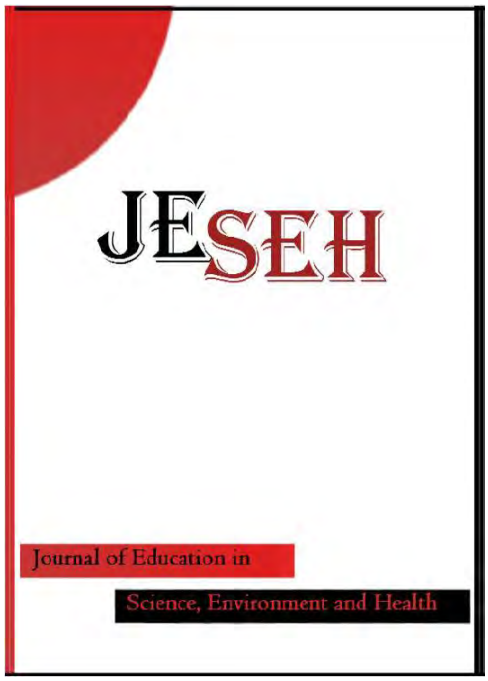

ISSN: 2149-214X

Journal of Education in Science, Environment and Health

www.jeseh.net

Investigation the Effectiveness of Storytelling on Fifth Grade Turkish Students' Environmental Problems

Fatma Costu[1], Elif Demirci[2], Bayram Costu[2]
[1]Istanbul Sabahattin Zaim University
[2]Yildiz Technical University

To cite this article:

Costu, F., Demirci, E. & Costu, B. (2022). Investigation the effectiveness of storytelling on fifth grade Turkish students' environmental problems. *Journal of Education in Science, Environment and Health (JESEH), 8*(3), 264-282. https://doi.org/10.55549/jeseh.1158512

JESEH
Journal of Education in Science, Environment and Health
Volume 8, Issue 3, 2022
https://doi.org/10.55549/jeseh.1158512

Investigation the Effectiveness of Storytelling on Fifth Grade Turkish Students' Environmental Problems

Fatma Costu, Elif Demirci, Bayram Costu

Article Info

Article History

Published:
01 July 2022

Received:
09 January 2022

Accepted:
13 June 2022

Keywords

Story, Stroytelling, Environmental education, Word-association test,

Abstract

Even though there are numerous studies on environmental education in the literature, they are limited to investigate the effects of stories. In this context, this research aimed to investigate the views of fifth grade Turkish students concerning environmental problems through storytelling. In accordance with this aim, action research has carried out. The study was conducted with 35 students enrolled in a middle school. Four stories related to different environmental topics were told participants during four weeks. Qualitative data were obtained through focus group interviews supported by data analysis of word association test (WAT). WAT included six key words was applied as pre- and post-WAT. The frequency tables and concept networks were constructed based on WAT results. Participants discussed the effects of environmental problems, the consequences of environmental problems, and environmental protection through focus group interviews. According to the WAT results, students mostly associated "human" with "environmental problem" and "environmental pollution". They also used of ecological terms increased at the end of intervention.

Introduction

Environmental issues are at the alarming rate for all around the world in recent years. These problems refer to any action which has the harmful effects on living things such as pollution, global warming, and species extinction (e.g., Almahasheer & Duarte, 2020; Ebadi et al., 2020; Erten, 2004; Gregory et al, 2021; Hasnat et al., 2018). According to The Living Planet Report by World Wildlife Fund (WWF, 2018), consumption of natural resources (ecological footprint) has shown an increase about 190% in the last 50 years (WWF, 2018). In Turkey, 144 ton plastic waste has polluted the seas every day (TEMA, 2021). On the other hand, Turkish Government has imposed new regulations such as paid plastic bags and zero-waste project in order to protect environment (Bilgili, 2021; TEMA, 2021). In fact, eradication of environmental problems could be possible only when each individual in each society feels a responsibility and takes the action. Therefore, environmental education has been a vital component of environmental protection. Environmental education doesn't only imply taught of basic concepts, but also aims at active participation in environmental problems to generate effective solutions. One of the general objectives of current Turkish science curriculum is to enhance students' interest towards environment and to develop positive attitudes (MoNE, 2018). Many studies on environmental education showed that students' environmental knowledge, attitudes and behaviors are not at the desired level in Turkey (e.g., Akkuzu-Guven & Uyulgan, 2021; Aydın, 2014; Erten, 2004). One reason for this problem is stated as those parents and educators are not competent on environmental issues (e.g., Amardini et al., 2021). Another reason is that environmental education in teacher training programs is ineffective (Demir & Yalçın, 2014; Hastürk, 2021). Turkey is a transcontinental country located mainly on the peninsula of Anatolia in Western Asia, with a smaller portion on East Thrace in Southeast Europe. The country, which is surrounded by seas on three sides, the Black Sea in the north, the Mediterranean Sea in the south, and the Aegean Sea in the west. In addition to this, there is also the Marmara Sea, which is described as the inland sea. Not a day goes by that an environmental disaster or issue does not trouble her. In the recent past, mucilage in the Marmara Sea has occupied the country's agenda and continues to do so (Acar et al., 2021). A huge attempt conducted to examine the marine mucilage, which invaded the Marmara Sea recently, has revealed that though the sea's surface is now clean thanks to the ongoing efforts, the threat is not over yet. It is a very important issue for the people living in this country, regarding the mentioned environment issue of Turkey, to gain awareness about such environmental problems and to take the necessary measures to prevent them.

Environmental education promotes students' knowledge base, skillset and capacity to work individually and collectively at a range of scales to care for the natural world through developing an action orientation (Clark et al. 2020). In order to develop the quality of environmental education, activity- based learning in natural

environment is mainly suggested (e.g., Demir & Yalçın, 2014; Erten, 2004; Geçit & Şeyihoğlu, 2012). Although this kind of activities offer students an opportunity to experience about natural world, there are challenges addressed on both national and international studies. One of the activity-based learning is stories and storytelling. Stories and storytelling would be an effective method for environmental education. Related studies in literature show that stories are practical, applicable, and not time-consuming (e.g., Demircioğlu et al.,2006; Jonassen & Hernandez-Serrano, 2002; Şimşek, 2004). Storytelling does not require high skills or special equipment as much as alternative options does. Besides, it could be easily adapted to different lessons including literature and foreign language. Therefore, stories and storytelling were used in the present study in order to teach environmental issues.

Theoretical underpinnings

Story and Storytelling

Story refers to "a narrative is designed to interest, amuse, or instruct the hearer or reader, either true or fictional" (Dictionary, n.d.). Accordingly, the story is related to interest and instruction from its definition. Stories make contributions to language skills of individuals beginning from early childhood period. Many children get familiarize the stories thanks to bedtime storytelling by their parents. Children who are four years old can be able to tell stories based on their real experience or imagination. When they grow up, their capacity to produce stories increases and they construct their own stories. Children who grow up in storyteller families have a potential to assume a role of personal narrator (National Research Council, NRC, 2000).

Even though storytelling means both telling and writing of stories, this research has focused on the telling of stories by single researcher as author. Several advantages of using stories could be listed as below:

- Facilitates negotiation (Jonassen & Hernandez-Serrano, 2002)
- Helps to memorize knowledge or experience (Jonassen & Hernandez-Serrano, 2002)
- Effective way to construct persuasive arguments (Jonassen & Hernandez-Serrano, 2002)
- Kind of a role-modeling by offering a chance to independently choice good or bad attitude (Jonassen & Hernandez-Serrano, 2002)
- Powerful way to present real events at past (Şimşek, 2004)
- Develops linguistic skills (Şimşek, 2004)

Because of these variety of benefits, stories are used as instruction strategy in many disciplines such as medicine, economy, and education. Moreover, some educators including Bruner (1990) advocate that stories are considered as an important component of culture (Jonassen & Hernandez-Serrano, 2002). Bruner (1990) claims that stories are appropriate tools for social constructionism and social negotiation. He believes that telling stories is a humanly action to make something meaningful. In the book of Acts of Meaning, several features of narrative are explained, in the following, under the discussion of Folk Psychology as an Instrument of Culture:

- Inherent sequentiality means constituents of the story such as events or characters have unique sequence. In other words, they do not have a meaning on alone apart from as they are given in the stories.
- Factual indifference refers that the power of the story is independent from whether it is real or fictional.
- Unique way of managing departures from the canonical means that stories could be used in order to explain the exceptional situation in ordinary patterns.
- Dramatic quality implies that stories should include moral commitment.
- Dual landscape refers that events in stories simultaneously occur both in general scene and in mental world of the main character.

