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The Effects of Animated Cartoon Series on 5th Grade Students' Environmental Literacy Sub-dimensions: The Case of "SU ELÇİLERİ"

Esra Gün Şahin[a]*, Harika Özge Arslan[b]

a* Esra Gün Şahin, Düzce University, Faculty of Education, https://orcid.org/0000-0003-0619-1090 * esragunsahin@gmail.com

b Harika Özge Arslan, Düzce University, Faculty of Education, https://orcid.org/ 0000-0003-1620-6559 harikaarslan@duzce.edu.tr

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ABSTRACT

The purpose of this study is to explore the effect of an animated cartoon series on middle school student's sub-dimensions of the environmental literacy. A quasi-experimental pre-post design with a control group is utilized. The sample is 33 volunteer 5th-grade students who attended intact classes. The objectives of the "Human and Environment" unit set the framework of the implementation and distance learning was used in both groups. In the control group, lecturing, interactive activities, and questioning was used during 5 weeks of the implementation. In the experimental group, the content and the activities are the same as the control group except watching animated cartoons. Episodes of the "Su Elçileri" series matched with the content and objectives of the unit were watched with the sequence of the objectives of the unit. It is ensured that the students realized the environmental problem discussed in each episode and think like the characters in the animated cartoon series. Research data were collected using Environmental Knowledge Test, Affective Dispositions towards the Environment Scale, Environmentally Responsible Behavior Scale, and Environmental Problems Attitude Scale. The findings indicate that exposure to the "Su Elçileri" animated cartoon series results in significantly better improvement in environmentally responsible behaviors and the attitude toward environmental problems than the control group. The findings draw attention to animated cartoons as a teaching strategy in environmental education and science education, especially in younger age groups.

Keywords: Environmental Literacy, Animated Cartoons, Environmental Education, Science Education

Çizgi Filmlerin 5. Sınıf Öğrencilerinin Çevre Okuryazarlığı Alt-boyutları Üzerine Etkileri: Su Elçileri Örneği

ÖZ

Bu çalışmanın amacı çizgi filmlerin ortaokul öğrencilerinin çevre okuryazarlığı alt boyutları üzerine olan etkilerini incelemektir. Çalışmada ön-test son-test kontrol gruplu yarı deneysel desen kullanılmıştır. Örneklem birbirine benzer özelliklere sahip sınıflarda öğrenim gören 33 gönüllü 5. sınıf öğrencisinden oluşmaktadır. Uygulama "İnsan ve Çevre" ünitesi kazanımları çerçevesinde her iki grupta da uzaktan eğitim olarak yapılmıştır. Kontrol grubunda 5 hafta boyunca, etkileşimli etkinlikler ve soru sorma ile desteklenen geleneksel ders anlatımı yapılırken, deney grubunda bunlara ek olarak çizgi filmler izlenmiştir. Ünite kazanımları ile eşleştirilmiş "Su Elçileri" çizgi filminin bölümleri kazanımların sırasına uygun olarak izlenmiştir. Öğrencilerin her bölümde ele alınan çevre probleminin farkına varmaları ve çizgi filmde yer alan karakterler gibi düşünmeleri sağlanmıştır. Verilerin toplanmasında Çevre Bilgi Testi, Çevreye Yönelik Duyuşsal Eğilimler Ölçeği, Çevreye Yönelik Sorumlu Davranış Ölçeği ve Çevre Problemleri Tutum Testi kullanılarak toplanmıştır. Bulgular "Su Elçileri" çizgi filminin bölümlerini izleyen öğrencilerin kontrol grubu öğrencilerine göre çevreye yönelik sorumlu davranışlarında ve çevre problemlerine yönelik tutumlarında anlamlı gelişme olduğunu göstermektedir. Bu bulgular özellikle küçük yaş grupları için çevre eğitiminde çizgi filmlerin bir strateji olarak kullanılmasına dikkat çekmektedir.

Anahtar kelimeler: Çevre Okuryazarlığı, Çizgi film, Çevre Eğitimi, Fen Eğitimi

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1 | INTRODUCTION

Knowing the elements and understanding how works the environment we live in is important to protect the living organisms and non-living things as a part of this environment and offer solutions to environmental problems. One of the most important objectives among the secondary school science course objectives is to raise scientifically literate individuals. Being aware of the problems experienced in their environment, being knowledgeable about these problems and producing solutions using their scientific process skills, discovering nature, understanding the relationship between humans and the environment, creating sustainable environmental awareness by preventing the damage caused by people to the environment are among the targeted behaviors of scientifically literate individuals. (MoNE, 2018).

