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METAPHORICAL PERCEPTIONS OF SECONDARY SCHOOL STUDENTS ABOUT RECYCLING

Research article

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Abstract

The aim of this study was to investigate the metaphorical perceptions of secondary school students about recycling. The working group of the study consisted of 120 7th- and 8th-grade students studying in a public school in the fall semester of the 2022–2023 academic year. Of this working group, 54 (45%) were male and 66 (0%) were female. With the questionnaire prepared on the form, "Recycling is like....." and "Because....." two-stage open-ended questions were asked to the students. Phenomenology was used as the research design. Content analysis in the qualitative analysis section was used to analyze the data. In addition, the demographic information of the students; gender, mother's and father's graduation status, how many hours they read books daily, how many hours they watch television daily, and their daily phone and tablet usage times were descriptively stated. At the end of the study, it was concluded that the students were very interested and enthusiastic about recycling. It was understood that recycling awareness and sensitivity can be created in students by evaluating these tendencies. In order to evaluate students' interest in recycling, it is recommended to focus on more specific studies on recycling, carry out club and course activities, give students tasks that will create recycling awareness, and organize competitions.

Keywords: Metaphor Analysis, Recycling, Secondary School Students

1. Introduction

With the world's population increasing day by day, the use of natural resources is also increasing and some of our natural resources are in danger of being depleted within a short time. In particular, the fact that some wastes remain intact in nature for a long time causes serious environmental problems and damage to the soil, plants, and animals. Especially in places where population growth and industrialization are higher, it becomes an important problem that the materials offered for public use appear as waste. Because solid wastes remain intact in nature for a long time, they cause environmental pollution and negatively affect human health (Çimen & Yılmaz, 2012). In addition, the increase in irresponsible use, waste and careless behavior clearly reveal that measures should be taken for the sustainability of natural resources. In order to leave a livable, unspoiled world to future generations, it is necessary to take important steps about recycling and this awareness should be raised in children at an early age. Dewey (1996) emphasized the importance of providing environmental education to individuals at an early age by stating that the education provided at an early age is of great importance in the formation of positive awareness, behavior, attitude, and perception towards the environment.

This study was conducted to raise awareness about recycling among secondary school students, to remind them of the importance of recycling and to keep this meaning alive in their minds. In order to achieve this goal, an attempt was made by the researcher to reveal the schema related to recycling in the minds of the students, to understand their mental associations and to recognize their affective interests by using the metaphor method. Lakoff (1993) explained the importance of the metaphor method as the main mechanism by which abstract reasoning is achieved, which enables us to grasp abstract concepts and forms an integral part of the way we interact, think, and behave about the world. In other words, it is described as a tool through which people try to express how they observe events, objects, environment, and life by using different analogies (Cerit, 2008:694). The metaphor concept can be summarized as understanding an object from another perspective (Lakoff & Johnson, 1980). Metaphors enable the establishment of new relationships by capturing the similarities of new information with previous old information and thus help to explain new information in a concrete way (Senemoğlu, 2007). From a different perspective, Afacan (2011) stated that metaphors enable the learning of unknown facts and the retention as well as recollection of learned facts when needed. Conceptually, metaphors are a powerful mental tool that a person can use to understand a phenomenon that is abstract and difficult to understand.

The increasing consumption activities and the fact that people do not give importance to recycling are the main reasons that direct us to this study. Also show that students are inclined and willing to recycle from an early age. And with these, this study was carried out to prove that secondary school students are emotionally ready for recycling education.

When the literature was examined, the limited number of studies that investigated the metaphorical perceptions of secondary school students about recycling and the fact that no other study was found in secondary schools except that by Egüz & Gökalp (2023) was the biggest factor that prompted this research. In Egüz & Gökalp's (2023) study, a metaphor study on recycling was conducted on a working group of 116 8th-grade students. In their study, it was concluded that male students used recycling bins more actively than female students. The difference of our study from the study of Egüz & Gökalp (2023) was to reveal the emotional readiness levels of secondary school students about recycling and to explore their desire for recycling. As a result of the review of the literature, it is seen that different studies have been conducted on recycling other than the metaphor method. For instance, Ural Keleş & Keleş (2018) attempted to determine the perceptions of primary school students about recycling in their study. In the study, it was concluded that all of the students recognized the recycling symbol. In addition, as a result of the study, it was suggested that recycling should be taught to students at an earlier age.

