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Secondary School Students' Views on Environmental Pollution

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ABSTRACT

In this study, secondary school students' views on environmental pollution were focussed. The participant group consisted of 5th, 6th, 7th, and 8th grade students (52 girls-55 boys) studying in Hakkâri city centre. In the qualitative study design, the Word Association Test (WAT) was used as a data collection tool. Descriptive analysis technique was used to analyse the data, and frequency and percentage charts were presented in the form of cut-off points (CP). In the results obtained, it can be stated that students have knowledge about the causes and consequences of environmental pollution. Although some answers responded to the types of environmental pollution (air pollution, water pollution, etc.), most answers shed light on the causes of pollution (garbage, ped bottle, etc.). Students' mental construction of environmental pollution is mostly based on wastes that take a long time to disappear in nature. In addition, some expressions that are far from the possible definitions and adjectives of environmental pollution show that they have cognitive knowledge deficiencies. In the study, the importance of education and training services on environmental pollution, especially on the impact of polluting wastes both regionally and globally, starting from early childhood, comes to the fore. Based on the results achieved, identification of misconceptions students have towards environmental pollution and conducting educational activities to eliminate this misconceptions could be recommended. In addition, which metaphors students relate the concept of garbage that they express the most could be researched.

Keywords: Environmental pollution, environmental education, secondary school students.

Introduction

Humans exist in a holistic structure consisting of living environments such as air, water, soil and plant and animal communities (Yavetz et al., 2014). This holistic structure called the environment can be destroyed by humans over time (Bertiz, 2014) and the natural balance can be damaged. These problems (Atalay, 2005, p. 391; Aydın, 2017), which threaten human and living existence such as air, water, soil and noise pollution, solid waste garbage problem in cities and irregular urbanisation, emerge as environmental pollution (Jamali, 2007; Ukaogo et al., 2020; Xu et al., 2022).

Environmental pollution, which has increased due to different reasons in the historical process, has some sociological and economic foundations. For example, the growth of industry in the UK has led to migration and urbanisation (Atalay, 2005; Özdemir, 2014, p. 401). Thus, capital and services overflowed where the population was dense (Lacoste, 2004, p. 101). Over time, increasing urbanisation and globalisation with industry has turned into environmental pollution. It is also clear that this pollution causes climate change and global warming in the long term (Aydın, 2017). Today, especially globalisation has become an effective facilitator of environmental pollution (Kwabena-Twerefou et al., 2017; Nazeer et al., 2016), and global environmental concerns have triggered debates.

Environmental pollution caused by humans leads to the greatest damage to humans (Kuzu, 2008). Current data from the World Health Organization [WHO] show that an estimated 4.2 to 7 million people die from air pollution worldwide each year and nine out of ten people breathe highly polluted air (WHO, 2024). In Africa alone, air pollution from industrial waste and motor vehicles caused 164,000 deaths in 1990 (UNICEF, 2019). A study conducted in 2023 in South Asia revealed that air pollution shortens the life expectancy of people by about 5 years (Antonel & Chowdhury, 2014). Damages affect not only the past and people's physical health, but also our future and psychological health (Rajper et al., 2018; Ullah et al., 2021). The literature shows that environmental pollution causes deterioration in human DNA structure and reduces the life

span and productive life years of the individual (Güney, 2004; Nazeer et al., 2016). Drawing attention to the dangers of prenatal exposure to air pollution, Margolis et al. (2021) state that this situation reduces the academic success of adolescents. Similarly, Thygesen et al. (2020) found that exposure to air pollution at an early age increased the risk of developing ADHD (Attention Deficit and Hyperactivity Disorder). Air pollution also has a wide range of impacts, including a significant negative impact on the quality of life of students with and without allergies (Pisithkul et al., 2024) and low school attendance (Mohai et al., 2011).

