with digital storytelling have a positive effect on fifth grade students' perceptions of environmental behaviours and can be an efficient educational tool in environmental education.

Findings Related to the Second Sub-Problem

In order to find an answer to the question "Is there a significant difference between the pre-test and post-test scores of the Environmental Behaviour Test of the control group when the Human and Environment unit is carried out for the science programme curriculum book?", necessary tests were conducted. When Skewness and Kurtosis and Shapiro-Wilk values are analysed in Table.3, it is shared that the control group showed normal distribution in normality test results. Since the difference between the test results of the control group showed normal distribution, dependent t-test, one of the parametric test techniques, was applied. The data related to the dependent t-test are presented in Table 8.

Table 8. *Control Group Pre-Test-Post-Test Dependent T-Test Results*

Variable	Groups	N	X	ss	t	t test sd	p
Pre-test	28	3,73	1,34	0,25	27	-2,485	0,019
Post-test	28	4,24	1,22	0,23			

When the table is analysed, it is seen that there is a statistically significant difference between the test scores applied to the control group ($p<0.05$). When the effect size is calculated according to cohen's d value, it is seen that it is at a medium level (d=,39). When the 5th grade science activities were carried out with the activities in the science curriculum book, it was concluded that there was a change in students' perceptions of behaviour towards the environment compared to the pre-experiment. These findings show that the activities in the "Human and Environment" unit of the curriculum textbook (MEB, 2023) prepared according to the 2018 science programme (MEB, 2018) have brought about a change in students' perceptions of behaviour towards the environment. However, when we compare the effect size of the experimental group (r=,49) with the effect size of the control group (d=,39), it is seen that this significance is more effective in favour of the experimental group, and that DS is more effective in changing students' perceptions of behaviour towards the environment positively than the textbook activities.

Findings Related to the Third Sub-Problem

Necessary tests were conducted to find an answer to the question "When the Human and Environment unit was conducted using digital storytelling, is there a significant difference between the pre-test and post-test scores of the experimental group Affective Dispositions towards the Environment Test?". It is stated in Table 4 that the data of the experimental group for the EATT showed normal distribution. In order to compare the tests within the experimental group, dependent t-test, one of the parametric tests, was applied. The findings are given in Table 9.

Table 9. Experimental Group Pre-Test-Post Test Dependent t-Test Results

Variable	Groups	N	X	ss	t test		
					t	sd	p
Pre-test	28	3,56	0,29	0,056	0,46	-3,10	0,004
Post-test	28	3,84	0,25	0,048			

There was a statistically significant difference between the pre-test and post-test scores applied to the experimental group ($p<0.05$). When the effect size is calculated according to the cohen d value, it is seen that it is high (d=1). When these data are evaluated, it shows that the teaching carried out using digital storytelling creates a significant difference in students' affective dispositions towards the environment compared to the teaching carried out with the activities in the curriculum book. It can be said that the digital storytelling experience was effective in making students more sensitive to the environment and human damage to the environment.

Findings Related to the Fourth Sub-Problem

Necessary tests were conducted to find an answer to the question "Is there a significant difference between the pre-test and post-test scores of the Affective Dispositions towards the Environment Test of the control group when the Human and Environment unit was conducted for the science programme curriculum book?". As shared in Table 4, the difference between the tests of the experimental group shows normal distribution (sig.>0,05). Since the control group showed normal distribution, dependent t-test was applied and the results are given in Table 10.

Table 10. Control Group Pre-Test-Post-Test Dependent t-Test Results

Variable	Groups	N	X	ss	t test t	sd	p
Pre-test	28	3,55	0,28	0,05	0,42	-,836	0,410
Post-test	28	3,62	0,40	0,07			

There was no statistically significant difference between the pre-test and post-test scores applied to the control group (p>0.05). When we calculate the effect size according to the cohen d value, it is seen that it has a small effect value (d=,19). According to this result, it was revealed that there was no change in the students' affective dispositions towards the environment in the control group in which the teaching was carried out according to the curriculum textbook (MEB, 2023). In terms of the affective characteristics that students should acquire towards the environment, digital storytelling-centred activities provided more significant changes than the activities given in the curriculum book.