With this study, it was aimed by the researcher to raise awareness of recycling and to determine the students' interest in recycling also aimed to reveal the importance of creating recycling awareness in students from an early age. The purpose of the study is to examine the metaphorical perceptions of secondary school students towards recycling. Based on this purpose, the following questions were sought to be answered:

- What are the metaphors that secondary school students create for the concept of recycling?
- Under which categories can the metaphors that secondary school students create about the concept of recycling be analyzed according to their similarities?

2. Method

2.1. Research Design

In this study, the researcher tried to determine the metaphorical perceptions of secondary school students about recycling. The phenomenology design, which is one of the qualitative research designs, was used in the study. This design is used for studies aiming to investigate phenomena that we frequently encounter in daily life, which we are not completely unfamiliar with, but which we have difficulty in grasping the meaning of and offers a suitable research environment for these studies (Yıldırım & Şimşek, 2016, p. 69). In this study, the phenomenology research design was used to explore the experiences, insights, meanings, and phenomena that secondary school students have during the education process in order to determine students' perceptions about recycling and their level of understanding about the subject.

2.2. Study Group

The working group consisted of a total of 120 students, 54 males and 66 females, from the 7th and 8th grades, studying in the fall semester of the 2022—2023 academic year in Bitlis Province.

While forming the working group, attention was paid to the fact that the students had learned the subject of recycling before and within the current year. This choice was made in order to increase the reliability of the study by enabling them to give more informed answers. While approaching the 7th- and 8th-grade students, the researcher tried to involve students in such a way that she could get as much detailed information as possible without seeking any difference.

2.3. Data Collection Tool

In the data collection process, an online questionnaire form prepared via Google Forms was used. In order to obtain information about the demographic characteristics of the working group, multiple-choice questions were asked to the students through the questionnaire form. In addition, open-ended questions consisting of two stages were presented in the last part of the form in order to identify students' metaphorical perceptions. In the first part of the open-ended questions, the question "Recycling is like ....." was asked in order to understand what secondary school students liken recycling to, and the students were given the necessary explanations on how to fill this part. In the second part of the open-ended questions, the students were assigned a section in which they would make a detailed explanation with "Because....." in order to understand the logical connection of the metaphor they likened recycling to. For this section, it was clarified that students should write the reasons for likening recycling in detail. In metaphor studies, the words 'like or similar' are generally used to explain the link between the subject of an individual's mental image and the source of the mental image. The word 'because' is used to provide a logical basis for the metaphors created by the participants (Saban, 2009).

At the beginning of the questionnaire form, the purpose and importance of the research was explained to the students, and it was emphasized that their meaningful answers were very important for the study to achieve its purpose. In addition, no personal information was asked that would prevent the students from answering comfortably and reveal who they were.

2.4. Data Collection Process

The data in the study were obtained through a questionnaire created with Google Forms with a study lasting 15 days. At the end of this period, the survey was closed to sharing and the data collection process was completed.

2.5. Data Analysis

The data analysis of this study was conducted by content analysis, which is included in qualitative research. Content analysis is carried out by bringing together the determined data within the framework of certain themes and concepts as well as organizing and interpreting them in a way that the reader can understand (Yıldırım & Şimşek, 2013).

In the research, first, the demographic characteristics of the students were tabulated. Then, the metaphors and their frequencies determined by the open-ended question "Recycling is like ....." asked to the students to reveal their metaphorical perceptions about recycling were presented in a table. The metaphors were ranked and interpreted from the highest frequency value to the lowest. Two of the metaphors expressed by the students were not included in the evaluation as they did not contain any meaning. Then, the second open-ended question in the questionnaire, "Because.....", and the sentences explaining the reason for the metaphors were analyzed. As a result of the analyzed sentences, metaphors and sentences were categorized by considering the meaning connections they contain.

In order to increase the reliability of the study, the raw data were presented to two different experts who have experience in the field of science, and they were asked to create categories according to the meanings of the sentences. As a result of the categorization process, 90% concordance was found. The parts containing differences and ambiguities were reviewed and categorical corrections were made to finalize the study.