The environmental literacy is the whole of habits that include knowledge, skills, attitudes, and behaviors of individuals on environmental issues (Roth, 2002). Environmentally literate individuals are expected to have environmental knowledge, to be aware of environmental problems, and to develop positive attitudes and behaviors towards these problems. This set of behaviors helps people maintain stronger and healthier relationships with nature and other people. The aim of the environmental literacy is to understand the events that take place in the environment we live in, to understand the positive or negative effects of people on these events, and to minimize the damage to nature (Roth, 2002). Knowledge, attitude, and behaviors are common dimensions of the environmental literacy defined in most of the studies (e.g. Hungerford & Volk, 1990; Negev et al., 2008; Pe'er, Goldman & Yavetz, 2007). In addition to these dimensions, affective dispositions towards the environment included affective reactions towards environmental problems and deterioration was also concerned (Erdogan, 2009; Roth, 1992; Teksoz, Sahin ve Ertepinar, 2010). Affective dispositions towards the environment is a broad term and "plays a crucial role in development of environmental responsibilities of individuals" (Fettahlioglu et al., 2016, p. 3182).

The most effective way to improve the environmental literacy of the society is to educate individuals on environmental issues. Among the objectives of environmental education are to have knowledge about the environment and environmental problems, to hold a positive attitude towards the environment, to develop the necessary skills and approaches for environmental protection, and to actively participate in the solution of problems (Ileri, 1998). The personality traits of individuals are formed at an early age of life and the knowledge, skills, behavior, and value judgments gained at these ages are more permanent and sustainable for individuals (Susar-Kirmizi, 2014), the environmental education given to individuals at early ages will be effective in terms of behavior change which is the most intended outcomes of the environmental education. Therefore, the children at younger ages should be the groups that need to be informed and sensitized the most about the environment. According to Erol (2005), environmental education is a need of the young persons because although the young generation is not responsible for the environmental problems they live in, they are individuals who will be personally affected by these problems and who will be effective in solving problems with their behaviors. Environmental education to be given to individuals forming the society from a very young age is also important in terms of preventing some new problems before they occur (Sontay, Gokdere, & Usta, 2015).

Today, technology is used to a great extent to provide individuals various skills, values, attitudes, and behaviors. Among the different technological tools for education, radio, and television programs (animated cartoons, animated films, interviews, competition programs, discussion programs, etc.), computers and computer programs (presentation tools, calculation programs, statistical programs, etc.), simulators and the Internet can be counted (Arici & Dalkilic, 2006). Due to the widespread use of television among these technological tools, it is a mass communication tool for children since they can interact with it at very early ages. Television serves as a tool for the individual to obtain information about the outside world and to get to know the outside world (Yagli, 2013). Some studies show that television cartoon series are among the programs most preferred by children to watch on television (BEBKA, 2018; RTUK, 2018). Therefore, enriching the content of the animated cartoons and developing them in terms of science subjects and objectives will be effective on children's behaviors.

Animated cartoons and animated films attract the attention of children with their visuals and include both entertaining and educating elements. Research studies show that animated cartoons make the teaching process

more enjoyable, contribute to the increase in the desire to learn while supporting the imagination of children (Asci, 2006). Through the relationship with the visual content and movie that form the structure of animated cartoons make them effective and useful tools in the field of education alongside other education tools with the features such as simplifying events and making them easy to understand, dividing them into time zones by creating images (Can, 1996). Considering that children learn many concrete or abstract concepts through animated cartoons, an animated cartoon with a well-prepared content contributes significantly to children's cognitive development (Dalacosta, et al., 2009) and their social and emotional development (Tatli, 2017). It is known that individuals in early childhood show behaviors to believe that the imaginary heroes, places, and events in the animated cartoons are real, to use the words or expressions they hear in these cartoons in their daily life, to identify with the heroes of these cartoons and repeat their actions (Ozdemir & Ramazan, 2012). According to Eskandari (2007), 91% of boys and 80% of girls see heroes of animated cartoons as role models, and most parents say that these cartoons affect their children's lifestyles. Therefore, it is possible to state that animated cartoons can be effective on children's behavior.