As mentioned above, since stories and storytelling offered students an alternative way of learning especially difficult and boring lessons, there are numerous studies in the education literature (e.g., Demircioğlu, 2008; Dewan, 2005; Özdemir, 2012; Solak, 2006; Yılmaz, 2015). The relevant research about stories usually comprised in two main categories. The first category utilized historical events in stories e.g., famous scientist' personal life and their contribution to the scientific world. Such this type of stories prompted to inspire children's scientific motivation and engagement in the science learning activities (Hadzigeorgiou, 2006; Hadzigeorgiou et al., 2012; Jiangbo et. al., 2021). The latter category utilized stories to illustrate the sequence of events to address the scientific knowledge directly for enhancing students' understanding (e.g., Avraamidou & Osborne, 2009; Jiangbo et. al., 2021; Kokkotas et al., 2010; Simmons, 2006). Checking related literature, the

number of international studies that investigate the effectiveness of stories and storytelling on teaching environmental issues is also very limited while it is not found any research on this topic in national literature. In fact, stories are effective for children to understand the differences and others (Demircioğlu, 2008; Yılmaz, 2015; Jiangbo et. al., 2021). For this reason, stories should be used to enhance awareness about any living things and any environmental problem even they have never been experienced or met by children (Fanini & Fahd, 2009; TESS-India, 2014). Moreover, it was found that stories are useful method for socio-scientific issues (Hwang, 2011).

As science educators, one of our responsibilities is to enhance students' interest towards environment and to develop positive attitudes (MoNE, 2018). Unfortunately, many students find that environmental topics are too boring in comparison to other subjects in science education. In addition, environmental education is not given enough importance by science teachers due to some limitations such as insufficient background knowledge of teachers, time constraints, and inappropriate conditions for nature education (e.g., Şimşekli, 2004). Another point to take into account in environmental education is about students' emotions. Educators need to encourage hope for future rather than to remark destructive effects of environmental problems. Using storytelling should be a practical way to teach environmental issues because it increases students' interest and motivation (Demircioğlu, 2008; Kütük, 2007; Özer; 2004; Solak, 2006).

In the related literature, it was observed that majority of studies using stories was conducted on English teaching and these studies produced favorable outcomes (e.g., Armie, 2020; Nicholas et al., 2011). One advantage of this method is that using stories provides contextual learning (Özdemir, 2012; Yardım, 2011; Yılmaz, 2015). Since environmental issues contain contextual property in their nature, storytelling would be a fruitful method for environmental education. Another advantage of using stories is that students defined this method as enjoyable (Demircioğlu, 2008; Solak, 2006; Yılmaz, 2015). This is important for environmental protection because Erten (2004) claims that people protect what they love. Erten (2004) advocates that endearing animals and plants to children should become one of the main objectives of environmental education. For this purpose, storytelling could be considered as a suitable method. Moreover, Şimşekli (2004) suggested that educators in environmental education should prefer the methods which can be applied on all lessons. In related literature, the studies exampled to utilized stories for environmental issue. For example, Derman and Aslan (2016) stated that Dede Korkut stories (in Turkish literature) are good sources for studies dealing with on environmental education. Similarly, other countries' literature there are many examples for environmental issue, i.e., as said Denkova (2011), Macedonian literature there are also many story examples for environmental issue.

In conclusion, environmental problems such as global warming, loss of biodiversity, and pollution have a significant role for all humanity. Environmental education concerning environmental awareness, environmental activism, and environmental knowledge has a crucial role on dealing with these issues. Nevertheless, there are several issues that restrict the quality of environmental education in our country similar to many other countries such as teachers' ability, students' attitudes or time constraints (Demir & Yalçın 2014; Rahman et al., 2018; Şimşekli, 2004). Although there are many studies conducted on environmental issues, there are few studies focused on qualitative approaches, younger participants, and alternative instrument such as word association or focus group interview (e.g., Dasdemir, 2018; Kahyağolu, 2016).

Stories and Science Education

Stories and scientific inquiry have similar patterns. For instance, setting a scene, presenting a problem, and resolving the problem are respectively followed in many stories while presenting a context, giving a problem, and producing a solution are main parts of scientific inquiry (TESS-India, 2014). Furthermore, Dahlstrom (2014) advocates that storytelling has a significant role for science communicator. Especially for non-expert audiences, using storytelling contributes to comprehension, interest, and engagement. Also, it was pointed that people tend to believe in narrative statements rather than logical or scientific arguments (e.g., Dahlstrom, 2014). Stories are strongly related to the scientific practices such as modeling. Fuchs (2015) posed a question to identify relationship between formal science and folk science (stories) in modern macroscopic physics. For this purpose, he compared the simulation of formal models with storytelling. In his study, it was found that stories facilitate to understand and to build scientific models. Therefore, stories could be considered as an agent of theory as well as a method for conceptual change model.

Another benefit of stories is that they are effective manner for case-based reasoning. It facilitates the problem solving by storing and identifying experiential knowledge. It was proposed that stories are fundamental methods in order to teach how to apply knowledge learned in schools on problems in informal settings. In addition,

likewise to the simulations stories should enable people to substitute themselves in experience which they have never had (Jonassen & Hernandez-Serrano, 2002).

Klassen (2006) defined five domains of context by examining several theories such as constructivism and social constructionism and these are theoretical, practical, social, historical, and affective. Then, he developed the Story–Driven Contextual Approach (SDCA) which is a method for contextual science teaching based on these contexts. According to this approach, contextualization is an effective and useful way in order to minimize the complexity of laboratory works and to comprehend theoretical background of scientific phenomena. Furthermore, scientific discourse is suggested in classrooms by emphasizing the importance of linguistics. Thus, students would act as novice scientists instead of passive observers whereas teachers are responsible for monitoring the process.

Stories are assumed as a way to enhance students' emotions and emotions are strongly related to the motivation, attention, memorization and finally learning. Therefore, using stories is one of the basic elements of SDCA (Klassen, 2006). Stories provide teachers to engage active engagement of students in the five domains which are theoretical, practical, social, historical, and affective. The schema of SDCA is given in the Figure1.

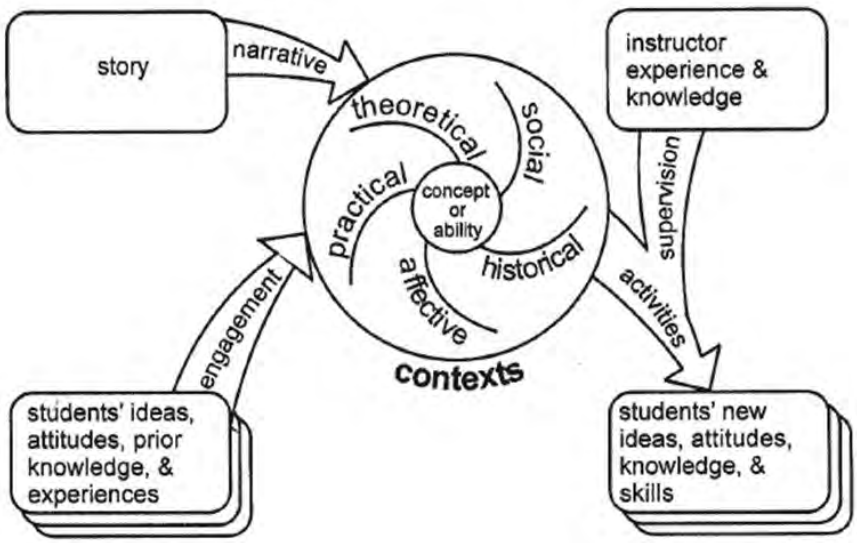

Figure 1. A schema for the story-driven contextual approach

Klassen and Klassen (2014) addressed an important problem that a significant number of students show low interest to science lessons. As a result, their intellectual involvements are insufficient and efforts to teach science would be useless. Nevertheless, they supported that use of science stories is a useful way to increase interest of students both in class and out-of-school. Moreover, it was suggested to combine the science stories, hands-on activities, and social interaction within the contextual manner.

Mutonyi (2016) has conducted a longitudinal study with secondary school students in Uganda throughout four years. Even though some researchers agree African–American, African, and similar cultures have limited connections to modern science (Mutonyi, 2016), she used cultural manners like stories, proverbs, and anecdotes on teaching scientific concepts. In Mutonyi's study, researchers used the stories to initiate discussions about health issues. The analysis of data showed that stories contribute to emotional engagement, motivation, and knowledge level of learners.

Even though the most of studies related to stories or storytelling in our country (i.e., Turkey; Bayraktar, 2014; Hava, 2021) and other countries (e.g., Armie, 2020; Nicholas et al., 2011; Hemmati et al, 2015; Hwang et al, 2016) has focused on English language teaching, there are several research on science education. One of them advocated that stories enhance students' willingness to learn chemistry (Demircioğlu et al., 2006). According to the research, stories would be useful to relate scientific concepts with daily lives, to increase students' motivation, and to provide active participation of students. Furthermore, stories should be used to eliminate alternative frameworks and to replace them by scientific ones. It was suggested to use visual materials for promoting effectiveness of stories.

Another research was carried out in order to investigate the effect of scientific stories on learners' creativity and affective properties (Gölcük, 2017). In accordance with this purpose, the study was designed as the convergent parallel mixed method research. The participants consisted of elementary students and data were collected through semi-structured interview, open-ended questions, Torrance Test of Creative Thinking Test, and Attitude toward Science Questionnaire. As a result of the study, quantitative data found no significant difference in terms of students' creativity and attitudes toward science.