Word clouds were prepared, as shown in Figure 1, to indicate the metaphor frequency obtained from the study. The word cloud study was conducted by logging in to the word cloud page from the Wordart website (https://wordart.com/) with a personal e-mail address and password. The metaphors with high frequency values in the word cloud were presented visually by showing them in large fonts. Word cloud is a visualization technique used to provide an overview of the content of written texts, and the size of the words is proportional to the frequency of use of that word in the text (Tessem, et al., 2015).

3. Results

In the study, demographic characteristics of the sample, educational status of parents, daily book reading hours, daily television watching hours, daily time spent with phone-tablet and daily time spent watching documentaries on recycling-environment were determined and are presented in Table 1.

Table 1. *Demographic and other characteristics of the sample.*

Variable Type		Frequency (f)	Percentage (%)	Variable Type		Frequency (f)	Percentage (%)
Gender	Female	66	55	Grade	7th Grade	85	70.8
	Male	54	45		8th Grade	35	29.2
Mother's education status	Never attended school	21	17.5	Father's education status	Never attended school	-	-
	Primary School	42	35		Primary School	23	19.2
	Secondary School	22	18.3		Secondary School	23	19.2
	High School	24	20		High School	29	24.2
	Associate Degree	3	2.5		Associate Degree	13	10,8
	Bachelor's Degree	7	5.8		Bachelor's Degree	20	16.7
	Master's Degree	1	0.8		Master's Degree	12	10
	PhD	-	-		PhD	-	-
Average daily hours of reading	Never	6	5	Average daily hours of watching TV	Never	20	16,7
	0–1 hour	85	70.8		0–1 hour	49	40.8
	1–2 hours	22	18.3		1–2 hours	37	30.8
	2–3 hours	3	2.5		2–3 hours	12	10
	3–4 hours	-	-		3–4 hours	-	-
	4 hours or more	4	3.3		4 hours or more	2	1.7
Average daily hours spent on a computer, tablet or phone	Never	18	15	Frequency of watching recycling or environment-themed documentaries	Never	28	23.3
	0–1 hour	48	40				
	1–2 hours	30	25		Occasionally	76	63.3
	2–3 hours	19	15.8				
	3–4 hours	2	1.7		Often	16	13.3
	4 hours or more	3	2.5				

When Table 1 was analyzed, it was seen that the sample consisted of a total of 120 students, 66 females (55%) and 54 males (45%). It was observed that 85 (70.8%) of the sample consisted of 7th-grade students and 35 (29.8%) of the sample consisted of 8th-grade students.

When the education status of the students' mothers was examined, it was seen that the majority (42 people, 35%) were primary school graduates, very few (7 people, 5.8%) were bachelor's degree graduates, and only 1 person (0.8%) was a master's degree graduate. When

the education status of their fathers was analyzed, it was seen that 29 (19.2%) were high school graduates and 12 (10%) were master's degree graduates.

When the students' daily reading habits were analyzed, it was seen that 85 (70.8%) read books for an average of 1 h a day, while 6 students (5%) did not read any books daily.

When the students' television watching habits were analyzed, it was seen that 49 (40.8%) watched television for an average of 1 h a day, while 20 students (16.7%) did not watch television at all.

When the students' daily computer, tablet, and phone usage habits were analyzed, it was observed that 48 (40%) spent an average of 1 h a day, while 18 (15%) did not use them at all.

When the students' frequency of watching recycling or environment-themed documentaries was examined, it was observed that 76 students (63.3%) watched them occasionally, while 28 students (23.3%) never watched them.

The students' metaphors were transformed into word clouds and are presented in Figure 1.

Figure 1. Word cloud of secondary school students' metaphors about recycling.

When the metaphors used in the word cloud in Figure 1 were examined, it was seen that the following metaphors were emphasized in large fonts: tree (8), cleaning (6), rebirth (5), life (4), environmental cleaning (4), saving (4), garbage (4), paper (4), earth (3), water (3), and environment (3).

The metaphors created by secondary school students for the concept of recycling and their frequency (f) and percentage (%) are presented in Table 2.