Although air pollution, water pollution, wastes and noise pollution are generally observed in Türkiye, these problems vary at the provincial level (Ministry of Environment and Urbanisation, 2020, p. 37). Türkiye Environmental Problems and Priorities Assessment Report (2023) reveals that 41% of provinces have water pollution, 27% have air pollution, 28% have waste pollution and 4% have noise pollution. In addition, Greenpeace's 2021 report states that the annual average air PM2.5 value measured for each province in Türkiye is four times higher than the World Health Organization recommendation (Greenpace, 2021). The main cause of widespread air pollution in the country is the use of poor quality fuel for heating (Türkiye Environmental Problems and Priorities Assessment Report, 2023). Moreover, such environmental pollution is not limited to urban and rural areas. Therefore, it can be stated that the achievement of "sustainable development" in Türkiye is under threat (Akca et al., 2018).

Against this negative picture of the environment in Türkiye, 94% of respondents in a recent survey stated that they feel a responsibility to protect the environment (KONDA, 2021). In addition, the country's politicians play an active role in bilateral, regional, and international cooperation efforts to solve environmental problems (Ministry of Foreign Affairs of the Republic of Türkiye, 2024). However, despite this high awareness (Ağtaş et al., 2019; Erbasan & Ekol, 2020; Gürbüz et al., 2023; Küreci, 2018), increasing environmental pollution has not been prevented (Muşmul & Yaman, 2018). In particular, air, water and soil pollution continue to be among the types of pollution that people need to tackle.

Environment and Education

The increasing importance of environmental problems has led to a closer look at the relationship between educational variables and environmental pollution. Because the most important developer of the process towards environmental awareness is education (Ardoin & Bowers, 2020; Dillon & Herman, 2023; Rickinson, 2001). Some people who are poorly educated and therefore insensitive or uninformed about the environment are not aware that their current activities lead to environmental pollution (Damırova, 2019). Especially the information and education that children receive from their families and teachers have an important place in this sense. At this point, it is important to know what the factors that pollute the environment are and to take precautions accordingly. Supporting this assumption, DeChano (2006) showed that students in Chile, England, Switzerland, and the USA have low environmental knowledge even if they have high environmental attitudes. In this context, to find permanent solutions to environmental problems, it is necessary to raise environmental awareness in children at a very young age (Rebolj & Devetak, 2013; Uludağ, 2012) in order for children to develop a strong bond with the environment and the world they live in (Akdemir & Akengin, 2013, p. 25).

Environmental education presents an effective approach in developing environmental information attitudes, and behaviors of individuals (Van De Wetering et al., 2022). Transformation of environmental education received by an individual to behavior is accepted to be a major step towards protection of the environment (Gülersoy, 2021). Studying graduate studies on environmental education conducted in our country in 2011-2022 period, Karakoyun and Uzun (2022) mentioned that subjects mainly cover environmental attitudes and environmental awareness. Among studies that cover various methods and practices towards environmental education, Kiziroğlu (2023), mentioned environmental education can be supported with development of various projects while Özgel et al. (2018) observed that travel-observation method supported by nature camp were more effective in raising awareness on environmental problems. Babadağ (2022) put forth that activities attended by families improved environmental behaviors of students. Without doubt, students that receive environmental education were more sensitive towards environmental problems and had increased awareness on sustainability (Erdoğan, 2021). At this point, organizing mandatory classes on environment based on a sustainable outlook in the curriculum (Özdemir, 2007), presenting environment-related achievements in all classes by making the required associations instead of a single class (Erten, 2004), and the requirement to increase extension of current digital technologies in environmental education and research settings (Lowan-Trudeau, 2023) came forward in relevant studies.

The main objectives in the relationship between environment and education are to develop awareness and sensitivity of the connection between social, political, economic and ecological events in rural and urban areas,

and to provide opportunities for individuals to acquire the knowledge, responsibilities, attitudes and value judgements necessary to protect and improve the environment (Tbilisi Declaration on Environmental Education; cited in Sevinç, 2009). The aim is to raise awareness in urban and rural areas, to protect and improve the environment, and to change behavioral patterns. Drawing attention to this issue, the United Nations Conference on Environment and Development adopted a global environment and development agenda for the 21st century, called Agenda 21. Agenda 21 has a scope that emphasizes the development of public awareness and education for a sustainable world.