In contrary to quantitative data analysis, qualitative findings have shown that students find scientific stories as enjoyable and interesting (Gölcük, 2017). Additionally, students expressed that scientific stories facilitate to make scientific connections in real-life experiences. Finally, some of the students explained that stories should be used in other lessons, particularly in difficult subjects because they claimed that stories are helpful for comprehension. Consequently, it was asserted that stories are effective to create affirmative learning environment.

Environmental Issues and Stories

Stories give a chance to empathize, so they are suggested as a way to understand animals and plants in environmental issues (TESS-India, 2014). Increasing tourism in northwestern Morocco raises concerns for possible environmental consequences (Fanini & Fahd, 2009). For this reason, a story book related to different aspects of ecosystem was prepared and distributed to students. As a result of survey completed by 74 students from rural and urban areas, it was found that stories are effective to increase the awareness to local environmental issues. Moreover, students who live in urban could define certain species despite of the fact that they have never seen them similar to description of their peers in rural areas.

By taking into consideration of socio-scientific issues, Hwang (2011) argued that environmental education should be given through discourse instead of teaching environmental concepts at knowledge level. However, he concluded that many teachers have insufficient ability on environmental instruction because of various reasons. As a result of the study with teachers, Hwang claimed that integration of stories to the curriculum helps teachers to develop their instructions on different environmental topics. For instance, it was reported that alternative energy teaching with whom a teacher 15-year experiences cannot be fully understood without stories.

Folktales as cultural tools might have a significant role on the acquisition of environmental knowledge. 15 stories were collected from different cultures: America, North American Indians, Australian aborigines, Tahiti, Japan, Africa, England, Ireland and Malaysia (Ahi et al., 2014). The content analysis of these stories showed that they have a wide range of subjects consisting of nature-human interaction, pollution, and natural life. Nevertheless, it was found that some stories include negative behavior such as destroying trees and it was remarked that these stories might serve as bad role model for children. In the light of this line, the present study aimed to investigate the views of fifth grade Turkish students concerning environmental problems through storytelling.

Research questions

There were two research questions of the study as follows:

1. How does affect storytelling on fifth grade students' cognitive structures concerning environmental problems?
2. How does affect storytelling on fifth grade students' views concerning environmental problems?

Method

We utilized transformative action research in this study. The action research aimed to produce solution based on participants' thoughts and reflections throughout certain practices (Savin-Baden & Major, 2013). Transformative action research can be used synonym with social constructionist action research and promotes high participation with interpretation to investigate different thoughts (Savin-Baden & Major, 2013). In this study since we aimed to reveal the development of students' views concerning environmental issues, the second author give the students storytelling training before applying the storytelling sessions.

Sample

The participants of this study consisted of 35 fifth grade Turkish students enrolled in one middle school (12 males, 23 females). The school is located one of the low socio-economic parts of Istanbul the biggest metropolitan in our country. Data were gathered at students' own classroom because they would feel more comfortable in their familiar environment. All participants were at the same class and the class was heterogeneous in terms of academic achievement. The instructor (second author of the paper) was at the same time science teacher of that class. Students were between the ages of 10 (n=12), 11 (n=19), and 12 (n=2). Ethnic breakdown of students are ranging between Turkish (31), Syrian (n= 3), and Kurdish (n=1). Students who have a foreign language came to Turkey about two years ago and participated in educational activities in a formal learning environment. Therefore, it could be assumed that they are actively participated in the activities in the educational content. The students had difficulty with speaking in Turkish; however, they good at understanding and writing. Their families were informed the research purpose and the importance of the study via parents' meeting. Participation was provided teachers' encouragement and there was no other inducement. Pre- and post-WAT were simultaneously assigned to all participants. However, one student did not complete the post- WAT since she was absent on the day of post- application. On the other hand, focus group interview conducted with 35 participants at first three weeks while the class consisted of 33 students at the last week of focus group interview.

Data collection tools and analysis

Word association test (WAT)

To collect data, pre- and post- WAT and focus group interview were utilized. Firstly, WAT was used as pre- and post- with the purpose of investigation of participants' cognitive structures concerning environmental issues. WAT was a practical instrument which enable researchers to obtain a wealth of data in various fields (Govender, 2002). Semantic linkages in word association test (WAT) were assumed to cover mental associations, therefore it should be used in examination of cognitive structures, investigation of conceptual frameworks, or determination of conceptual change and retention (Coştu et al., 2021; Derman & Eilks, 2016; Polat, 2013). In this study, the six key concepts were used in the WAT; these are "environment", "environmental protection", "environmental pollution", "environmental problem", "natural life" and "biodiversity". These concepts determined based on the science curriculum in Turkey (MoNE, 2018) and based on the stories used here (see Figure 2).

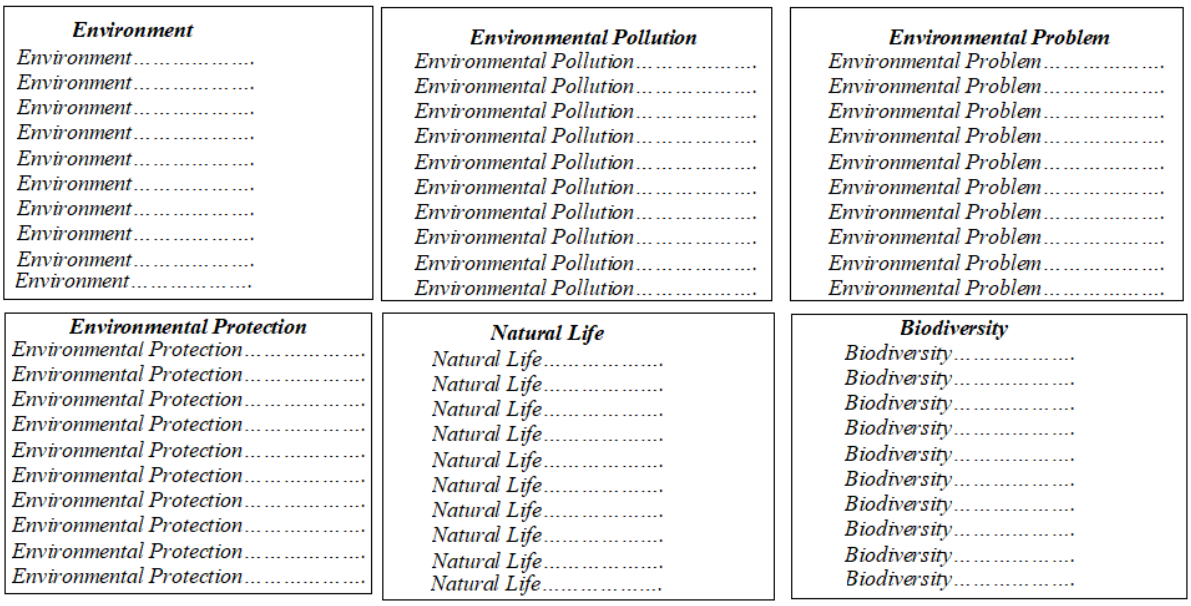

Figure 2. Key words used in the WAT

Moreover, the approval of a science educator out of the authors was received on the determination of these key concepts. The WAT was arranged in a separate page for each key concept by cutting A4 paper to six equal pieces (as seen in Figure 2). Personal information was not taken from the students in order to feel comfortable

and express freely their opinions. Only school numbers of students were asked as personal information not to feel them excited. In literature, 30 seconds were determined as suitable length of time to complete word association test (e.g., Bahar et al., 1999; Coştu et al., 2021; Polat, 2013). Nevertheless, pilot testing was conducted in order to determine the amount of time because sample of this study were younger and had lower language skills compared to their peers. Thus, the WAT was applied on another fifth-grade class in the same school and it was seen that one minute was appropriate for each key word for fifth grade students.

As a result of the pilot test, it was not observed any problem with understanding of key concepts which might threat the feasibility in order to promote content validity. Pre- and post-WAT data were documented for each student. Frequency tables were constituted to examine how many answers had been produced for each key concept and how many of these answers repeated. Data obtained from these frequency tables and cut-off point technique were used to develop concept networks. In the cut – off point technique, the point of 3 or 5 less than the highest frequency of answers was defined as the first cut-off point. Other cut-off points were determined by dropping frequencies at regular intervals until all key concepts came up in the concept network (Bahar et al., 1999; Coştu et al., 2021; Waern, 1972). The cut-off point interval in this study was determined as "5".

Focus group interview

Since the primary purpose is to gain deep knowledge rather than intended answers or majority of evidence, focus group interview was used to examine how storytelling influence on fifth grade students' views concerning environmental issues. Despite similarities with individual interview, interview with focus group has its own characteristics. One of them is that focus group interview mostly aims to release opinions of particular group about a particular issue rather than understanding individual differences (Savin-Baden & Major, 2013). Another difference is that social interaction was promoted in focus group interview since social environment is one of the agents that constructs the individual's beliefs, thoughts, and knowledge from the view of Vygotsky (1978). The researcher (the second author) moderated focus group interviews after each storytelling session. In order to construct a natural environment as much as possible, interviews were conducted in classroom at usual science lessons. Semi-structured manner was designed because younger students might have a difficulty to give proper answers to closed questions, need open-ended items and it is needed prompts to clarify their thoughts. Main themes of interview questions were mostly determined based on the discussion questions of "The Story of Mr. Fox" which were available on open educational platform TESS–India (Teacher Education through School Based Support in India). In the mentioned story, there comprised a wide variety of environmental problems, hence it was selected. The common questions on four focus group interview sessions were as follows: (1) What are the reasons for environmental problems?, (2) What are the consequences of environmental problems?, (3) What do you suggest to prevent environmental problems?