Discussion and Conclusion

Our study was carried out on the question; "When the subject of Human and Environment is carried out using digital storytelling, does it have any effect on secondary school students' behavioural perceptions and affective disposition towards the environment?". Based on the findings, the results will be discussed in general.

In the conclusion section, a literature review was conducted taking into account the following information; our study was carried out to examine the changes in affective disposition towards the environment and perception of environmental behaviour. However, there were difficulties in finding sample studies while scanning. Especially in the international arena, environmental affective disposition and behavioural perception are considered as sub-dimensions under the title of 'environmental literacy' as a general term (Dissinger & Roth, 1992). Environmental literacy covers 4 sub-dimensions; environmental knowledge, environmental affect, environmental behaviour and skills (Sontay, 2013). Therefore, in the case studies here, environmental literacy will be mentioned in the context of environmental literacy.

During the experiment, two different scales (EBT and EATT) were applied to the experimental and control groups as pre-test and post-test. For the Environmental Behaviour Test (EBT), it was concluded that there was a significant difference between the pre-test and post-test scores of the experimental group. It was seen that there was a positive change in the behaviour perceptions of the group in which digital storytelling method was used. In the control group, it was concluded that there was a significant difference in behavioural perceptions towards the environment and that the lesson plan taught with the help of the curriculum book made a positive change on the students. This result shows that the activities in the textbook (MEB, 2023) prepared in line with the 2018 Science Curriculum (MEB, 2018) contribute to the perception of environmental behaviour. However, when we compare the effect sizes of these two groups in terms of significance in terms of EBT; it is seen that the effect size of the experimental group (r=,49) is high (r=,49), while the effect size of the control group (d=,39) is medium (d=,39), and therefore, it is seen that the DS is more effective than the activities in the curriculum book.

When the studies on the perception of behaviour towards the environment were examined in the literature, no studies were found in which the effect of digital storytelling on this issue was tested. Here, in general, the studies investigating the effect of DS on behavioural situations are included; Kutlucan et al. (2019) wanted to reveal students' deficiencies in values education with the help of DS. As a result, it was concluded that the students' preparation of a DS on this subject had positive effects on their learning values and behaviours. Grindle (2014), in his study, investigated the effect of DS on human behaviour and as a result; he stated that DS affects human behaviour and can interact at deep emotional and unconscious levels. When the studies on the effect of digital storytelling on environmental literacy in the international literature are examined; Rusda et al. (2023) concluded in their study that the creation of a DS is useful in encouraging students' interest in gaining environmental literacy. Andrıopoulou et al. (2022) investigated the effect of DS on the development of environmental literacy and sustainability awareness and found that DS was effective in developing environmental literacy. The results in parallel with our study show that digital storytelling provides students with an advantage in creating a behaviour perception that will contribute to the solution of the environmental problem as a concrete indicator of the individual's environmental knowledge, attitude and skills thanks to the components it contains. It is also possible to say that digital storytelling has a positive effect on environmental literacy, motivates students in terms of human-environment relationship and encourages them to develop a more environmentally sensitive awareness. In fact, digital storytelling is effective in creating potential behavioural change by establishing an emotional interaction mechanism in people thanks to its seven components (point of view, interesting question, emotional content, voiceover, music, rhythm, economy). In doing so, thanks to its virtual feature, it is also thought to make the process faster in managing behavioural perceptions that will facilitate action.

A significant difference was also found in favour of the control group for the EBT. Our study is one of the very few studies investigating the effect of textbooks created for the current 2018 Science Programme on environmental literacy. Studies on this subject were generally conducted during the previous science curricula. In the study conducted in terms of the effect of 2018 Science Curriculum (MEB, 2018) on the perception of environmental behaviour and environmental literacy, Şahin (2020) found that there was a significant difference in the behaviour dimension, which is one of the sub-dimensions of environmental literacy, of the students who were educated with the curriculum book. With the similar result with our research, it can be said that the 2018 Science Curriculum contributed to the development of students' perception of behaviour towards the environment. The implementation of the science course with the constructivist approach and the activities in the curriculum book was effective in creating positive behavioural awareness towards the environment in students.