Purpose of the Study

Raising a generation conscious of the environment is more important than all the measures to be taken (Özüpekçe, 2019). In this context, our study focuses on exploring the meanings that students attribute to environmental pollution at an early age. There are many studies on environment and environmental pollution in the relevant literature (Al-Maliki et al., 2021; Dyah-Rahmawati et al., 2020; Hammami et al., 2017; Hinojo-Lucena et al., 2019; Iliopoulou, 2018; Olufemi et al., 2014; Pisithkul et al., 2024; Souza et al., 2020; Ullah et al., 2021; Zsóka et al., 2013). In general, the studies have been handled with quantitative methods that reveal students' knowledge, attitudes, and thoughts towards the environment. However, discovering the meanings and expressions that students attribute to environmental pollution is as important as raising awareness. The correct identification of the factors that pollute the environment will also shed light on possible solutions. Because the high and low rates in students' attitudes and perceptions towards the environment are insufficient to fully explain what they see as polluting substances and actions. For this reason, considering the lack of relevant literature, there was a need to determine the views of secondary school students on environmental problems in our study. The present study was conducted at a school with a low socio-economic level. Therefore, it is important to consider the place of the results in the relevant literature. Because the environmental awareness of students living in villages and cities in the same country or region may differ (Huang & Yore, 2005; Olufemi et al., 2014). The thrust of our study is to provide policy makers with a scientific perspective and deep understanding of potential future conditions in order to find solutions to achieve sustainability goals. Within the framework of this purpose, the question sought to be answered in the study was "What are the views of secondary school students' on environmental pollution?”

Method

Research Design

This study aims to explore the meanings and interpretations that secondary school students' attribute to environmental pollution. Therefore, the study was designed according to the basic qualitative research method that reveals how individuals associate phenomena and events with their own world (Merriam, 2015). Basic qualitative research is concerned with the meaning people attribute to events and the perspective from which they view events (Robson, 2015). Therefore, this study helped to reveal deeper meanings beyond the attitudes and perceptions attributed to environmental pollution by secondary school students' (Hsieh & Shannon, 2005).

Participants

The participant group consisted of 5th, 6th, 7th, and 8th grade students studying in a public school in Hakkâri province of Türkiye in the spring semester of the 2023-2024 academic year. In total, 107 students were interviewed. Of the students, 48.60% were girls and 54.40% were boys. 25.24% of the students study in Grade 5, 31.77% in Grade 6, 26.17% in Grade 7 and finally 16.82% in Grade 8.

Data Collection Tool

In this study, the Word Association Test (WAT) was used to collect students' opinions. While preparing the WAT, which is one of the alternative measurement tools, key concepts related to the subject were determined and students were asked to write the words that came to their minds related to these key concepts. The number of repetitions of word associations, their scientificness and whether they are related to the key concept or not allowed us to comment on the cognitive structure (Bahar & Özatlı, 2003, p. 75). In this direction, information about the implementation of the WAT was also provided to the students before the implementation. In the study, environmental pollution was given to the students as a concept and environmental pollution was written 5 times under each other in order to prevent them from giving the same answer. The participants were given 30 seconds for each line. This duration was based on the average duration given in the studies in the literature (Bahar & Özatlı, 2003). The "Environmental Pollution Word Association Test" was organized as follows.

Environmental pollution.....
Environmental pollution.....
Environmental pollution.....
Environmental pollution.....
Environmental pollution.....
A sentence about environmental pollution.....

The ethical process in the study was as follows:

- Ethics committee approval was obtained from Van Yuzuncu Yil University, Social and Human Sciences Publication Ethics Committee (Date: 23.05.2024, Number: 2024-10).
- Informed consent has been obtained from the participants.