The purpose of these questions was to investigate fifth grade students' views via focus group interview concerning environmental issues. For this reason, they were analyzed and coded as defined in data analysis process. Moreover, there were several questions asked in order to elaborate discussion and to engage participants in the stories. Qualitative method was used in order to assess the views of students throughout the procedure. Focus group interview was the central method at this study for collection of qualitative data. The researcher used abridged transcript that avoids to type excessive data such as introduction type, irrelevant responses, or moderator directions (Krueger & Casey, 2015). The classic analysis strategy was preferred since the researcher was novice about qualitative approach. This strategy includes basic elements such as several reading, cutting, and sorting for determination of thematic codes (Krueger & Casey, 2015).

Intervention

Firstly, pre-WAT was assigned to 35 fifth grade students. One week before the intervention of pre-WAT, the sample were acquired a familiarity to WAT technique with simple key words such as "sun" and "tree". They were warned not to look at the other papers by reminding that there were no single correct answers, and all answers were valuable. The students were assumed to produce ten response words by associating the relevant key concept in one minute. The same procedure was repeated until the completing of all key concepts by all the participants. At following four weeks, one story was told by instructor each week. After storytelling session, focus group interview was conducted and recorded on audiotape each week. Finally, the post-WAT was given by following the same procedure in the pre-WAT. Overall procedure lasted for six weeks (see Table 1).

Table 1. Intervention procedure of the study

1st Week	Pre-WAT (40 min.)
2nd Week	Storytelling Session (7 min) + Focus Group Interview (21 min)
3rd Week	Storytelling Session (6 min) + Focus Group Interview (26 min)
4th Week	Storytelling Session (12 min) + Focus Group Interview (22 min)
5th Week	Storytelling Session (3 min) + Focus Group Interview (28 min)
6th Week	Post-WAT (40 min.)

The pilot study of focus group interview was done to minimize possible limitation at three months ago conducting the study. Firstly, the Story of Mr. Fox and its discussion questions were chosen and translated to Turkish by the authors. The pilot story was about "a fox who found himself in buildings instead of his forest and family when it emerged from its hibernation". At the end of the pilot study, it was observed that Turkish version of the story wasn't effective as much as the original one and the researcher wasn't competent in storytelling. Consequently, four stories which were written in Turkish or has already translated to Turkish by experts were chosen for intervention. The names of the stories were "Crumpled Piece of Paper", "The Boat That Wonders Under The Sea", "The Bear That Wasn't" and "Human and Environment" and they were ranged based on science curriculum objectives (see Figure 3).

Story 1
Title: Crumpled Piece of Paper
Writer: Aytül Akal
Related Objective: Students will be able to express the importance of interaction between human and environment and negative effects of environmental pollution on human health.
Emphasized Environmental Issue: Pollution
Short Summary: One day a piece of crumpled paper falls to the ground from the garbage truck. Although a lot of people pass by, no one pick it up for a variety of reasons. A crumpled paper keeps waiting worriedly until two children comes there...

Story 2
Title: The Boat That Wonders Under the Sea
Writer: Aytül Akal
Related Objective: Students will be able to make suggestions for resolving an environmental problem in its immediate surroundings or in our country.
Emphasized Environmental Issue: Water Pollution, Natural Habitat
Short Summary: Always dreaming of being a submarine, the ferry's dream came true. But the bottom of the sea is not what it would have expected. He decided to return to be the ferry with the children who accompany him in this adventure.

Story 3
Title: The Bear That Wasn't
Writer: Frank Tashlin
Related Objective: Students will be able to inference about future environmental problems as a result of human activities.
Emphasized Environmental Issue: Species Extinction, Natural Habitat
Short Summary: A bear in the winter hibernation wakes up to find himself in the middle of a factory. He see working machines and stone pile buildings instead of trees, grass, flowers…Also, everyone keeps telling her it's not a bear!

Story 4
Title: Human and Environment
Writer: Official Course Book
Related Objective: Students will be able to discuss examples of benefits and harm situations in human-environment interaction.
Emphasized Environmental Issues: Human-Nature Interaction, Deforestation
Short Summary: Mustafa and his family moved to a big city 5 years ago. He saw factory established in his village when they went to for the summer vacation. A large part of the forest has been destroyed, many of the animals did not appear. On the other hand, many villagers had found work at the factory. Mustafa thought about what to do...

Figure 3. The stories utilized in the intervention

As seen in the Figure 3, stories were about different themes to ensure representativeness of general context such as "species extinction", "pollution", and "human-nature interaction".

Results and Discussion

WAT results

The first research question of this study was: How does affect using storytelling on fifth grade students' cognitive structures based on pre-posttest of Word Association Test (WAT) concerning environmental issues? According to the results of WAT, the number of answers for each key concept was presented in Table 2.

Table 2. Total number of different response words for each key concept

Key concepts	Total number of words Pre-WAT	Post-WAT
Environment	200	232
Environmental protection	167	169
Environmental pollution	190	197
Environmental problem	165	194
Natural life	186	200
Biodiversity	132	177
Total Number	*1040*	*1169*

It was seen that words associated by the students increased for each key concept. The highest rise occurred in "biodiversity" whereas the lowest one occurred in "environmental protection". The frequencies of different response words for each key concept were determined through examination of all students' pre- and post-WAT result. The words which are synonyms or have close meanings were presented in the same category at the frequency tables (For example, the students associated "environment" key word in the WAT as "street", "village" "city" coded as "street" because of similar meanings). As a result of obtained data, Table 3 and Table 4 indicate respectively response words which have high frequencies in pre-WAT or post-WAT.

Table 3. The frequency of response words in pre-WAT

Response Words	Key Words: Environment	Environmental Protection	Environmental Pollution	Environmental Problem	Natural Life	Biodiversity
Cleaning	12	14	2	2	9	1
Pollution	12	---	9	10	---	---
Tree	10	---	1	3	6	---
Beauty	9	6	1	1	9	6
Human	7	6	5	3	7	1
Life	6	3	6	3	7	3
Green	6	1	---	---	1	1
Animal	5	1	3	---	4	1
Flower	5	1	1	---	6	1
Street	5	---	2	---	3	---
Protection	5	9	1	1	2	---
Not to Pollute	5	6	1	---	---	---
Safety	1	6	1	1	---	---
Not to Litter	---	5	---	---	---	---
Garbage	---	1	17	1	---	---
Harmful	1	---	5	4	---	5
Malignity	---	---	5	8	1	3
Fight	---	---	---	7	---	---
Problem	---	1	---	11	---	---
Health	2	4	2	---	5	---
Diversity	---	---	---	---	---	9
Illness	---	---	2	2	---	8
Difficulty	---	---	3	1	---	5
Redundancy	---	---	---	---	---	5

According to the Table 3, some of the high frequencies belong to the last words of key concepts such as pollution, protection, and problem. Additionally, there are some notable response words that seems to be irrelevant to the associated key word such as fight with "environmental problem" or difficulty and illness with "biodiversity". Students thought that environmental problem refers to something like having problem with their friends because the word "environment" are also used to define social sphere in Turkish language. On the other hand, garbage has the highest frequency because of association with "environmental pollution". Moreover,

cleaning, beauty, human and life are response words of students that were associated with all key concepts. Thus, these response words could be defined as "mutual recurrent words".

As seen in Table 4, frequency of the last word of key concepts such as "environmental protection" and "environmental problem" remarkably decreased compared to the pre-test results, whereas students used more different response words with high frequencies. Similarly, another decrease is observed in frequencies of fight, illness, and difficulty which were associated with irrelevant key words on pre-test. Furthermore, animal which was associated with "biodiversity" has the highest frequency. Lastly, tree, flower, and animal replaced by cleaning and beauty as mutual recurrent words.

