

## Evaluation of Science Teacher Candidates' Metaphorical Perceptions Regarding Environmental Problems

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**Abstract:** The population of this research consisted of second, third and fourth grade teacher candidates studying in the Science Teaching Department of Trakya University Faculty of Education in the 2022-2023 academic year. The sample in the study consisted of 81 science teacher candidates. The research was carried out with a qualitative design and phenomenographic research method. A metaphor form of "Environmental problems ..... similar/like; because ....." was used as a tool to collect qualitative data. In the first blank of this form, they were asked to make an analogy about the concept of "environmental problems", and in the second blank, they were asked to explain the reason for this analogy. As a result of the content analysis of metaphors regarding the concept of environmental problems, a total of 60 types of metaphors were created. It was observed that the participants frequently used the metaphors of "disease", "avalanche", "boomerang", "dominos", "cancer" and "virus". The metaphors produced by prospective teachers are divided into 8 different categories according to the because..... part. These categories of environmental problems were determined as "cleaning up", "death", "expansionism", "feel", "pessimism", "precaution", "progress/increase", and "return". It is seen that the majority of the teacher candidates participating in the research have a perception of progress/increase and being pessimistic about environmental problems. As a result, when the metaphors created by prospective teachers towards the concept of environmental problems and the categories they were associated with were examined, it was observed that the participants generally had a very negative perception of environmental problems.

**Key Words:** Environment, Environmental Problems, Science Teacher Candidates, Metaphor

### Fen Bilimleri Öğretmen Adaylarının Çevre Sorunlarıyla İlgili Metaforik Algılarının Değerlendirilmesi

**Özet:** Bu araştırmanın evrenini 2022-2023 öğretim yılında Trakya Üniversitesi Eğitim Fakültesinin Fen Bilgisi Öğretmenliği Anabilim Dalında öğrenim gören ikinci, üçüncü ve dördüncü sınıf öğretmen adayları oluşturmuştur. Araştırmada örneklem 81 fen bilgisi öğretmen adayından oluşmuştur. Araştırma nitel desende ve fenomenografik araştırma yöntemi ile gerçekleştirilmiştir. Verileri toplama aracı olarak, "Çevre sorunları ..... benzer/gibidir; çünkü ....." şeklinde bir metafor formu kullanılmıştır. Bu formda yer alan ilk boşlukta "çevre sorunları" kavramı ile ilgili bir benzetim yapmaları, ikinci boşlukta ise bu benzetimin nedenini açıklamaları istenmiştir. Çevre sorunları kavramına yönelik metaforların içerik analizi sonucunda toplam 60 çeşit metafor oluşturulmuştur. Katılımcıların "hastalık", "çiğ", "bumerang", "domino taşları", "kanser", "virüs" metaforlarını sıklıkla oluşturdukları gözlenmiştir. Öğretmen adaylarının üretmiş oldukları metaforlar çünkü... kısmına göre 8 farklı kategoriye ayrılmıştır. Çevre sorunları ile alakalı bu kategoriler "temizlik", "ölüm", "yayılcılık", "hissetme", "kötümserlik", "tedbir", "ilerleme/artma" ve "geri dönme" olarak belirlenmiştir. Araştırmaya katılan öğretmen adaylarının büyük çoğunluğunun çevre sorunları konusunda ilerleme/artma ve kötümser olma yönünde bir algısı olduğu görülmektedir. Sonuç olarak öğretmen adaylarının çevre sorunları kavramına karşı oluşturdukları metaforlar ve ilişkilendirildikleri kategoriler incelendiğinde genel olarak katılımcıların çevre sorunları ile ilgili oldukça olumsuz bağlamda algıya sahip oldukları gözlenmiştir.

**Anahtar Kelimeler:** Çevre, Çevre Sorunları, Fen Bilgisi Öğretmen Adayları, Metafor

#### 1. INTRODUCTION

With the industrial revolution, rapidly increasing technological developments and the rapid increase in the world population have brought about excessive consumption, which has led to an increase in production and rapid consumption of natural resources. In order to meet the needs arising from the increasing demand, natural resources have been used unconsciously and endlessly, and nature has been destroyed (Akgün, et al., 2016; Miser, 2019; Sarıgöz, 2013; Uluşan, 2020). This production and consumption frenzy in humanity has caused the environment to be neglected. While the

development efforts of states have increased their level of economic development, they have also brought about environmental problems that will endanger humanity and destroy future generations. The fact that environmental problems have become global rather than regional has led to some searches for a balance between the natural environment and development.

Leaving a livable environment for all living things for future generations is one of the most important duties of humans. Training human resources with environmental awareness, which will bring radical solutions to the environmental problems

encountered, produce services for the benefit of humanity and benefit from them, will provide significant progress in solving these problems and needs (Karakoçan Dev & Kurtdele, 2020; Uzun & Sağlam, 2005).

Environmental problems have now become dangerous all over the world. From a global perspective, only environmentally literate people who internalize the environment and protect it in the behavioral process can prevent such rapid destruction of the environment (Çelikbaş, 2016; Karakaya, 2016). Environmental literacy gained educationally has a different importance for educators (Candan & Erten, 2015; Gülay and Özncar; 2010). If it is aimed for future generations to have this characteristic, it should first be imparted to the teacher candidates who will educate these people (Bilim, 2012; Esa, 2010; Green et al., 2016).