There are many studies in the related literature exploring the effects of animated cartoons on children. The effects of Turkish-made television cartoons on children's development and communication (Can, 1995), determination of gender roles (Ergen Kilci, 2009), consumer behaviors (Asçi, 2006), violence tendencies (Issever, 2008), aggression behaviors (Ulken, 2011; Yasar & Paksoy, 2011), listening and speaking skills (Od, 2013), concept teaching (Coskun & Koroglu, 2016), understanding the subject content (Scanlan, 2000) relationship with museum education (Arikan, 2014), and cultural heritage (Tas Alicenap, 2015) were studied. In addition, there are studies investigating the effects of the use of cartoons in education on science teaching (Abdusselam, 2013), social studies teaching (Teymuroglu & Oruc, 2016), and academic achievement and attitudes towards English course (Bulbul & Oruc, 2019). Even there are some studies on animated cartoons and environmental education (Stibbe, 2008; Toledo, et al., 2014), as far as we know no practical study is present on the effect of cartoons on children's environmental literacy.

During the behavior development period of children, they may tend to imitate the behaviors of the characters they watch, like, and interest in animated cartoons (Astuti, Waluyo, & Rohmadi, 2019). Presenting environmental education issues through cartoons may be beneficial for these children to become aware of environmental problems and develop nature-friendly behaviors by creating sensitivity about other living things than humans in nature. Thus, this study focuses on the effect of animated cartoon on students' sub-dimensions of the environmental literacy, for that purpose the "Su Elçileri" animated cartoon series in the "TRT Çocuk" channel was used.

The main research motivation that drives this study is to investigate the effect of "Su Elçileri" short films on the environmental literacy of 5th-grade middle school students. The environmental literacy has four dimensions (Erdogan, 2009; Roth, 1992; Wang, 2014) and the effect of animated cartoons on these sub-dimensions of the environmental literacy (knowledge, affective dispositions, attitude, and behavior) should be investigated. The sub-questions of the study are: What is the effect of the "Su Elçileri" cartoon series on (1) the environmental knowledge (2) the affective disposition towards the environment (3) the environmentally responsible behavior, and (4) the attitudes towards the environmental problems of middle school students?

2 | METHOD

DESIGN OF THE STUDY

In this study, a quasi-experimental design with a pre-test post-test control group was used. In case of impossibility of unbiased assignment for the selection of the study group, a quasi-experimental design is used to determine the experimental and control groups among the ones with close success levels. (Buyukozturk et al., 2014). Intact classes were randomly assigned to the experimental and control groups. The scales used to collect data on the sub-dimensions of the environmental literacy were applied before and after the 5-weeks implementation.

THE SAMPLE

This study was conducted with 5th grade students during the distance education carried out due to the COVID-19 pandemic in the spring semester of the 2020-2021 academic year.

Table 1. Gender Distribution of The Sample

Group	Female	Male	N
EG	9	7	16
CG	11	6	17

Note. EG is the experimental and CG is the control group

The participants are students in a public middle school which is in a city center in the western Black Sea region of Turkey. There are 33 students in total, 16 in the experimental group and 17 in the control group. The students have similar achievement levels. They are 11-12 years old. Most of them are middle-income students. They had at least one of the necessary equipment for distance education such as laptop, smart cell phone, or tablet. Because participation in the courses in distance education is not compulsory, the number of students decreased towards the end of the implementation. The numbers given in Table 1 represent the students who fully participated in the entire implementation process and tests.

SU ELÇILERI (WATER AMBASSADORS)

In this cartoon series, the Ministry of National Education (MONE), the General Directorate of State Hydraulic Works (DSI), and Turkish Radio and Television Corporation (TRT) are the beneficiaries, and the Ministry of Environment and Urbanization is the contracting authority. The TV series prepared within the scope of the "Water Ambassadors Training and Awareness Raising Technical Assistance Project" financed by the European Union and the Republic of Turkey. There are 31 short episodes, and each episode is approximately 10 minutes long.

"Su elçileri" means water ambassadors, and four main characters, Captain Pengu (a penguin), Mandalina (a water buffalo), Misket (a meerkat), and Pelik (a pelican) are the members of the 'Water Ambassadors'. The water ambassadors aim to protect nature, deals with the environmental problems and what needs to be done to eliminate these problems.