Table 2. *Metaphors, frequency, and percentage values of secondary school students' concepts about recycling.*

Metaphor No.	Metaphor name	*f*	%	Metaphor No	Metaphor name	*f*	%
1	Tree	8	6,77	35	Clothes	1	0.84
2	Cleaning	6	5,08	36	Our Home	1	0.84
3	Rebirth	5	4,23	37	Domestic waste	1	0.84
4	Environmental Cleaning	4	3,38	38	Refreshing the memory	1	0.84
5	Garbage	4	3,38	39	Ballpoint pen	1	0.84
6	Life	4	3,38	*40*	Saving the Life	1	0.84
7	Paper	4	3,38	41	Economy	1	0.84
8	Saving	4	3,38	42	Medicine	1	0.84
9	Boomerang	3	2,54	43	Humans	1	0.84
10	Environment	3	2,54	44	Newspaper	1	0.84
11	Earth	3	2,54	45	Lizard	1	0.84
12	Water	3	2,54	46	Phoenix	1	0.84
13	Respect for the environment	2	1,69	47	Renewable energy	1	0.84
14	Nature	2	1,69	48	Fruit	1	0.84
15	Economic contribution	2	1,69	49	River	1	0.84
16	Regeneration	2	1,69	50	Revival	1	0.84
17	Factory	2	1,69	51	Oxygen	1	0.84
18	Photosynthesis	2	1,69	52	Forest	1	0.84
19	Book	2	1,69	53	It’s like grass	1	0.84
20	Plastic	2	1,69	54	Plastic bottle	1	0.84
21	Waste	2	1,69	55	Water cycle	1	0.84
22	Cleaning the Earth	2	1,69	56	Dishes waiting to be washed	1	0.84
23	Waste prevention	2	1,69	57	Notebook	1	0.84
24	Accomplishment and pleasure	1	0.84	58	Clean air	1	0.84
25	Receiving information	1	0.84	59	Repeated event	1	0.84
26	Lifesaving	1	0.84	60	An uncontaminated Earth	1	0.84
27	Helping someone	1	0.84	61	Recovering after being sick	1	0.84
28	Reinvention	1	0.84	62	Fish struggling to survive	1	0.84
29	Like broken glass	1	0.84	63	New things	1	0.84
30	Turning lifelessness into vitality	1	0.84	64	Rain falling on dry earth	1	0.84
31	Garbage free	1	0.84	65	Replenishment	1	0.84
32	Garbage can	1	0.84	66	Battery	1	0.84
33	Starfish	1	0.84	67	Time	1	0.84
34	Seed	1	0.84	68	Armor	1	0.84
		Total			68	118	100

When Table 2 was analyzed, it was seen that secondary school students created 68 different metaphors about recycling. Together with the metaphors used more than once, a total of 118 metaphors were created.

Among the metaphors used by the students, the most frequently used metaphors are listed as follows: tree (f: 8, 6.77%), cleaning (f: 6, 5.08%), rebirth (f: 5, 4.23%), environmental cleaning, garbage, life, paper, saving (f: 4, 3. 38%), boomerang (f: 3, 2.54%), environment (f: 3, 2.54%), earth (f: 3, 2.54%), water (f: 3, 2.54%).

The metaphors created by the students were grouped under categories, frequency and percentage values were determined, and some sample sentences were assigned to the categories, which are presented in Table 3.

Table 3. *Categories, metaphors, frequencies, percentages and sample sentences belonging to the categories of metaphors created by secondary school students about recycling.*