Data Analysis

In the analysis of the data obtained during the study process, firstly, the answers given to the WAT were examined in detail. The frequency table shows the number of words in response to the key concepts and how often each concept was responded to according to the number of words. Concept networks were created with this frequency table and the cut-off point (CP) technique determined by Bahar et al. (1999) was used to clearly reveal the cognitive structure between concepts. In this technique, a certain number of six of the most responded words for any key concept in the WAT are used as cut-off points. In the next stage, the cut-off point was lowered at regular intervals and the process continued until all keywords appeared in the concept network. Using this technique, words related to the key concepts were listed, sorted according to their frequency values and concept networks were created according to the determined ranges. Concept networks were formed according to 71 and above, 30-20, 19-10, 9-5 and 4-1 cut-off points. The concepts written on a colored background among the words shown in the concept networks indicate key concepts. The words in boxes on a colorless background represent the associated response words. The response words associated with the key concepts were transformed into a concept network with colored arrows according to the frequency values given (Table 1). Each arrow represents the number of words whose color repeats at certain intervals:

- Cut-off point 71 and above is coloured blue.
- Cut-off point between 30-20 is coloured red.
- Cut-off point between19-10 is coloured green.
- Cut-off point between 9-5 is coloured brown.
- Cut-off point between 4-1 is coloured navy blue.

Results

In the study in which secondary school students' thoughts about environmental pollution were revealed with the WAT, the frequency value of the words produced by the students was first analyzed. The responses were then divided into various categories and visuals by dividing them into cut-off points. Student responses were not based on the semantic equivalence of the related concept with environmental pollution, but only on student responses.

Table 1.
Frequencies of the Words Produced for the Concept of Environmental Pollution

Answers	f	Answers	f
Garbage	71	Oil	7
Plastic	27	Carbon dioxide	7
Pet bottle	26	Human	7
Air pollution	26	Cutting down trees	6
Glass	25	Space pollution	6
Waste	24	Recycling	6
Nylon bag	23	Sewerage	5
Paper	21	Disorder	5
Smoke	19	Death	5
Trash bin	18	Oxygen	4
Water pollution	18	Forest pollution	4
Extinction	17	Acid	3
Battery	15	Trash cart	3
Disease	14	Homeless	3
Iron	12	Visual pollution	3
Dirty	12	Cigarette	3
Cleaning	11	Radiation	2
Factory smoke	11	Warning signs	2
Irresponsibility	11	Garbage factory	2
Melting of glaciers	10	Torn clothing	1
Odor	10	Garbage dump	1
Forest fire	9	Gloves	1
Global warming	9	Leaf	1
Irregularity	9	Total	535

According to Table 1, the most striking student responses were garbage, plastic, pet bottle, air pollution, glass, waste, nylon bag, and paper. For each of these words, there are at least 20 or more student answers. In addition, it is understood that the least produced concepts for environmental pollution among the responses are torn clothing, garbage dump, gloves, and leaves.

In the study, the words under the concept of environmental pollution were separated according to their cut-off points. Accordingly, the concept network created for cut-off point 71 and above is shown in Figure 1.

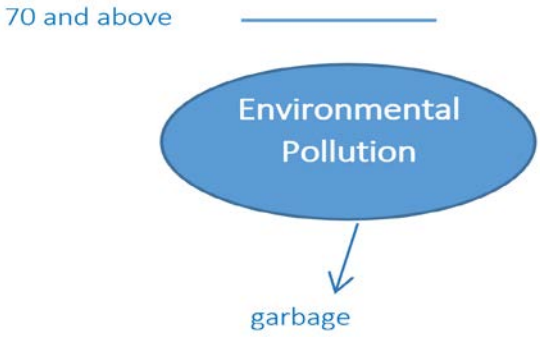

Figure 1.
Concept Network Created for Cut-Off Point 71 and Above

When we look at the concept network created for cut-off point 71 and above in Figure 1, it is seen that the participants associate environmental pollution with the concept of garbage (f=71).

The concept network for cut-off points 30-20 is presented in Figure 2.