Table 4 The frequency of response words in post-WAT

	Key Words					
Response Words	Environment	Environmental Protection	Environmental Pollution	Environmental Problem	Natural Life	Biodiversity
Cleaning	17	15	---	1	14	---
Pollution	14	---	14	19	1	1
Tree	15	2	3	2	10	2
Beauty	3	1	---	1	7	2
Human	7	8	12	9	8	5
Life	10	4	3	2	5	6
Green	5	1	---	1	1	---
Animal	8	5	5	7	10	21
Flower	7	2	1	1	8	3
Grass	7	3	---	---	3	---
Protection	---	2	---	---	4	---
Environment	---	2	2	1	5	2
Safety	---	5	---	1	---	---
Insect	6	1	---	---	2	2
Garbage	1	4	15	16	---	---
Forest	5	---	1	---	4	1
Malignity	---	---	5	4	---	---
Fight	---	---	1	4	---	---
Problem	---	---	5	2	---	---
Health	1	1	---	---	6	---
Diversity	---	---	---	---	---	8
Illness	---	---	4	2	---	---
Difficulty	---	---	2	3	---	2
Redundancy	---	---	---	---	---	5
Nature	8	4	2	---	7	4
Plant	2	5	---	2	4	10
Exhaust	---	---	5	3	---	---
Natural Disaster	1	---	5	4	---	---
Living Things	2	---	2	---	---	8
Generation	---	---	---	---	---	5

According to the frequency analysis, the concept networks based on the pre – WAT results are presented in Figure 4. As seen the Figure 4, there was only one key concept emerged within the range for the cut-off point 16 and above. It was determined that 17 students associated "environmental pollution" with garbage. For the cut-off point 11 to 15, both "environment" and "environmental protection" were associated with cleaning. Also, students associated "environment" with pollution which is a negative term while "environmental problem" was associated with its last word. For the cut-off point 6 to 10, all key concepts appeared and associated words slightly increased. However, there were several issues. Firstly, there was no direct association among key concepts. Secondly, "biodiversity" which was a new term for students was associated with illness. Finally, to associate "environmental problem" with fight points the misunderstanding of this concept because the word "environment" is also used in order to define social-behavioral problems in daily life. According to the frequency analysis, the concept networks based on the post –WAT results are presented in Figure 5.

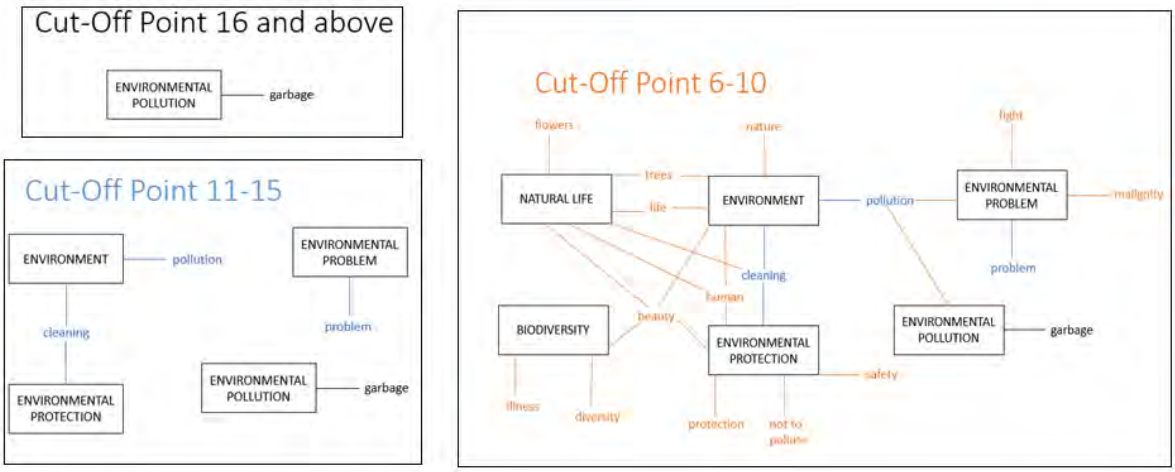

Figure 4. Concept networks formed based on pre-WAT

As seen the Figure 5, it was observed that associations of key concepts increased in comparison to pre-WAT for the cut-off point 16 and above. In this range, "environment", "environmental problem", and "biodiversity" were associated with different response words instead of "environmental pollution". For the cut-off point 11 to 15, it was determined that all key concepts were associated with different words. Nevertheless, there was no direct association of key concepts between each other similar to pre-test. For the cut-off point 6 to 10, it was observed that students made more meaningful associations. For instance, "environment" was associated with natural concepts such as bugs, flowers, and grass. Moreover, animals and human were amongst the most frequently used response words. In brief, participants produced more response word for each key concept in the post-test than the pre-test. The number of associated words for "environmental protection" has risen to 169 from 167. Despite the fact that this raise seemed to be insignificant as quantitative data, there were several important points on qualitative analysis of response words. Nine students associated "environmental protection" with police, soldier, and headman in pre-WAT whereas these words were not used in post-test. Instead of these words, students produced response words which could be considered as suggestion for environmental protection. For instance, competition, recycling, project, poster, story and TEMA were among associated words in post-test.

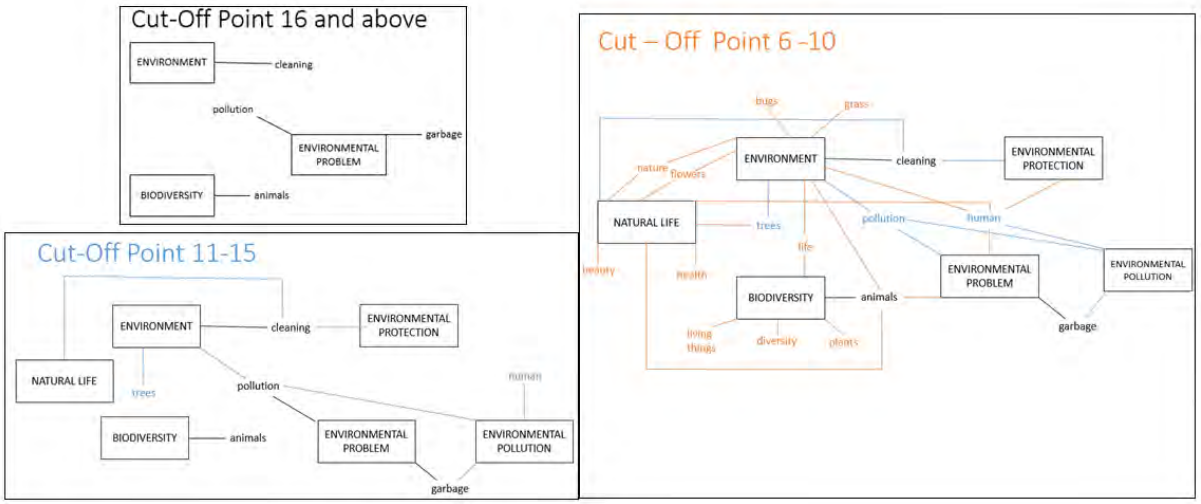

Figure 5. Concept networks formed based on post-WAT

On the other hand, inter-connections between key concepts were not observed in both pre- and post-WAT. This situation could have resulted from that majority of key concepts consisted of two words such as "environmental pollution". For instance, participants may have responded quickly as "pollution" by thinking that pollution and environmental pollution had the same meaning. As a result of the comparisons of frequency tables pre- and post–WAT, it is observed that the associations of ecological terms such as trees, flowers and animals were developed for each key concept with high frequencies. The first key concept of WAT is "environment" and pollution, and cleaning were equally used as response words to it in pre-WAT. In post-WAT, cleaning has acquired highest frequency for "environment" whereas pollution was ranked as the second, together with tree.

Moreover, frequency of ecological terms such as flowers, bugs, grass, and animals has increased as seen in concept network of post-WAT. These finding showed that students have started to link "environment" with primarily positive meanings and ecological terms at the end of the storytelling sessions. In addition, the story which is told at second week about water pollution focuses on a boat as a main character. Although boat and water pollution were not used as response words in pre-WAT, it is observed that both were associated with "environmental pollution" as a result of post-WAT. Similarly, the story at the third week is about a bear threatened with extinction and it is shown that bear was associated with "biodiversity" in post-WAT.

Focus group interview results

The second research question of this study was: How does affect using storytelling on fifth grade students' views via focus group interview concerning environmental issues? Participants discussed the same three questions regarding four different stories for four weeks. Focus group interviews' findings of were analyzed in major themes in the following sections. Also, it was given some students' explanations as example. In the example, the students numbered as S1, S2…etc.