There is an environmental theme for each episode such as water, environmental protection, environmental problems, environmental pollution, recycling, and protection of natural resources (Ada & Kartal, 2019). All the episodes are free to watch on both the website of the "TRT Çocuk" channel (TRT Çocuk, 2021) and on the official Youtube channel. The subtitles under the "Human and Environment" unit are "Biodiversity", "Human and Environment Relationship" and "Destructive Natural Events". The objectives of each sub-title correspond exactly to the subjects mentioned in the episodes of "Su Elçileri". Before the implementation, each episode was watched and matched (except two episodes) with the objectives of the unit (see Table 2).

Table 2. Objectives of "Human and Environment Unit" and Related "Su Elçileri" Episodes

Objective	Episode number
F.5.6.1.1. Make an inquiry on the importance of biodiversity for natural life. Gives examples of plants and animals that are endangered or in danger of extinction in our country and in the world.	1, 16
F.5.6.1.2. Discuss the factors that threaten biodiversity based on research studies.	4, 12, 19
F.5.6.2.1. Express the importance of interaction between humans and the environment. The negative effects of environmental pollution on people's health are mentioned.	5, 6, 8, 22, 26, 30
F.5.6.2.2. Offer suggestions for the solution of an environmental problem in the immediate surroundings or in our country.	4, 13, 16, 20, 23
F.5.6.2.3. Make inferences about environmental problems that may occur in the future as a result of human activities.	9, 14, 15, 18, 28
F.5.6.2.4. Discusses the benefits and harms of human-environment interaction on examples.	2, 4, 15, 17, 27
F.5.6.3.1. Explain the destructive natural events caused by natural processes. F.5.6.3.2. Express the ways of protection from destructive natural events.	3, 7, 25

TREATMENT

The research was prepared within the framework of the "Human and Environment" unit objectives in the 5th-grade science curriculum. Distance education was used for 5 weeks in both experimental and control groups

because of the COVID-19 pandemic. None of the students have problems that would prevent them from participating in distance education such as internet access or access to electronic devices.

The structure of lesson plans on "Human and Environment" unit in experimental and control groups were summarized in Table 3. In both groups, z book application was used. Z book is defined as the enriched version of the textbooks with multimedia elements without touching the written texts. The secondary school 5th-grade science textbook provided by the Ministry of National Education was followed and the interactive activities in EBA platform were conducted. Lecturing and questioning were the main strategies used throughout the implementation. In the experimental group, at the beginning of each lesson, students get to watch an episode of "Su Elçileri" animated cartoon related to the subject content and objectives of that lesson. After watching an episode of the "Su elçileri" cartoon series during the lesson, questions were asked to the students to help them understand the relationship between the episode and the learning outcomes of the lesson. Particular attention was drawn to the behavior of the characters, and class discussion initiated on why they behaved the way in the episode. The students were asked how they would behave if they were a character in the cartoon, it was tried to make them have empathy for the characters. A total of 29 episodes were watched with the sequence of the objectives of the unit (see Table 2) during the treatment.

Both classes met for 80 minutes per meeting, two times a week. Due to the limited hours of the lesson, at least one of the episodes was shown to the students during the lesson, and the link of the other related episode/s was sent to the students or their families via a messaging mobile application as homework. The student who watched the episode/s of the "Su Elçileri" at home, wrote sentences summarizing the episode that they watched on a mobile app and commented on the behaviors of the characters. At the same time, the teacher created a discussion environment in this mobile app group and ensured the participation of the students.

Table 3. Structure of Lesson Plans on "Human and Environment" Unit

	In class	At home
Experimental group	• Watching an episode of "Su elçileri" • Discussing on behaviors of the characters in "Su Elçileri" • Lecturing with Z book • Conducting interactive activities in the EBA platform	• Watching other related episodes of the objectives. • Summarizing the episode that they watched and commented on the behaviors of the characters via mobile messaging app • Studying unit worksheet • Completing unit evaluation questions
Control group	• Lecturing with Z book • Questioning • Conducting interactive activities in the EBA platform	• Studying unit worksheet • Completing unit evaluation questions

DATA COLLECTION TOOLS

Data on the sub-dimension of the environmental literacy: knowledge, affective dispositions, attitude, and behavior were collected through four tools. These are "Environmental Knowledge Test", "Affective Dispositions towards the Environment Scale", "Environmentally Responsible Behavior Scale", and "Environmental Problems Attitude Scale". Data was collected through an online platform.