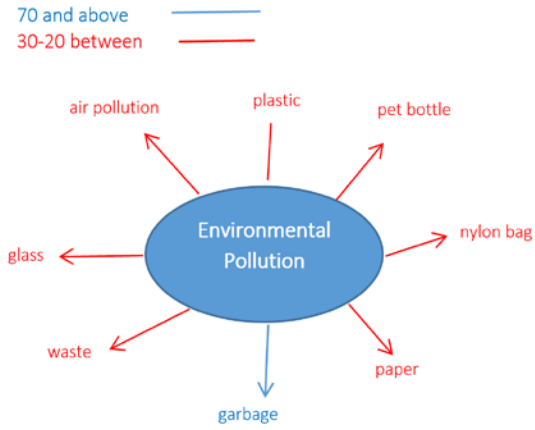

Figure 2.
Concept Network Created for Cut-Off Point 30-20

When we look at the concept network created for cut-off point 30-20, it is seen that the concepts of air pollution, plastic, ped bottle, nylon bag, paper, waste and glass are associated with the concept of environmental pollution.

The concept network for cut-off points 19-10 is presented in Figure 3.

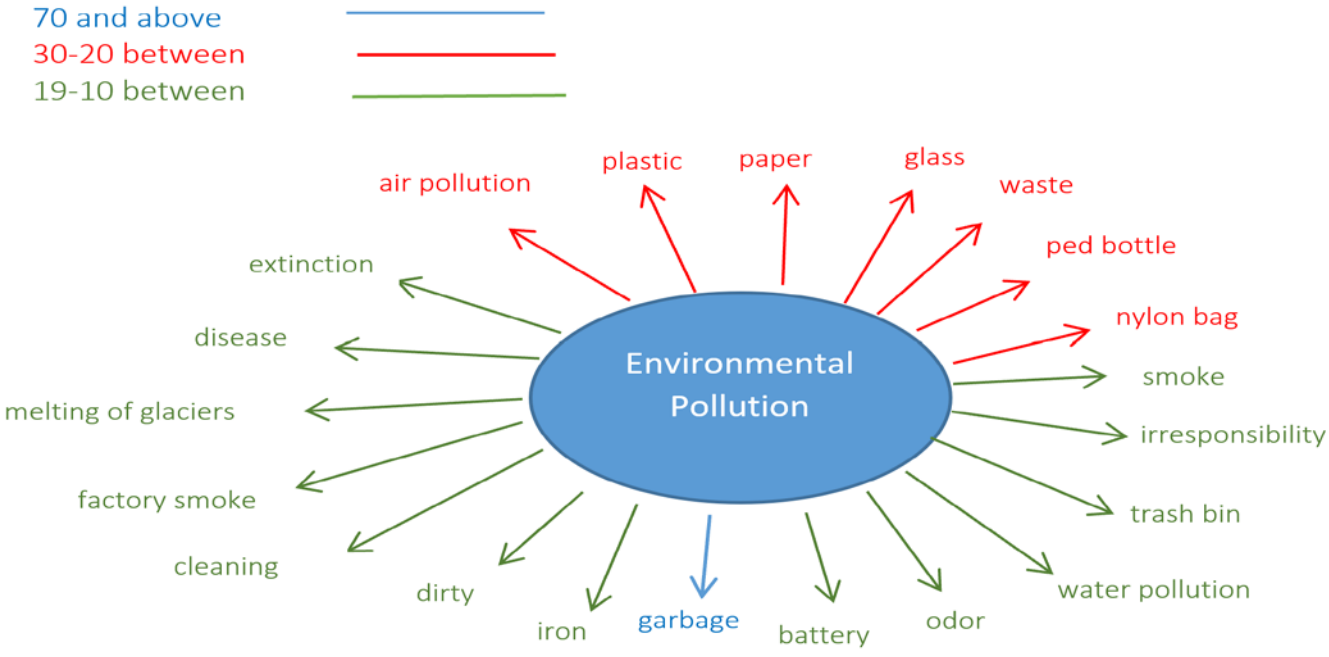

Figure 3.
Concept Network Created for Cut-Off Point 19-10

When we look at the concept network created for cut-off point 19-10, it is seen that the concepts of smoke, irresponsibility, trash bin, water pollution, odor, battery, iron, dirty, cleaning, factory smoke, melting of glaciers, disease, extinction are associated with the concept of environmental pollution.

The concept network for cut-off points 9-5 is presented in Figure 4.