Categories	Metaphor	*f*	%	Example sentence
1. Saving	Saving (4), Economic contribution (2), Waste prevention (2), Economy (1)	9	7,62	*Recycling is like **saving**. Because we save money by recycling.*
2. Self-renewal	River (1), Lizard (1), Refreshing the memory (1)	3	2,54	*Recycling is like a **river**. Because it renews itself in every situation, just as a river renews itself.*
3. Protecting the nature	Tree (7), Earth (3), Respect for the environment (2), Garbage can (1), Renewable energy (1), Clean air (1), An uncontaminated Earth (1), Armor (1)	17	14,40	*Recycling is like a **tree**. Because trees take sunlight and photosynthesize, which means they recycle, so I liken trees to recycling.*
4. Cycle	Paper (4), Boomerang (3), Garbage (3), Factory (2), Plastic (2), A broken glass (1), Newspaper (1), Notebook (1), Garbage-free (1), Plastic bottle (1), Water cycle (1), Repeated event (1), New things (1), Tree (1)	23	19,49	*Recycling is like the **water cycle**. Because water passes through all kinds of processes in the water cycle and returns to us again.*
5. Reuse	Regeneration (2), Photosynthesis (2), Reinvention (1), Clothes (1), Renewal (1), Dishes waiting to be washed (1), Battery (1), Time (1), Water (1)	11	9,32	*Recycling is like **photosynthesis**. Because, like plants, they constantly convert carbon dioxide into oxygen to renew the air.*
6. Protecting natural resources	Water (2), Forest (1)	3	2,54	*Recycling is like **water**. Because as we use water carelessly, we realize its value when it runs low and we see that life without water is quite difficult.*
7. Cleaning	Cleaning (6), Environmental cleaning (4), Cleaning the Earth (2), Nature (2)	14	11,86	*Recycling is like **environmental cleaning**. Because with recycling, the living space of living things is cleaned.*
8. Sustainability	Ballpoint pen (1)	1	0,84	*Recycling is like a **ballpoint pen**. Because with recycling, we can use waste over and over again throughout our lives. We can use it for a long time, just like a ballpoint pen.*
9. Regeneration	Rebirth (5), Life (2), Phoenix (1), Saving life (1), Seed (1), Fruit (1), Revival (1), Grass (1), Healing after being sick (1), Rain falling on dry earth (1), Turning lifelessness into vitality (1), Starfish (1), Fish struggling to survive (1)	18	15,25	*Recycling is like a **phoenix**. Because there is a legend that the phoenix is reborn from its ashes, when we recycle, the world is also reborn.*
10. Being valuable	Book (2), Life (2), Our Home (1), Oxygen (1)	6	5,08	*Recycling is like **oxygen**. Because we cannot breathe and live without oxygen, we cannot live without recycling.*
11. Mutual benefit	Sharing knowledge (1), Helping someone (1)	2	1,69	*Recycling is like **helping someone**. Because a person helps another person,*

Categories	Metaphor	*f*	%	Example sentence
				and then when the person who helped the other person is in need, the other person helps him or her as well.
12. Negative perception	Waste (2), Garbage (1), Domestic waste (1)	4	3,38	*Recycling is like **garbage**. Because the recycling materials that accumulate around us look just like garbage.*
13. Happiness	Accomplishment and pleasure (1)	1	0,84	*Recycling is like **accomplishment and pleasure**. Because recreating and reusing a product that would otherwise go to waste gives happiness and a sense of accomplishment.*
14. Protecting the Earth	Environment (3), Saving the life (1), Medicine (1)	5	4,23	*Recycling is like **saving the life**. Because every material we recycle extends the life of the Earth.*
15. Classification	Human (1)	1	0,84	*Recycling is like a **human** being. Because we should classify people according to their species and treat them accordingly.*
Total		118	100	

Table 3 shows that the metaphors created by secondary school students about recycling were divided into 15 different categories according to the meanings attributed by the students. While 14 of these categories contained positive sentences, 1 was determined as a category containing a negative sentence. The table shows the categories, metaphors belonging to the category, their frequencies (f), percentage (%) values, and example sentences belonging to the category. Some metaphors such as water, garbage, life, and tree were used in different categories according to the meaning attributed by the students. Water was included both in the category of protecting natural resources and in the category of reuse. Garbage was included in the categories of cycle and negative perception, while life was examined in two different categories, namely regeneration and being valuable.

The categories of the metaphors, explanations of the categories, and student sentences related to them are presented below.

3.1. Saving:

There are 9 metaphors (7.62%) in this category. The most frequently used metaphors were saving, economic contribution, and waste prevention. The least used metaphor was economy. Some meaningful sentences created by the students for this category are as follows:

- "Recycling is like saving. Because we save money by recycling."
- "Recycling is like economic contribution. Because recycling involves less cost compared to the first time it is made."
- "Recycling is like waste prevention. Because by recycling, we prevent waste and contribute to the national economy."
- "Recycling is like economy. Because when materials are recycled, less money is spent, so it contributes to the economy."