ENVIRONMENTAL KNOWLEDGE TEST: This test was prepared by the researchers to measure the environmental knowledge of the students about the subjects in the Human and Environment unit. The items were composed of 30 questions taken from the "Skill-Based Questions" and "Environmental Education Teaching Material" (Ozdemir et al., 2019) prepared by the Ministry of National Education. Opinions of two experts were taken for the content and face validity of the scale. For content validity, experts were asked to fill in the blank table of specifications and prepare an answer key for the scale. In addition, the experts interpreted the intelligibility of the test items. After the revisions, a pilot study was conducted. The sample of the pilot study was 149 middle school students in the 6th and 7th grades. As a result of item analysis, 3 questions were removed since their discrimination index was too low. Cronbach's Alpha value was calculated as 0.91 and its reliability was determined to be high (Buyukozturk, 2011; Crocker & Algina, 1986).

AFFECTIVE DISPOSITIONS TOWARDS ENVIRONMENT SCALE: The scale developed by Erdogan (2009), is a 4-point Likert-type scale consisting of 14 items measuring affective tendencies towards the environment. A minimum of 14 points and a maximum of 56 points can be obtained. The reliability coefficient was calculated as Cronbach alpha .72 for pre-test data and .92 for post-test data. Therefore, the scale is reliable since the Cronbach alpha coefficient was higher than .70 (Pallant, 2013).

ENVIRONMENTALLY RESPONSIBLE BEHAVIOR SCALE**:** The scale consists of 26 behavioral expressions and was developed by Erdogan, (2009). The seven-point Likert scale; never (0 times), 1 time, 2 times, 3 times, 4 times, 5 times to more than five times, was used. However, these responses were categorized under four groups; "never", "1 to 3", "4 to 5" and "more than 5" to analyze. Therefore, the scores range between 26-104 points. The calculated Cronbach alpha coefficients for pre-test and post-tests were .87 and .91 respectively indicate a reliable scale (Pallant, 2013).

ENVIRONMENTAL PROBLEMS ATTITUDE SCALE: The scale was developed by Ozdemir (2016) for middle school students. It is a five-point Likert-type scale consisting of 20 items (11 positives and 9 negative items). The reported reliability was relatively moderate (.64), and it was calculated as .64 for both pre-test and post-test data of the present study.

ANALYSIS OF DATA

Both descriptive and inferential data analyses were conducted via IBM SPSS Statistics 25. First, the assumption of normal distribution was checked, and non-parametric Mann-Whitney U was conducted to compare the scores of the control and experimental groups. The Wilcoxon Signed-Rank tests were used to compare the pre-test and the post-test scores of each group.

3 | FINDINGS

The descriptive statistics of data obtained from the control group and experimental group are presented in Table 4 and Table 5.

Table 4. Descriptive statistics of data obtained from control group

Group	Test	N	Min	Max	Mean	SD	Skewness	Kurtosis
CG	Pre-K	17	4.00	24.00	12.41	5.799	.279	-.693
	Post-K	17	5.00	22.00	13.29	6.322	.031	-1.769
	Pre-AD	17	35.00	55.00	48.94	5.717	-1.355	1.742
	Post-AD	17	21.00	56.00	48.35	8.867	-2.144	5.253
	Pre-ERB	17	42.00	83.00	59.53	12.526	.515	-.553
	Post-ERB	17	26.00	86.00	61.29	13.415	-.801	2.046
	Pre-ATT	17	58.00	88.00	72.18	8.141	.335	-.413
	Post-ATT	17	48.00	84.00	70.94	8.569	-1.074	1.965

Note. Abbreviations: CG= Control Group. K=Knowledge, AD= Affective Dispositions towards the Environment, ERB= Environmental Responsible Behavior, ATT= Environmental Problems Attitude