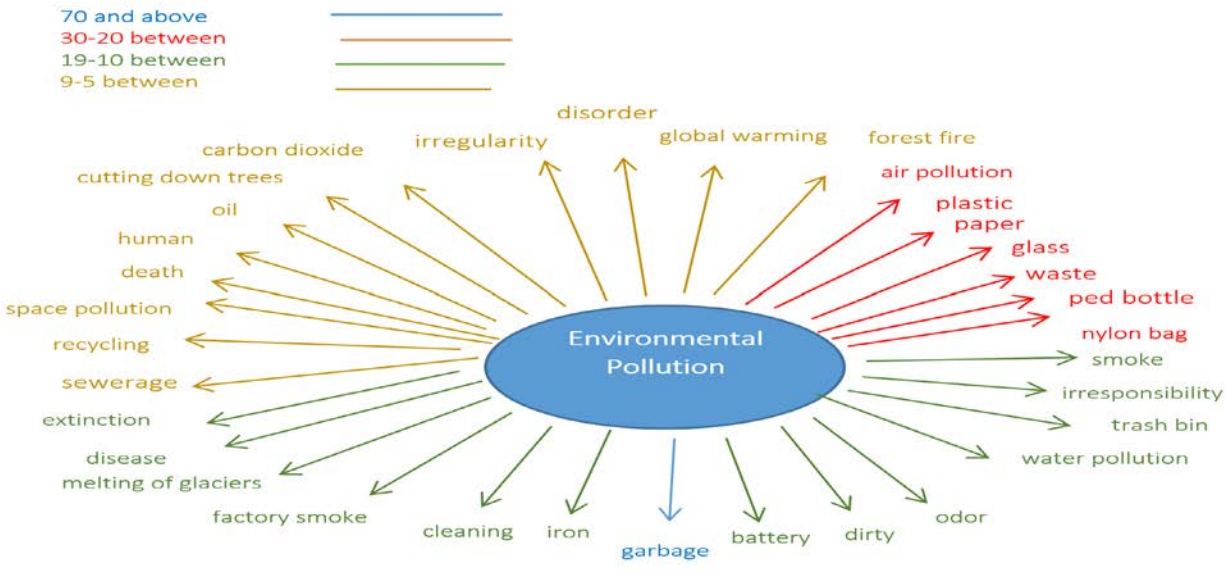

Figure 4.
Concept Network Created for Cut-Off Point 9-5

When we look at the concept network created for cut-off points 9-5, it is seen that the concepts of forest fire, global warming, disorder, carbon dioxide, irregularity, cutting down trees, oil, human, death, space pollution, recycling and sewerage are associated with the concept of environmental pollution.

The concept network for cut-off points 4-1 is presented in Figure 5.