3.2. Self-renewal:

There are 3 metaphors (2.54%) in this category. All of the metaphors were used once. Some meaningful sentences created by the students for this category are as follows:

- "Recycling is like a river. Because the river renews itself just like recycling."

- "Recycling is like a lizard. Because when the lizard's tail breaks, a new one grows in its place and renews itself."
- "Recycling is like refreshing the memory. Because as information is refreshed, it renews itself and stays in the mind."

3.3. Protecting the nature:

There are 17 metaphors (14.40%) in this category. The most frequently used metaphors were tree, earth, and respect for the environment. The least used metaphors were garbage can, renewable energy, clean air, an uncontaminated Earth, and armor. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like a tree. Because recycling, like trees, protects nature."*
- *"Recycling is like a tree. Because if we waste paper, many trees will be destroyed, but if we don't waste it, we can save 7-8 trees a day."*
- *"Recycling is like the Earth. Because as we throw paper in the garbage, trees are depleted and as a result, our world is depleted."*

3.4. Cycle:

A total of 23 metaphors (19.49%) are included in this category. The most frequently used metaphors were paper, boomerang, garbage, factory, and plastic. Some of the least used metaphors were newspaper, notebook, clean air, water cycle, plastic bottle, and tree. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like paper. Because paper can also be recycled."*
- *"Recycling is like a boomerang. Because everything we throw away comes back to us."*
- *"Recycling is like garbage. Because garbage can be recycled."*
- *"Recycling is like a factory. Because in factories, new things are produced by recycling."*
- *"Recycling is like the water cycle. Because water passes through all kinds of processes in the water cycle and returns to us again."*
- *"Recycling is like a tree. Because trees take sunlight and photosynthesize, which means they recycle, so I liken trees to recycling."*

3.5. Reuse:

There are 11 metaphors (9.32%) in this category. The most frequently used metaphors were renewal and photosynthesis. Some of the least used metaphors were clothes, notebook, battery, time, and water. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like regeneration. Because with regeneration, old materials can be transformed into new materials."*
- *"Recycling is like photosynthesis. Because like plants, they renew the air by constantly converting carbon dioxide into oxygen."*
- *"Recycling is like photosynthesis. Because it renews a substance used in photosynthesis and turns it into a new substance that has never been used."*
- *"Recycling is like clothes. Because dirty clothes are cleaned again in the washing machine."*
- *"Recycling is like water. Because when we use water, it gets polluted, but when it evaporates, it becomes clean water again."*

3.6. Protecting natural resources:

There are 3 metaphors (2.54%) in this category. The most frequently used metaphor was water. The least used metaphor was forest. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like a forest. Because we can use our natural resources for a longer time with recycling."*
- *"Recycling is like water. Because as we use water carelessly, we realize its value when it runs low, and we see that life without water is quite difficult."*

3.7. Cleaning:

There are 14 metaphors (11.86%) in this category. The most frequently used metaphors were cleaning and environmental cleaning. The least used metaphors were nature and cleaning the Earth. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like cleaning. Because recycling cleans nature."*
- *"Recycling is like environmental cleaning. Because with recycling, the living space of living things is cleaned."*
- *"Recycling is like nature. Because with recycling, nature is protected by being cleaned from dirt."*
- *"Recycling is like cleaning the Earth. Because with recycling, we are cleaned from dirt, waste, and harmful gases."*

3.8. Sustainability:

There is 1 metaphor (0.84%) in this category. The metaphor used was ballpoint pen. The meaningful sentence created by the student for this category is as follows:

- *"Recycling is like a ballpoint pen. Because with recycling, we can use waste over and over again throughout our lives. We can use it for a long time, just like a ballpoint pen."*