Table 5. Desciptives of data obtained from experimental group

Group	Test	N	Min	Max	Mean	SD	Skewness	Kurtosis
EG	Pre-K	16	3.00	25.00	14.88	6.781	-.159	-1.171
	Post-K	16	3.00	25.00	16.25	7.638	-.391	-1.457
	Pre-AD	16	43.00	56.00	50.69	3.535	-.222	-.101
	Post-AD	16	33.00	56.00	50.19	6.167	-1.622	3.000
	Pre-ERB	16	45.00	72.00	55.63	7.482	.690	.223
	Post-ERB	16	57.00	90.00	76.06	9.567	-.484	.030
	Pre-ATT	16	57.00	90.00	73.81	8.557	-.618	.554
	Post-ATT	16	68.00	90.00	77.69	6.311	.285	-.686

Note. Abbreviations: EG= Experimental Group, K=Knowledge, AD= Affective Dispositions towards the Environment, ERB= Environmental Responsible Behavior, ATT= Environmental Problems Attitude

Afterward, it was tested whether the pre-test data collected before the treatment were different between the control and experimental groups. For this purpose, the Mann Whitney-U test was performed, and no statistically significant difference was found between experimental and control groups' pre-test scores in any of the sub-dimensions of the environmental literacy. Results were summarized in Table 6, none of the p values is significant. The findings showed that the students' knowledge levels, affective dispositions toward environment, environmentally responsible behaviors, and attitudes towards the environmental problems were not different from each other before the implementation. Therefore, the differences that may arise between the groups after the implementation could be attributed to the effect of the implementation.

Table 6. Comparison of pre-test scores of the groups

Group	Test	N	Mean Rank	U	P
CG	Pre-K	17	15.09	168.500	.241
EG	Pre-K	16	19.03		
CG	Pre-AD	17	15.91	154.500	.500
EG	Pre-AD	16	18.16		
CG	Pre-ERB	17	18.03	118.500	.528
EG	Pre-ERB	16	15.91		
CG	Pre-ATT	17	15.65	154.000	.533
EG	Pre-ATT	16	18.44		

Note. Abbreviations: CG= Control Group, *EG= Experimental Group*. K=Knowledge, AD= Affective Dispositions towards the Environment, ERB= Environmental Responsible Behavior, ATT= Environmental Problems Attitude.

After the implementation, the post-test data of both the experimental and control groups were compared with each other and the difference between the pre-test and post-test data of the groups were investigated. The findings are presented separately for each test below. Environmental knowledge post-test data of experimental and control groups were compared with Mann Whitney U statistics and the findings are given in Table 7.

Table 7. Comparison of post-test scores of the groups

Group	Test	N	Mean Rank	U	P
CG	Post-K	17	14.79	173.500	.176
EG	Post-K	16	19.34		
CG	Post-AD	17	16.44	145.500	.730
EG	Post-AD	16	17.59		
CG	Post-ERB	17	11.26	233.500	.000*
EG	Post-ERB	16	23.09		
CG	Post-ATT	17	13.71	198.500	.023*
EG	Post-ATT	16	20.50		

Note. Abbreviations: CG= Control Group, *EG= Experimental Group*. K=Knowledge, AD= Affective Dispositions towards the Environment, ERB= Environmental Responsible Behavior, ATT= Environmental Problems Attitude.

After 5 weeks of treatment, there is no statistical difference between experimental (Mean Rank=19.34) and control group students' (Mean Rank=14.79) knowledge on the concepts of the "Human and Environment" unit, U=173.500, z= 1.354, p>.05, r=0.24 (small effect size). There is improvement in the knowledge acquisition of both groups when compared to the pre-K scores of the groups (see Table 4-5). The pre-K mean score of the control

group is $\overline{X}$=12.41, the post-K score is $\overline{X}$= 13.29, and the experimental group's pre-K score is $\overline{X}$=14.88, post-K mean score is $\overline{X}$=16.25. Even there is a mathematical difference between the post-K scores of the groups, the difference is not statistically significant (see Table 7). The question of whether there is a difference between pre-K and post-K scores of each group was investigated with Wilcoxon signed-rank test (see Table 8). The findings show that there is no statistical difference between pre-K and post-K scores of the control group (Z=.833, p>.05, r=0.10 small effect size) as well as the experimental group (Z=.830, p>.05, r=0.10 small effect size).

Table 8. Comparison of pre-K and post-K scores of each group.