For the Affective Disposition Towards Environment Test (EATT), there was a significant difference between pre-test and post-test in the experimental group, while there was no significant difference in the control group. It can be said that there has been a positive change in the students' affective disposition towards the environment thanks to the DS. 2018 Science Course Teaching Programme (MEB, 2018), the activities in the curriculum

textbook (MEB, 2023) did not have any effect on the affective disposition towards the environment and did not cause a change in students' sensitivity towards the environment and its problems.

In the literature, there is no research on the effect of DS on affective disposition towards the environment. It is seen that environmental education studies, especially in the field of digital storytelling, are insufficient. It is thought that our study will contribute to overcome this deficiency. When we look at the studies examining the effect of DS on affective disposition and emotional behaviour on any subject; Balaman (2015), in his study with vocational school students, investigated the effect of using DS on social value judgments. As a result, it was found out that the DS method did not have a significant effect on students' social value judgements. Among the reasons for the emergence of a different result with our current study; basic situations such as the fact that the research does not specifically measure affective disposition towards the environment, working on different age levels, and using different scales can be counted. Gözen and Cırık (2017), on the other hand, examined how social-emotional learning behaviours change through DS activities. As a result of their research, it was determined that the use of DS made significant contributions to children's social-emotional learning behaviours. Sulistianingsih et al. (2018) investigated the effectiveness of DS on students' emotional intelligence and revealed that DS is a powerful teaching method to improve students' emotional intelligence. The results in parallel with our study show that digital storytelling can be used as an effective method on gains related to affective structure such as emotional value judgements, tendencies, etc. It also shows that it is a favourable method in terms of having a fictional plot and providing people with affective experience indirectly. For this reason, it is possible for the individual to increase his/her sensitivity towards the environment and environmental problems and to develop his/her skills to take into account the structure of the society while exhibiting responsible environmental behaviours with the help of DS. Digital storytelling is also suitable for creating the necessary awareness to attract students' interest and motivation to the desired outcome by having fun. Thus, it facilitates the adoption of the affective tendencies that the student should take from the subject by adopting indirect experience in a virtual way.

When we conducted a literature review for the MEB (Mınıstry of Natıonal Educatıon) curriculum book for EATT, it was determined that the 'Environmental Education' studies conducted within the scope of the 2018 Science Curriculum (MEB, 2018) in the TR literature are insufficient, and the existing studies generally cover outdated science curricula, different disciplines or studies conducted with people at different levels of education. No research on affective disposition towards the environment was found.

As a result, digital storytelling had a positive effect on students' perceptions of environmental behaviour and affective tendencies within the scope of environmental education in secondary school science course. Digital storytelling is an effective tool to carry the human relationship with the environment to a more positive level. Digital storytelling has features that can teach the importance of the environment, the damage caused by people to the environment, the measures to be taken in this regard, and the necessary skills to be an exemplary individual in order to instil

environmental awareness in the society. In this regard, it has been useful in shaping behaviour perceptions by establishing deep emotional interaction with students. It has an important potential in developing affective tendency and behaviour perception on a subject by providing indirect experiences through fictional or lived stories in the virtual world. While doing this, it also has a key role in learning by having fun, using imagination, keeping motivation high and extending the attention span to the lesson and effectively acquiring the acquisition to be given.

Suggestions to be given in line with the results of the study;

- Digital storytelling is effective in developing affective disposition and behaviour perception. Researches related to this subject can be reproduced,
- It is thought that digital storytelling is effective on behavioural perception and affective disposition towards the environment thanks to the indirect experiences it will provide to the individual through imagination. Therefore, studies on the use of digital stories in environmental education in the literature should be expanded,
- Research on the use of digital storytelling within the scope of environmental education in secondary school science course should be increased,
- It would be useful to enrich these studies with digital stories designed by the students themselves,
- Within the scope of the current 2018 Science Curriculum (MEB, 2018), it is important for the studies examining the relationship between human and environment to become widespread, to eliminate the deficiency in this subject, and to contribute to the literature.

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