Reasons for Environmental Problems

One of the questions which were asked to students in four focus group interviews was: What are the reasons for environmental problems? Responses to this question were resulted in those codes: "human", "animals", and "disasters". Most students reported that people result in environmental pollution. Some students directly indicated to human such as "people, insensitivity" while some of them clarified in unstraightforward way such as:

S2: "throwing litter",
S5: "factories",
S7: "exhaust fumes",
S16: "People waste their food and throw away",
S26: "cutting trees"

Many students pointed that disasters or weather events cause the environmental pollution. For example:

S8: "earthquakes",
S14: "natural disasters",
S20: "hurricanes",
S27: "fires"

Significant number of students expressed that animals leaded to environmental pollution as following:

S4: "Animals throw shells at the things they eat",
S7: "Things that were not eaten by animals cause the pollution",
S23: "feces of animals"

Some students claimed that natural disasters, fires, and weather events bring on environmental problems. However, they did not explain in detail when the researcher asked them to give justification. Moreover, one student "S21" indicated "sound" as a reason for environmental problems without further explanation. In the same focus group session, another student "S24" explained, "Loud sounds results in broken glasses, so environmental pollution happens"

Outcomes of Environmental Problems

Second question of focus group interview was: What are the consequences of environmental problems? Responses of participants were categorized in to "human", "plants", "animals", "all living things", and "the earth". Majority of students reported effects of environmental problems in terms of human life. For example;

S20: "Life becomes harder …… diseases…"
S7: "Air contaminated by exhaust fumes can cause diseases like difficulty in breathing"

S24: "Prices would increase, life becomes expensive"
S4: "… could lead to the cancer"
S22: "Manufactured gases can prevent the vision of a pilot"

Many students pointed the effects of environmental problems to the earth as following:

S18: "Icebergs could melt"
S19: "Atmosphere could be damaged"
S26: "Clouds would be harmed, and dirty rain could occur"
S8: "Water pollution"

Some participants reported outcomes of environmental problems only regarding animals whereas some of them defined with respect to plants. However, the number of responses that were coded as plants were slightly higher than the number of responses regarding animals. Several examples of both cases were presented respectively in the following:

S28: "Fishes could die"
S14: "Deaths of animals increase"
S15: "I watched at news: the sea is polluting; fishes are washing up onto a shore"
S5: "Plants which are grow in the soil could be damaged"
S22: "Plants weathering"
S24: "Factory fumes could prevent trees to photosynthesize"

Moreover, many students expressed outcomes of environmental problems in terms of all living things or multiple agents such as human and animals as following:

S19: "Living thing could die because of mass poisoning"
S22: "People and animals could die"
S7: "Air pollution……losing lives of fishes and other living things"
S6: "All living things, fishes would die"

Prevention of Environmental Problems

The last question which was analyzed in focus group interview was: What do you suggest to prevent environmental problems? Participants addressed various solutions to environmental problems throughout the discussions. These responses were evaluated and almost equally distributed to three main categories at the end of several rounds of reading transcripts. Firstly, students addressed that simple actions taken by themselves or local administrations such as increasing of garbage cans. In this context, many students claimed that warning people not to throw litter would be important for prevention of environmental problems.

S16: "by warning people"
S17: "Caution signs could be hanged everywhere"
S2: "It could be solved if people do not throw litter"
S4: "It should be increased the number of garbage cans"
S8: "It must be used something to prevent car exhaust"

Secondly, students considered that punishment and reward system would be effective in order to solve environmental problems. Some of them suggested legal sanctions including penalty fine and prison sentence whereas some students addressed the prize competitions. For instance;

S19: "It could be sentenced to imprisonment"
S22: "fine for people who are throwing litter"
S23: "……competitions at all countries…. tablets to minors and iPhone to adults"
S24: "By putting cameras in the trash cans, the people who put the garbage in the garbage bin will be rewarded, and the ones who do not throw it will be punished"
S21: "to put the people who are polluting the environment to work in the field"

Thirdly, many participants made suggestions on educating people via posters, projects and commercials about environmental protection. Some of them shared their opinions concerning simple inventions specially to collect the garbage.

S13: "Booklets can be distributed to people"
S1: "People should be trained"
S20: "Cleaning robots can be made"
S6: "Waste collecting boxes such as basketball hoops can be made, it becomes fun"
S9: "Posters can be prepared"
S18: "Recycling projects"

To sum up, many students had different views of the same issue and advocated their views with various arguments although focus group design has a disadvantage to affect to each other among participants. In contrary to the prepossession, participants shared their opinions and produced various solutions to environmental issues through social interactions. It is reported certain changes in the view of some students, but these changes seemed to be related in the effects of stories (see in Table 5).

Table 5 Change in students' expression throughout storytelling sessions

Students	Related Question	Students' Responses
S8	What are the reasons for environmental problems?	✓ Earthquakes (1st week) ✓ Fabric fumes, weather events (2nd week) ✓ Deforestation (3rd week) ✓ No response reported (4th week)
S2	What are the consequences of environmental problems?	✓ Sick people get worse (1st week) ✓ Animals loses their lives (2nd week) ✓ Plants are affected (3rd week) ✓ No response reported (4th week)
S23	What are the consequences of environmental problems?	✓ People poisoning (1st week) ✓ No response reported (2nd week) ✓ Death risk of living things (3rd week) ✓ No response reported (4th week)
S19	What do you suggest to prevent environmental problems?	✓ It could be sentenced to imprisonment (1st week) ✓ Awareness of people (2nd week) ✓ People should be conscious (3rd week) ✓ All people get the right to be warned 3 times, then they are fined. (4th week)

It was claimed that these students showed the positive development on environmental conscious throughout implementation based on their expressions. For example, S8 stated earthquakes as the reasons for environmental problems at the first week, then he remarked man-made factors such as fabrics and deforestation. At the discussion on consequences of environmental problem, both S2 and S23 reported the effects on human life. However, they started to consider other living thing at following weeks. At that point, it should be noted that deforestation, animals, and natural habitat were frequently emphasized themes at the stories. Lastly, S19 suggested a radical solution that is taken by government at first, she slightly changed their expressions and produced a practical suggestion.

Conclusion

The study presented here aimed at examination of the views of fifth grade Turkish students related environmental issues through storytelling. As noted before, action research carried out with 35 fifth grade students with the purpose of investigation their views related environmental issues based on the Story-Driven Contextual Approach (Klassen, 2006). The researcher posed two research questions as: "How does affect storytelling on fifth grade students' cognitive structures?" and "How does affect storytelling on fifth grade students' views?" The data were collected with regard to these questions during six-week period. As a result of the WAT, the number of response words for each key concept in post-WAT were higher than in pre-WAT and it was as a clue of better understanding of these environmental concepts (e.g., Ercan, Taşdere, & Ercan, 2010). For instance; the number of response words for "environmental problem" has risen to 194 from 165. The increase in the number of related and correctly respond words could be explained by the change in students' conceptual frameworks (e.g. Kiryak & Calik, 2018). At the end of implementation, students mostly preferred ecological

terms to associate key concepts instead of words used in daily life because stories provided meaningful context to students (Özdemir, 2012; Yılmaz, 2015). In pre-WAT, students mostly associated beauty with "environment" while bugs, flowers, and grass were used as associated words for the same concept in post-WAT. Another finding is that number of students who associated human with "environmental problem" and "environmental pollution" increased in post-WAT. Similarly, most of the students considered the human as a reason for environmental problems through focus group interviews.

In addition to the reasons for environmental problems, students also discussed the environmental protection and the effects of environmental problems in focus group interviews. Most students stated that environmental problems have an effect on the human life when discussing the consequences of environmental issues. However, the results also showed that significant number of students were aware of the effects of environmental problems on other living things and the earth. Some students expressed their thoughts with a holistic view at the end of the implementation whereas they considered the problems from only humans' aspect at the beginning. In the manner of environmental protection, students focused on suggestions for creative inventions, legal sanctions as well as the simple actions could be taken by themselves, focus group interviews concluded that student developed various opinions in order to prevent environmental problems.

In focus group interview, students mostly addressed the themes emphasized in the stories during implementation such as dropping litter, deforestation, fabric fumes and water pollution while students used the characters of stories as associated words in post-WAT even though they had low frequencies. Additionally, positive changes in the views of some students were reported throughout the discussions.

On the other hand, some participants discussed the environmental issues independently from the stories and preserved their opinions throughout four weeks. For instance, they claimed that natural disasters and animals leads to environmental problems. Additionally, it was noted that seven students did not want to participate in any focus group interview even though they carefully followed the storytelling sessions. Three of them were Syrian children who had difficulty with speaking in Turkish (but good at understanding and writing) while others were also uninterested to usual science lessons.

In related literature, the studies found that stories are motivating and interesting for students (Ayra & Maul, 2012; Erten et al., 2013; Hadzigeorgiou, 2006; 2016; Jiangbo et. al., 2021; Özer, 2004; Yılmaz, 2015), it was confirmed based on the participants' reflections in this study. Moreover, it was observed that students showed less distractive behavior and maintained their attention longer in the implementation process. According to Solak (2006), story-based lessons are effective to increase the participation of low achievers who was afraid of failure. In this study, it was observed that majority of class had higher participation in lessons including some students who had low academic performance.

Consequently, this research is important due to the lack of studies about storytelling concerning environmental issues and it is needed to consider in the light of its limitations. Both WAT and focus group interviews concluded corresponding results in terms of the views of students concerning environmental knowledge. According to the results, storytelling contributed to environmental knowledge of many participants whereas it is not found a significant effect on some of them. When the research is evaluated from a holistic perspective, it is concluded that storytelling is an effective and practical way to environmental education. Similary, recent decade in the literature researches showed that science teaching with stories and storytelling enhance student's understanding as well as providing their positive attitudes toward science (Ayra & Maul, 2012; Erten et al., 2013; Hadzigeorgiou, 2006; 2016; Jiangbo et. al., 2021).

Recommendations

The study presented here does not imply that storytelling is the best way for environmental education and not attempt to prove any theory. The authors aimed to suggest that storytelling was an effective method to teach environmental topics by emphasizing its utility and efficacy. The study concluded favorable outcomes despite of the several limitations as noted before.