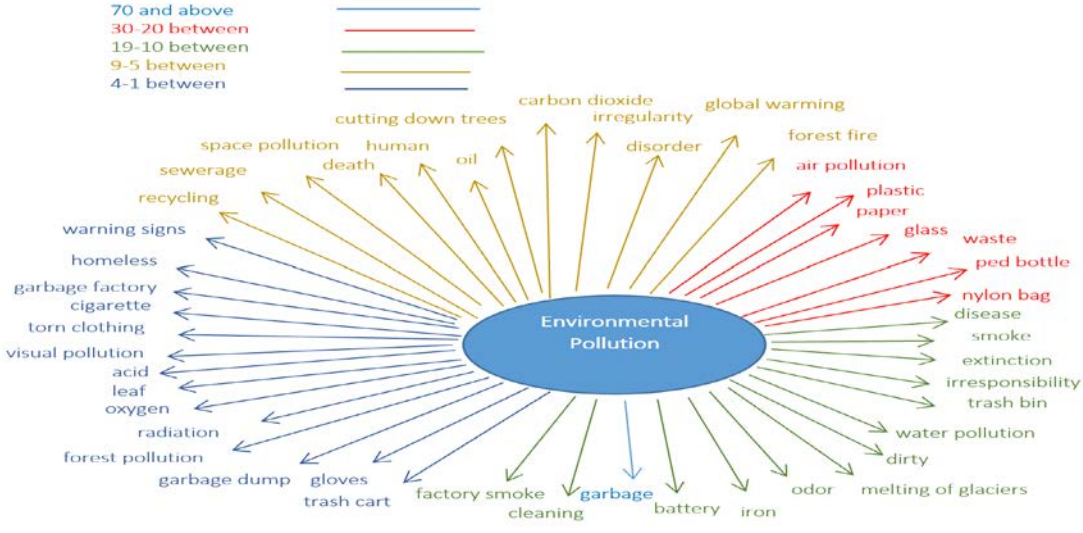

Figure 5.
Concept Network Created for Cut-Off Point 4-1

When we look at the concept network created for cut-off point 4-1, it is seen that the concepts of forest pollution, warning signs, radiation, visual pollution, homeless, trash cart, garbage factory, cigarette, acid, torn clothing, gloves, leaf, oxygen, garbage dump are associated with the concept of environmental pollution.

Discussion

The first noteworthy observation in this study, which focuses on secondary school students' views on environmental pollution, is the evaluation of students' responses in different semantic categories. Although some answers responded to the types of environmental pollution (air pollution, water pollution, etc.), most answers shed light on the causes of pollution (garbage, plastic bags, etc.). Therefore, it can be said that students are aware not only of environmental pollution itself but also of its possible consequences. Students' mental construction of environmental pollution is mostly based on wastes that take a long time to disappear in nature. Moreover, this understanding, which is far from the possible definitions and adjectives of environmental pollution (e.g. leaf, iron), shows that they have cognitive knowledge deficits (Uddin, 2014). A closer look at the results reveals students' assumptions about the solution (e.g. recycling and oxygen) and the long-term consequences (e.g. death) of environmental pollution.

Since human activities and changes in the environment are interconnected, the environment we live in often shapes our thought. It can be said that the concept of "garbage", which the participants frequently emphasized for pollution, responds to this theory (Hinojo -Lucena et al., 2019; Hoban et al., 2011). The fact that there is a rich literature supporting this finding brings a deeper understanding to our results. Related studies point out that students tend to express the problems they encounter more in daily life (Nacaroğlu & Bozdağ, 2020; Pınar & Yakışan 2017; Sağsöz & Doğanay, 2019; Uyanık, 2017). In another study investigating emotions, thoughts, and observations of secondary school students on environmental problems through the comics they draw, it was noted that the most important environmental problem was pollution (environment, air, water, rubbish) (Recepoğlu, 2021).

Another main trend regarding environmental pollution in our research is the presence of responses regarding human-induced pollution (Moradi & Görer-Tamer, 2017; Özcan & Demirel, 2019; Polat & Dellal, 2016). Unfortunately, humans have the biggest share in the emergence of environmental problems today. Humans have transformed from being only one of the factors that make up the environment to the leading role in the increase of environmental problems (Koçarslan et al., 2017). It is also clear that global problems are less frequently mentioned than local problems. In many studies supporting this result in the literature, the participants' statements for environmental problems were grouped around global problems such as water, air, and visual pollution (Ercan, 2011; Ertürk, 2017; Fettahlıoğlu, 2018; Özdemir-Özden & Özden, 2015; Yılmaz et al., 2002). In addition, in our study, it is seen that students mostly gave answers about the problem (environmental pollution) itself and its consequences rather than the solution. This argument could be interpreted as students were aware of long-term consequences of environmental pollution. Students knew that there was an effort for people, animals, plants, and the nature to live more in balance (Dyah-Rahmawati et al., 2020). In this study, responses of students including death, global warming, glacier melting, extinction of species, carbon dioxide, radiation, acid, air and water pollution could be presented as examples of long-term environmental consequences. On the other hand, high levels of anxiety, awareness, and information students had on environmental pollution might not be very promising for attitudes and behaviors towards improving the environment (Thomas et al., 2020). In an experimental study on noise pollution in Brazil, only 55% of students reported being bothered by noise and only half of them tried to solve the problem, even though outdoor noise pollution exceeded WHO recommended levels (Souza et al., 2020). The findings of Hammami et al. (2017) show that individuals think that plastic waste is harmful to the environment, but their knowledge of various aspects of plastic pollution is weak. Iliopoulou (2018), in another study conducted in Greece, says that students exhibit a kind of systematic thinking about pollution that is to a certain extent unconscious. It is possible to see such low levels of knowledge and awareness of environmental pollution in both developed and developing countries. For example, a study on the severity of environmental pollution and remedial measures found that only 39.0% of respondents had clear knowledge about environmental pollution (Nahar et al., 2021).