3.9. Rebirth:

There are 18 metaphors (15.25%) in this category. The most frequently used metaphors were being reborn and life. The least used metaphors were seed, grass, phoenix, fruit, rain falling on dry earth, turning lifelessness into vitality, revival, and starfish. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like rebirth. Because recycling re-purposes products."*
- *"Recycling is like being reborn. Because we reuse everything that we have lost hope in, everything that is useless to us."*
- *"Recycling is like the phoenix. Because there is a legend that the phoenix is reborn from its ashes, and when we recycle, the world is reborn."*
- *"Recycling is like fruit. Because when we bury the seed inside the fruit in the soil, new fruits are formed."*
- *"Recycling is like grass. Because grass matures, is mowed and grows again, and recycling is similar to this."*
- *"Recycling is like rain falling on dry earth. Because just as rain makes dry earth green, recycling revitalizes dead wastes."*
- *"Recycling is like turning lifelessness into vitality. Because when a garbage is cleaned from nature with recycling, the cleaned place becomes green."*
- *"Recycling is like revitalization. Because if we throw a waste in the recycling bin, that waste is re-presented in the markets and becomes alive again."*

3.10. Being valuable:

There are a total of 6 metaphors (5.08%) in this category. The most frequently used metaphors were book and life. The least used metaphors were our home and oxygen. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like a book. Because like books, recycling is valuable to us."*
- *"Recycling is like life. Because just as life is valuable to us, so is recycling."*
- *"Recycling is like our home. Because our home is valuable to us, if we do not throw garbage on the floor, we should not throw it into our environment."*
- *"Recycling is like oxygen. Because as we cannot breathe and live without oxygen, we cannot live without recycling."*

3.11. Mutual benefit:

There are 2 metaphors (1.69%) in this category. The metaphors used were sharing knowledge and helping someone. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like helping someone. Because a person helps another person, and then when the person who helped the other person is in need, the other person helps him or her as well."*
- *"Recycling is like sharing knowledge. Because sharing knowledge is just as useful and beautiful as recycling."*

3.12. Negative perception:

There are 4 metaphors (3.38%) in this category. The most frequently used metaphors were waste and garbage. The least used metaphor was domestic waste. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like waste. Because recycling materials are like wastes."*
- *"Recycling is like garbage. Because the recycling materials that accumulate around us look just like garbage."*

3.13. Happiness:

There is 1 metaphor (0.84%) in this category. The used metaphor was accomplishment and pleasure. The meaningful sentence created by the student for this category is as follows:

- *"Recycling is like accomplishment and pleasure. Because recreating and reusing a product that would otherwise go to waste gives happiness and a sense of accomplishment."*

3.14. Protecting the Earth:

There are 5 metaphors (4.23%) in this category. The most frequently used metaphor was environment. The least used metaphors were lifesaving and medicine. Some meaningful sentences created by the students for this category are as follows:

- *"Recycling is like the environment. Because recycling protects our environment and our world."*
- *"Recycling is lifesaving. Because every material we recycle extends the life of the Earth."*
- *"Recycling is like medicine. Because it prolongs the life of the Earth."*

3.15. Classification:

There is 1 metaphor (0.84%) in this category. The used metaphor was human. The meaningful sentence created by the student for this category is as follows:

- *"Recycling is like a human being. Because we should classify people according to their species and treat them accordingly."*

4. Conclusion and Discussion

In this study, conducted to reveal the metaphorical perceptions of secondary school students about recycling, 68 different metaphors were created. As a result of the metaphor analysis of the 68 different metaphor types, it was found that the students perceived and understood recycling in different ways in their minds.

When the metaphors used by the students were analyzed, it was seen that the most frequently used metaphors were as follows: tree (f: 8), cleaning (f: 6), rebirth (f: 5), environmental cleaning (f: 4), garbage (f: 4), life (f: 4), paper (f: 4), saving (f: 4), boomerang (f: 3), environment (f: 3), earth (f: 3), water (f: 3), respect for the environment (f: 2), nature (f: 2), economic contribution (f: 2), regeneration (f: 2), factory (f: 2), photosynthesis (f: 2), book (f: 2), plastic (f: 2), waste (f: 2), cleaning the earth (f: 2), waste prevention (f: 2).