Group	Posttest-Pretest	n	Mean Rank	Sum of Ranks	Z	P
CG	Negative differences	6	9.83	59.00	.833	.405
	Positive differences	11	8.55	94.00		
	Ties	0				
EG	Negative differences	7	6.50	45.50	.830	.406
	Positive differences	8	9.31	74.50		
	Ties	1				

Mann- Whitney U statistic was calculated to investigate the effect of animated cartoons on students' affective dispositions towards the environment (see Table 7). The findings indicate that there is no statistical difference between the control group and experimental groups' affective dispositions towards the environment post-AD U=145.500, z=.345, p>.05, r=0.06 (small effect size). The mean rank value of the control group is 16.44 and the experimental group is 17.59. The difference between each group's pre-AD and post-AD affective dispositions towards environment scores was compared with Wilcoxon signed-rank test. Table 9 shows the results of the analysis.

Table 9. Comparison of pre-AD and post-AD scores of each group.

Group	Posttest-Pretest	n	Mean Rank	Sum of Ranks	Z	P
CG	Negative differences	8	7.13	57.00	-.284	.777
	Positive differences	6	8.00	48.00		
	Ties	3				
EG	Negative differences	7	8.21	57.50	-.315	.753
	Positive differences	7	6.79	47.50		
	Ties	2				

The findings show that there is no statistically difference between pre-AD and post-AD scores of the control group (Z=-.284, p>.05, r=0.04 small effect size) and pre-AD and post-AD scores of the experimental group (Z=-.315, p>.05, r=0.04 small effect size) too.

The environmentally responsible behaviors of students are another dependent variable of the study. Mann-Whitney U statistics were calculated to answer the question, whether students' environmentally responsible behaviors of control and experimental group students differ after 5 weeks implementation. The results were given in Table 7. The findings show that there is a statistically significant difference between control and experimental groups' post-ERB scores (U=233.500, z=3.518 p<.05, r=0.61 (large effect size). The difference is in favor of the experimental group (Mean rank= 23.09) than the control group (Mean rank= 11.26). In addition, the difference between pre-ERB and post-ERB data of the control group and experimental group was statistically tested. Wilcoxon signed-rank results are in Table 10. The results show that there is no difference between pre-ERB and post-ERB test scores of the control group (Z=.592, p>.05, r=0.07 small effect size). However, the test was significant for the experimental group that means there is a statistically significant difference between pre and post-test scores of the students who are treated with "Su Elçileri" animated cartoon series (Z=3.520, p<.05, r=0.43 medium effect size). The post-ERB mean score is $\bar{X}$= 76.06 and the pre-ERB mean score is $\bar{X}$= 55.62.

Table 10. Comparison of pre-ERB and post-ERB scores of each group.

Group	Posttest-Pretest	n	Mean Rank	Sum of Ranks	Z	P
CG	Negative differences	7	9.14	64.00	.592	.554
	Positive differences	10	8.90	89.00		
	Ties	0				
EG	Negative differences	0	.00	.00	3.520	.000*
	Positive differences	16	8.50	136.00		
	Ties	0				

Last, the effect of animated cartoon series on students' attitude on environmental problems was tested. The results of the Mann-Whitney U test are presented in Table 6. The findings indicate that there is a statistical difference between the control group and the experimental groups' attitudes towards environmental problems (U=198.500, z=-2.255, p<.05, r=4 medium effect size). The difference is in favor of the experimental group, the mean rank value of the experimental group is 20.91 and the control group is 13.32. The mean post-ATT score of the experimental group is $\bar{X}$= 77.69, and the control group is $\bar{X}$= 70.94. In addition, the difference between pre-ATT and post-ATT scores of the groups were tested with Wilcoxon Signed Rank Test (see Table 11). There is a statistically significant difference between experimental groups' pre-ATT and post-ATT scores (Z=-1.991, p<.05, r=0.25 small effect size).

Table 11. Comparison of pre-ATT and post-ATT scores of each group.

Group	Posttest-Pretest	n	Mean Rank	Sum of Ranks	Z	P
CG	Negative differences	8	8.00	64.00	-.228	.820
	Positive differences	7	8.00	56.00		
	Ties	2				
EG	Negative differences	3	8.33	25.00	-1.991	.047
	Positive differences	12	7.92	95.00		
	Ties	1				

4 | DISCUSSION & CONCLUSION

The present study delves into whether 5th graders' environmental literacy improved by animated cartoons. For this purpose, 5 weeks intervention was conducted in a distance learning environment because of the restrictions during the COVID-19 pandemic. The findings indicate that among four sub-dimensions of the environmental literacy, environmentally responsible behavior and attitude toward environmental problems were improved better in experimental group students than control group students. No statistical difference was detected in the acquisition of knowledge and affective dispositions of the students.