In the literature, only storytelling was not effective to students' understanding about science concepts. Therefore, it should be used with other strategies such as free drawing and hands-on activities (e.g., Jiangbo et al., 2021). These strategies were utilized in similar relevant studies (e.g., Hong & Diamond, 2012; Siew et al., 2017; Walan, 2017), and they showed to be effective to support storytelling. Hence, empowering strategies should be used to promote storytelling.

To develop the quality of method and to gain more insights in academics aspects, pedagogical implications and recommendations for future research were presented as follow:

- Science teachers may give more emphasize stories on their lessons, particularly on environmental science topics.
- It is essential to make rehearsal for storytelling and to choose an appropriate story for learners.
- Cross-sectional cross-cultures studies should be carried out in order to obtain a more holistic insight.
- Longitudinal studies should be conducted to investigate long-term effects of stories and storytelling.
- Further research on stories for environmental issues would be designed as narrative approaches. Students would be able to share their own stories based on their experiences and observations. In that case, results would be more efficient and valuable in educational aspects.

Scientific Ethics Declaration

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

References

Acar, U., Yılmaz, O. S., Çelen, M., Ateş, A. M., Gülgen, F., & Şanlı, F.B (2021). Determination of mucilage in the sea of Marmara using remote sensing techniques with google earth engine. *International Journal of Environment and Geoinformatics (IJEGEO), 8*(4):423-434. https://doi.org/10.30897/ijegeo.957284

Ahi, B., Yaya, D., & Ozsoy, S. (2014). The concept of environment in folktales from different cultures: analysis of content and visuals. *International Electronic Journal of Environmental Education, 4*(1), 1-17. https://doi.org/10.18497/iejee-green.64123

Akkuzu-Guven, N. & Uyulgan, M. A. (2021). Are university students willing to participate in environmental protection activities (EPAs)? – Sub-dimensions of ecological intelligence as predictors. *Journal of Education in Science, Environment and Health (JESEH), 7*(3), 269-282. https://doi.org/10.21891/jeseh.960912

Almahasheer, H., & Duarte, C. M. (2020). Perceptions of marine environmental issues by Saudi citizens. *Frontiers in Marine Science, 7*, 600. https://doi.org/10.3389/fmars.2020.00600

Amardini, N. A., Redhana, I. W., & Suja, I. W. (2021, March). *Does parents' work affect students' environmental literacy in Bali, Indonesia*? In First International Conference on Science, Technology, Engineering and Industrial Revolution (ICSTEIR 2020) (pp. 328-331). Atlantis Press.

Armie, M. (2020). Between tradition and innovation: the short story, its storytelling, and their role in teaching ESL/EFL to children. In *Using literature to teach english as a second language* (pp. 1-33). IGI Global.

Aydin, F. (2014). Ortaöğretim öğrencilerinin küresel ısınma konusundaki bilgi düzeylerinin belirlenmesi. *Turkish Journal of Education, 3*(4), 15-27. https://doi.org/10.19128/turje.181089

Ayra, D. J., & Maul, A. (2012). The role of the scientific discovery narrative in middle school science education: An experimental study. *Journal of Educational Psychology, 104*(4), 1022–1032. https://doi.org/10.1037/a0028108

Bahar, M., Johnstone, A. H., & Sutcliffe, R. G. (1999). Investigation of students' cognitive structure in elementary genetics through word association tests. *Journal of Biological Education, 33*(3), 134-141. https://doi.org/10.1080/00219266.1999.9655653

Bayraktar, H. (2014). The impact of coherence relations on text comprehension of Turkish EFL readers. *Journal of Theory and Practice in Education, 10*(4), 1120-1142. https://dergipark.org.tr/en/pub/eku/issue/5462/74122

Bilgili, M. Y. (2021) Sıfır atık yaklaşımının kökenleri ve günümüzdeki anlamı. *İstanbul Ticaret Üniversitesi Sosyal Bilimler Dergisi, 20*(40), 683-703. https://doi.org/10.46928/iticusbe.787711

Bruner, J. S. (1990). *Acts of meaning* (Vol. 3). Harvard University Press.

Clark, C. R., Heimlich, J. E., Ardoin, N. M., & Braus, J. (2020). "Using a delphi study to clarify the landscape and core outcomes in environmental education." *Environmental Education Research 26* (3): 381–399. https://doi.org/10.1080/13504622.2020.1727859

Coştu, F., Bektaş, R., & Girgin, Ş. (2021). Pre-service science teachers' cognitive structure of optics. (p.83-102). In Tüfekçi, Ö.K (Ed.) *Academic evaluations from multidisciplinary perspective*. SRA Academic Publishing: Klaipeda, Lithuania.

Dahlstrom, M. F. (2014). Using narratives and storytelling to communicate science with nonexpert audiences. *Proceedings of the National Academy of Sciences, 111*(Supplement 4), 13614-13620.

Dasdemir, I. (2018). Research and trends in the field of environment education from 2012 to 2016: A content analysis of MA theses and PhD. dissertations in Turkey. *International Electronic Journal of Environmental Education, 8*(1), 1-14. https://dergipark.org.tr/en/pub/iejeegreen/issue/36399/357628

Demir, E., & Yalçın, H. (2014). Türkiye'de çevre eğitimi. *Türk Bilimsel Derlemeler Dergisi*, (2), 7-18. https://dergipark.org.tr/en/pub/derleme/issue/35093/389303

Demircioğlu, H., Demircioğlu, G., & Ayas, A. (2006). Hikâyeler ve kimya öğretimi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 30*(30), 110-119.

Demircioglu, I. H. (2008). Using historical stories to teach tolerance: The experiences of Turkish eighth-grade students. *The Social Studies, 99*(3), 105-110. https://doi.org/10.3200/TSSS.99.3.105-110

Denkova, J. (2011). Enviromental education in Macedonian literature for children and juvenils as a way of humanization of children's personality. *Procedia-Social and Behavioral Sciences, 15*, 3158-3162. https://doi.org/10.1016/j.sbspro.2011.04.264

Derman, A., & Aslan, Z. (2016). Çevre eğitimi için kültürel bir bakış açısı: dede korkut hikâyeleri, *Electronic Turkish Studies, 11*(14), 201-220. http://dx.doi.org/10.7827/TurkishStudies.9850

Derman, A., & Eilks, I. (2016). Using a word association test for the assessment of high school students' cognitive structures on dissolution. *Chemistry Education Research and Practice, 17*(4), 902-913. DOI: https://doi.org/10.1039/C6RP00084C

Dewan, A. S. (2005). *Teaching English to young learners through storytelling*. (Master's Thesis), Higher Education Council (YOK) National Thesis Center Database. (Accession No. 159445)

Dictionary. (n. d.). http://www.dictionary.com/browse/story

Ebadi, A. G., Toughani, M., Najafi, A., & Babaee, M. (2020). A brief overview on current environmental issues in Iran. *Central Asian Journal of Environmental Science and Technology Innovation, 1*(1), 1-11. https://doi.org/10.22034/CAJESTI.2020.01.08

Ercan, F., Taşdere, A., & Ercan, N. (2010). Observation of cognitive structure and conceptual changes through word associations tests. *Journal of Turkish Science Education, 7*(2), 136-154. http://88j.76d.mywebsitetransfer.com/index.php/tused/article/view/515

Erten, S. (2004). Çevre eğitimi ve çevre bilinci nedir, çevre eğitimi nasıl olmalıdır. *Çevre ve İnsan Dergisi, 65*(66), 1-13. https://gavsispanel.gelisim.edu.tr/Document/ezozer/20190923145207313_1995812a-f88e-4958-a6d8-cd23b9f02599.pdf

Erten, S., Kiray, S. A., & Sen-Gumus, B. (2013). Influence of scientific stories on students' ideas about science and scientists. *International Journal of Education in Mathematics Science and Technology, 1*(2), 122–137. https://doi.org/10.4628/ ijemst.v1i2.30

Fanini, L. & Fahd, S. (2009). Storytelling and environmental information: connecting School children and herpetofauna in Morocco. *Integrative Zoology, 4*(1), 188-195. https://doi.org/10.1111/j.1749-4877.2009.00158.x

Fuchs, H. U. (2015). From stories to scientific models and back: Narrative framing in modern macroscopic physics. *International Journal of Science Education, 37*(5-6), 934-957. https://doi.org/10.1080/09500693.2015.1025311

Geçit, Y., & Şeyihoğlu, A. (2012). The opinions of classroom teacher candidates' on activity-based environmental education. *Education Sciences, 7*(1), 355-370. https://dergipark.org.tr/en/pub/nwsaedu/issue/19817/212005

Gölcük, A. (2017). *Bilimsel hikâyelerle desteklenen fen eğitiminin öğrencilerin yaratıcılıkları ve duyuşsal özellikleri üzerindeki etkileri*. (Master's Thesis). Higher Education Council (YOK) National Thesis Center Database. (Accession No. 484077)

Govender, S. (2002). *Four levels of native-likeness: A new method of assessing learner lexicons*. (Master's Thesis). Available from ProQuest Dissertations and Theses database.