The metaphor tree, which had the highest frequency value in the study, appeared as the metaphor with the highest frequency value (f: 12) in the study conducted by Egüz and Gökalp (2023). From this standpoint, the metaphor that they found in their study is in parallel with that in the current study and supports our results. In addition, the metaphor paper (f: 4), which was found in this study, is in parallel with the results of the study of Egüz and Gökalp (2023). They supported the results in our study by including earth (f: 7), paper (f: 6), and water (f: 3) as metaphors among those with the highest frequency values. In addition, the metaphor clean environment (f: 7) in the study of Ural Keleş and Keleş (2018) and the metaphor environmental cleaning (f: 4), which had the highest frequency value among the results of our study, coincide and support each other. When recycling is mentioned, it is understood that "environmental cleaning" is among the first metaphors that are associated with students. The fact that students make a direct connection between recycling and the metaphor of "environmental cleaning" also shows that they have positive connotations about recycling in their minds.

The results of this study, such as the fact that one of the most frequently used metaphors was paper (f: 4) and that the students had recycling awareness, are in parallel with the studies of Çimen and Yılmaz (2012). According to their study, it was observed that students were interested and knowledgeable about recycling. The results of our study are similar to theirs in that teachers play an active role in creating recycling awareness and that paper is among the mostly used metaphors for recycling. Since activities are generally carried out in schools for the recycling and reuse of paper, it is seen as an expected result that the metaphor of "paper" comes to the minds of students in these studies.

Some of the least used metaphors were as follows: seed (f: 1), starfish (f: 1), clothes (f: 1), domestic waste (f: 1), economy (f: 1), medicine (f: 1), humans (f: 1), newspaper (f: 1), fruit (f: 1), lizard (f: 1), phoenix (f: 1), forest (f: 1), oxygen (f: 1), notebook (f: 1), plastic bottle (f: 1), battery (f: 1), and armor (f: 1). It is seen that these metaphors are not frequently used in daily life and school environment. It is thought that the few use of these metaphors is due to the fact that they are not closely related to recycling. Since they are rarely used metaphors, very few of the students used them.

The metaphors created by secondary school students were divided into a total of 15 different conceptual categories. When the frequency of the metaphors used in the conceptual categories were analyzed, the categories with the highest number of metaphors were listed according to their frequency values as follows: Cycle (f: 23), Rebirth (f: 18), Protecting nature (f: 17), Cleaning (f: 14), Reuse (f: 11), Saving (f: 9), Being valuable (f: 6), Protecting the Earth (f: 5), Negative perception (f: 4), Protecting natural resources (f: 3), Self-renewal (f: 3), and Mutual benefit (f: 2). The categories with the least number of metaphors were Happiness (f: 1), Classification (f: 1), and Sustainability (f: 1) with a frequency value of (f: 1).

Fourteen of these categories were positive and one was negative. When the metaphors created by the students were categorized, the fact that only one category was negative and the others were positive indicated that the students have positive perceptions about recycling, that they are interested and can willingly and voluntarily participate in recycling-related studies, and that they are open to guidance in this regard. In line with the results obtained from the sentences of the students, it is understood that they are happy with their perceptions about recycling and the studies carried out to raise awareness about recycling. In addition, the fact that the working group learned the subject of recycling at school, as required by the curriculum, shows that the school and teachers play a very important role in terms of raising recycling awareness and sensitivity in students. It was also it is deduced that students can contribute greatly to recycling if they are properly guided by their teachers. Because, in line with the meanings understood from the sentences explained with “Because.....”, it was observed that the students are aware of the benefits of recycling to the world, humanity, nature, economy, natural resources and our future. In addition, it was evident that most of the students are aware of how much damage humanity and the Earth face as a result of neglecting and underestimating recycling.

5. Suggestions

Based on the results of the study, the following suggestions were made about recycling:

- Recycling education and awareness should be included in textbooks starting from early grades.
- Teachers can create awareness in students by emphasizing recycling-themed topics in club activities or values education activities.
- Recycling-themed projects can be included in TÜBİTAK supported projects in schools.
- At the end-of-year art exhibitions organized in schools, projects on the harms of not recycling can be exhibited.
- Public service announcements, advertisements, banners, or posters can be used to raise awareness about recycling.
- Competitions can be organized in schools to encourage students to recycle, recycling volunteers can be selected, and the society can be encouraged to recycle through awareness-raising practices such as the use of wristbands, badges, or t-shirts related to recycling.

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