The knowledge gain score of both group students was small, the main reason for the low acquisition of knowledge may be the distance learning environment because of the COVID-19 pandemic. Interaction with the educational material is among the effective ways in online learning, the implementation of the present study includes interactive activities however the students' motivation to learn was low both because of the restrictions to control the spread of coronavirus and midterm and final exams were canceled in schools. The findings emphasize that "such an online education would never replace the need for live education" (Schneider & Council, 2021, s. 390). However, we realized that the experimental group students were more motivated to attend the online

classes, they enjoyed watching animated cartoons episodes during and after the lessons. Further study might be conducted on the effect of animated cartoons on student's motivation to learn environmental issues.

Especially the world of animals is one of the areas where the creative imagination of the child may rise to the surface. In this context, films that include animal characters have great pedagogical value and may improve a child's sensitivity. From this point of view, watching the "Su Elçileri" episodes may improve students' affective dispositions towards the environment since all four characters of the cartoon were sensitive to the environment and environmental problems. However, the result of the study indicates that there is no difference between control and experimental groups' post-affective dispositions towards environment test scores. The necessity of different experiences and practices to nurture affective dispositions of students is emphasized (Fettahlioglu et al., 2016) but the lack of field trips and outdoor learning activities that provides various experiences related to the environment and local environmental problems to the students in the online learning environment may not support students' affective dispositions enough. The main reason for that finding may be attributed to this fact.

According to Roth (1992), affective strand of the environmental literacy is related to several dimensions such as showing responsibilities towards the environment, intention to take an action and attitude toward environment. Although there is no improvement in affective dispositions towards the environment of the students, the findings showed that receiving instruction supported with animated cartoons significantly foster both environmentally responsible behaviors and attitude towards environmental problems. The most intended outcome of environmental education is to raise individuals who have positive attitudes towards environmental problems and exhibit environmental behaviors to solve these problems for a sustainable future. Therefore, the contribution of the study to the related literature is valuable. In each episode of the "Su Elçileri", a local environmental problem occurs, and animal characters solve this problem, experimental group students not only watch episodes but also discuss the problem, how they could behave if they were one of the animals among water ambassadors. The discourses of the students and teachers may improve their attitudes toward the environment and environmentally responsible behavior. In further studies, these discourses might be studied to focus on how watching animated cartoons improve these variables.

The design of the study had to be changed from face-to-face lessons to online environment because of the restrictions during the COVID-19 pandemic. This change results in some limitations and advantages. As a limitation, the sample size became small, online data collection was difficult because of the age range of the students, and parent cooperation was needed more than face to face schooling. Thus, similar studies may be conducted with a large sample and face to face education environment. "The absence or existence of degrees of literacy can best be determined by observed behavior" (Roth,1992, p. 5) therefore, observations and qualitative data could be collected to support the findings.

During the pandemic, students must stay at home and have been overly exposed to technological devices like TV, tablets, laptops, and cell phones. The content of the TV programs, games, cartoons, and their effects on students' behaviors became more important than ever. Bringing the course achievements and animated cartoons together help the students who were bored at home and during the online lessons be motivated to participate in classes and engage in the activities and discussions. The cartoons and animations in the educational environment enable children to participate in the learning environment with fun and willingness and improves effective learning and retention (Aslan, 2020). Therefore, animated cartoons may be used in science education and different grade levels.

STATEMENTS OF PUBLICATION ETHICS

This study includes human research, the methodology, and data collection tools that should be approved to be ethical. The institutional review board office of a state university approved the method of the study (dated March 30th, 2021). Before the study, students were informed about the study, the right to withdraw. Data obtained from the study, students' names, and the name of the school are guaranteed against sharing in the publications by researchers and parents signed the informed consent. This study started with fifty-two students and continued with thirty-three students who accepted the study.

RESEARCHERS' CONTRIBUTION RATE

The contribution rate of the authors is equal in the manuscript.

CONFLICT OF INTEREST

There is no conflict of interest.

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