Gregory, R., Kozak, R., St-Laurent, G. P., Nawaz, S., Satterfield, T., & Hagerman, S. (2021). Under pressure: conservation choices and the threat of species extinction. *Climatic Change, 166*(1), 1-21. https://doi.org/10.1007/s10584-021-03102-3

Hadzigeorgiou, Y. (2016). Narrative thinking and storytelling in science education. In Y. Hadzigeorgiou (Ed.), *Imaginative science education* (pp. 83–120). Springer.

Hadzigeorgiou. (2006). Humanizing the teaching of physics through storytelling: The case of current electricity. *Physics Education, 41*(1), 42–46. https://doi.org/10.1088/0031-9120/41/1/003

Hasnat, G. T., Kabir, M. A., & Hossain, M. A. (2018). *Major environmental issues and problems of South Asia, particularly Bangladesh*. Handbook of environmental materials management, 1-40. https://doi.org/10.1007/978-3-319-58538-3_7-1

Hastürk, G. H. (2021). Examining teacher candidates' environmental awareness in terms of different variables. *International Journal of Active Learning, 6*(1), 52-68. https://doi.org/10.48067/ijal.889798

Hava, K. (2021). Exploring the role of digital storytelling in student motivation and satisfaction in EFL education. *Computer Assisted Language Learning, 34*(7), 958-978. https://doi.org/10.1080/09588221.2019.1650071

Hemmati, F., Gholamrezapour, Z., & Hessamy, G. (2015). The effect of teachers' storytelling and reading story aloud on the listening comprehension of Iranian EFL learners. *Theory and Practice in Language Studies, 5*(7), 1482-1488. http://dx.doi.org/10.17507/tpls.0507.22

Hong, S. Y., & Diamond, K. E. (2012). Two approaches to teaching young children science concepts, vocabulary, and scientific problem-solving skills. *Early Childhood Research Quarterly, 27*(2), 295–305. https://doi.org/10.1016/j. ecresq.2011.09.006

Hwang, S. (2011). Narrative Inquiry for science education: Teachers' repertoire-making in the case of environmental curriculum. *International Journal of Science Education, 33*(6), 797-816. https://doi.org/10.1080/09500693.2010.481800

Hwang, W. Y., Shadiev, R., Hsu, J. L., Huang, Y. M., Hsu, G. L., & Lin, Y. C. (2016). Effects of storytelling to facilitate EFL speaking using Web-based multimedia system. *Computer Assisted Language Learning, 29*(2), 215-241. https://doi.org/10.1080/09588221.2014.927367

Jiangbo, H., Camilla, G., Ning, Y. & Yonggang, R. (2021) "Once upon a star": A science education program based on personification storytelling in promoting preschool children's understanding of astronomy concepts. *Early Education and Development, 32*(1), 7-25. https://doi.org/10.1080/10409289.2020.1759011

Jonassen, D. H., & Hernandez-Serrano, J. (2002). Case-based reasoning and instructional design: Using stories to support problem solving. *Educational Technology Research and Development, 50*(2), 65-77. https://doi.org/10.1007/BF02504994

Kahyaoğlu, M. (2016). Türkiye'de çevre eğitimi üzerine yapılan araştırmalar: bir içerik analizi çalışması. *Marmara Coğrafya Dergisi, 34*(1), 50-60. https://dergipark.org.tr/en/pub/marucog/issue/24661/260862

Kiryak, Z., & Çalik, M. (2018) Improving grade 7 students' conceptual understanding of water pollution via common knowledge construction model. *International Journal of Science and Mathematics Education*, 16, 1025–1046 (2018). https://doi.org/10.1007/s10763-017-9820-8

Klassen, S. (2006). A theoretical framework for contextual science teaching. *Interchange, 37*(1), 31-62. https://doi.org/10.1007/s10780-006-8399-8

Klassen, S., & Klassen, C. F. (2014). The role of interest in learning science through stories. *Interchange, 45*(3-4), 133-151. https://doi.org/10.1007/s10780-014-9224-4

Krueger, R. A., & Casey, M. A. (2015). *Focus groups: A practical guide for applied research*. California: Sage Publications.

Kütük, R. (2007). *The effect of mnemonic vocabulary learning strategy and storytelling on young learners' vocabulary learning and retention*. (Master's Thesis), Higher Education Council (YOK) National Thesis Center Database. (Accession No. 220649)

Ministry of National Education of Turkey [MoNE] (2018). *Fen bilimleri dersi öğretim programı. (Science curriculum)*. http://mufredat.meb.gov.tr/ProgramDetay.aspx?PID=143

Mutonyi, H. (2016). Stories, proverbs, and anecdotes as scaffolds for learning science concepts. *Journal of Research in Science Teaching, 53*(6), 943-971. https://doi.org/10.1002/tea.21255

National Research Council [NRC] (2000). *How people learn: Brain, mind, experience, and school*: Expanded edition. National Academies Press.

Nicholas, B. J., Rossiter, M. J., & Abbott, M. L. (2011). The power of story in the ESL classroom. *Canadian Modern Language Review, 67*(2), 247-268. https://doi.org/10.3138/cmlr.67.2.247

Özdemir, O. (2012). *The effects of storytelling and role playing on young learners' vocabulary learning and retention.* (Master's Thesis), Higher Education Council (YOK) National Thesis Center Database. (Accession No. 411874).

Özer, Ö. (2004). *Teaching English to children through TPR storytelling*. (Master's Thesis), Higher Education Council (YOK) National Thesis Center Database. (Accession No. 144631)

Polat, G. (2013). Determination of the cognitive structures of year secondary school students through word association test techniques. *Necatibey Faculty of Education Electronic Journal of Science and Mathematics Education, 7*(1), 97-120. http://dx.doi.org/10.12973/nefmed155

Rahman, N. A., Halim, L., Ahmad, A. R., & Soh, T. M. T. (2018). Challenges of environmental education: Inculcating behavioural changes among indigenous students. *Creative Education, 9*(1), 43. https://doi.org/10.4236/ce.2018.91004

Savin-Baden, M., & Major, C. H. (2013). *Qualitative research: The essential guide to theory and practice*. Routledge.

Siew, N. M., Chin, M. K., & Sombuling, A. (2017). The effects of problem based learning with cooperative learning on preschoolers' scientific creativity. *Journal of Baltic Science Education, 16*(1), 100–112. http://www.scientiasocialis.lt/jbse/files/pdf/vol16/100-112.Siew_JBSE_Vol.16_No.1.pdf

Şimşek, A. (2004). İlköğretim okulu sosyal bilgiler dersi tarih konularının öğretiminde hikâye anlatim yönteminin etkililiği. *Türk Eğitim Bilimleri Dergisi, 2*(4), 495-509. https://dergipark.org.tr/en/pub/tebd/issue/26126/275211

Şimşekli, Y. (2004). Çevre bilincinin geliştirilmesine yönelik çevre eğitimi etkinliklerine ilköğretim okullarının duyarlılığı. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi, 17*(1), 83-92. https://dergipark.org.tr/en/pub/tebd/issue/26126/275211

Solak, Ö. (2006). *A classroom experiment on story-based teaching with young learners with a focus on vocabulary retention and students' reflections*. (Master's Thesis), Higher Education Council (YOK) National Thesis Center Database. (Accession No. 210770)

Teacher Education through School-based Support in India [TESS-India]. (2014). Using of stories and storytelling to teach environmental issues. *Elementary Science* (10). http://www.tess-india.edu.in/about-tess-india

TEMA. (2021). https://goo.gl/4UnoND

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press, Cambridge.

Waern, Y. (1972). Structure in similarity matrices. A graphic approach. *Scandinavian Journal of Psychology, 13*(1), 5-16. https://doi.org/10.1111/j.1467-9450.1972.tb00043.x

Walan, S. (2017). Teaching children science through storytelling combined with hands-on activities - a successful instructional strategy? *International Journal of Primary, Elementary and Early Years Education, 47*(1), 34–46. https://doi.org/10.1080/03004279.2017.1386228

World Wild Fund [WWF] (2018). The living planet report. https://d2hawiim0tjbd8.cloudfront.net/downloads/lpr__2018_full_report.pdf

Yardım, S. (2011). *The effect of computer assisted and teacher-led storytelling on vocabulary learning of 5th grade students*. (Master's Thesis). Higher Education Council (YOK) National Thesis Center Database. (Accession No. 290543)

Yılmaz, Ş. (2015). *A case study on secondary school EFL learners' attitudes towards short story based reading lessons*. (Master's Thesis). Higher Education Council (YOK) National Thesis Center Database. (Accession No. 405423)

Author(s) Information

Fatma Coştu
Istanbul Sabahattin Zaim University
Faculty of Education
Contact e-mail: *fatma.costu@izu.edu.tr*
ORCID iD: 0000-0002-7101-6267

Elif Demirci
Yildiz Technical University
Faculty of Education
ORCID iD: 0000-0002-9565-9136

Bayram Coştu
Yildiz Technical University
Faculty of Education
ORCID iD: 0000-0003-1429-8031