Lack of understanding of the environment can stem from the individual's family, lack of education or the individual themselves. Although it is possible to hear different voices on this issue, many studies point to the importance and necessity of environmental education (Al-Maliki et al., 2021; Zsóka et al., 2013). For some researchers, this education is explained as improving the curriculum (Brody, 1991; Rebolj & Devetak, 2013), for others as strengthening environmental awareness in teachers and pre-service teachers (Arık & Yılmaz, 2017; Ayeni, 2021; Aznar-Díaz et al., 2019), and for others as people's voluntary protection of the environment (environmental citizenship) (Dobson, 2007).

Conclusion and Recommendations

In the current study a total of 535 responses were received from secondary school students on environmental pollution and these responses were studied over 47 different concept patterns. The relevant responses were visualized with 5 concept network. The developed concept networks were identified as 71 and above, 30-20, 19-10, 9-5, and 4-1. Among results, the concept of "garbage" was expressed as a single response for 71 and above breakpoint. Students gave plastics, pet bottle, air pollution, glass, waste, nylon bag, and paper responses at 30-20 breakpoint. In concept network developed for 19-10 breakpoint, smoke, irresponsibility, trash bin, water pollution, odor, battery, iron, dirty, cleaning, factory smoke, melting of glaciers, disease, and extinction responses drew attention. Lastly, there were many concepts developed for breakpoint 9-5 and 4-1. Among these responses, particularly forest fire, human, space pollution, warning signs, radiation, visual pollution, homeless came to the fore. Based on these findings, it was argued that secondary school students mostly thought pollution was caused by humans. Students perceived humans were mainly responsible for environmental pollution and were interested in results of human behaviors. In addition, it was observed that student responses such as forest pollution, extinction, disease, carbon dioxide, and radiation indicated that students were conscious of results of environmental pollution. On the other hand, it could also be argued that students had some misconceptions on environmental pollution. Particularly, their oxygen, leaf, homeless, and recycling expressions could be listed among these misconceptions. Students drew attention to not only today, but also possibilities for the future and although they had lacking information on environmental pollution, they mostly presented a coherent consciousness. However, this coherent approach could increase with a strong continuity. As a result, a society with high awareness level would have an equally high level of ownership and protection of the nature and environment (KONDA, 2021). In this scope, turning pro-environment ideas to behaviors and policies had a vital importance in the framework of the understanding of sustainability.

Study findings demonstrated that students had some misconceptions particularly on factors causing environmental pollution. At this point, identification of misconceptions and conducting educational studies for their elimination by teachers could be recommended. In addition, what were the items that students defined as garbage was a matter of curiosity. Different studies in this area could investigate which metaphors students related the concept of garbage with. Studies with such depth could lead to informative activities on the concept of recycling that draw attention with its increasing importance, its benefits, and which garbage could be reused with recycling.

Limitations

This study had some limitations in some of its dimensions. Particularly, most of the participants that lived on the east of Türkiye studied at a region that could be defined to have socio-economic disadvantages. Therefore, studies conducted at a different region and city center could provide different results. Secondly, this study includes secondary school students. Results of the study on younger and older age groups are interesting. Finally, the study was limited with structured interview questions to reach more participants.

Ethics Committee Approval: Ethics committee approval was obtained from Van Yuzuncu Yil University, Social and Human Sciences Publication Ethics Committee (Date: 23.05.2024, Number: 2024-10).
Informed Consent: Written informed consent was obtained from secondry school students who participated in this study.
Peer-review: Externally peer-reviewed.
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