Today's educational programs are created according to the constructivist approach, in which the student plays an active role and the teacher plays a guiding role (Arslan, 2007; Demirel et al., 2000). It is necessary to ensure the active participation of the student in the implementation of course programs based on the constructivist approach, and therefore to create educational environments in which the student constructs the knowledge (Koç & Demirel, 2004; Kroesbergen & Van Luit, 2005). Previous experience and knowledge are very important to gain new experience and knowledge, and in most learning theories, new knowledge is concept-centered (Jonassen et al., 1995; Rundgren et al., 2009). Metaphors are one of the educational tools that are parallel to the features of the constructivist approach and are used in different areas of education (Botha, 2009). In this approach, students construct knowledge themselves by using metaphors, thus learning concepts more easily. As a matter of fact, many studies conducted in this context have shown that positive changes have occurred in individuals' knowledge, attitudes and behaviors (Doğru & Saraç, 2013; Erdoğan, 2011).

Some studies in the literature include examining perceptions about the environment. At this point, a frequently used method in perception studies in the literature is the use of metaphors (Kızılay, 2020). When perceiving concepts, common aspects with another concept are often brought to mind. Another newly learned feature of a concept is often paired with the features of other well-known situations or analogies are created in the mind.

The metaphor is derived from the Greek words "meta" to change and "pherein" to carry (Kartal &

Ergün, 2022; Levine, 2005; Yapıcıoğlu & Korkmaz, 2019). Dewey expanded this definition by adding the element of "dream", which he defined as the conscious adaptation of the new and the old (Gürten & Köseoğlu, 2019; Levine, 2005). Botha (2009) quotes Scheffler's explanation of metaphor in his study as follows: Metaphors are inventions of thought to explore the possibilities of a certain type in an intuitive way (Çakmak, 2018; Toplu, 2015).

The first studies on metaphor date back to Aristotle. Aristotle examined the subject mainly on the axis of poetic expression and eloquence, focusing on the general relationship of metaphor with linguistics and its purpose in communication. According to him, metaphors are implicit comparisons made according to the principles of analogy, and their use outside the dictionary meaning is seen as a figure of speech (Akgün et al., 2016; Ortony, 2012).

Due to having different experiences, human beings have different perceptions, views and emotions in their brains. The fact that individuals' perception power and life experiences differ from each other results in the perception of a single situation or concept in different ways (Anılan, 2017; Kızılay, 2020; Yapıcıoğlu & Korkmaz, 2019). For this reason, the metaphor that each individual attributes to a new concept is often different.

Even in the language people use in everyday life (Tamimi, 2005), they unconsciously use many metaphors (e.g., table leg, chair arm, river mouth, etc.). These metaphors may sound absurd and ridiculous when used and thought with their literal meanings (Duit, 1991). Metaphors encourage the individual to think from different perspectives and discover the riches of language by using them imagination, thus removing the obstacles to creative thinking (Avcı, 2021; Doğan, 2019; Eraslan, 2011; Girmen, 2007; Yapıcıoğlu & Korkmaz, 2017).

The appeal of using metaphors in researches lies in their capacity to make individuals' knowledge and life experiences relevant and meaningful (Çakmak, 2018; Demirbilek, 2023; Deringöl & Gülten, 2016; Kartal & Ergün, 2022; Tepebaşılı, 2013). They attract attention because they are powerful modeling and mental mapping mechanisms for individuals to understand and structure their own world. Metaphors are considered an excellent technique for teaching the unknown and validated tools for retention and recall of learned information (Arslan & Bayrakçı, 2006; Yapıcıoğlu & Korkmaz, 2019).

Although metaphors are thought to be related to language and its use, they have more functions (Arik & Benli Özdemir, 2016; Çatalkaya, 2019). In addition

to research in cognitive linguistics and psychology (Pollard, 2003; Yapıcıoğlu & Korkmaz, 2019), it is one of the methods used for education and training purposes in educational sciences for a long time (Çelik & Çakır, 2015). Metaphors help educators make comparisons between two things, highlight similarities between two things, or explain one thing by substituting it for another (Duit, 2001; Saban, 2004). In particular, teachers consciously or unconsciously use metaphors to explain abstract concepts and generalizations (Çelik & Çakır, 2015; Yapıcıoğlu & Korkmaz, 2019).

There are very important benefits for students to learn the information to be learned through metaphors, by exercising their brains, in a game atmosphere, by using their minds and creativity. Students may be reluctant in classes where traditional teaching is applied. Gamifying lessons through metaphors will, above all, eliminate the negative thoughts that complicate and make teaching and learning complex. In addition, teaching through metaphors motivates students to understand and explore information and ideas at a deeper level while learning. This process also enables students to learn unfamiliar concepts, facts and events based on what they know and to establish a relationship between two concepts, facts or events (Marzano et al., 2000).

Regardless of the course, teachers who determine the educational environment have important roles such as making their students love the course, ensuring that they learn it, and making them feel its importance. The perception towards a course significantly affects the success in that course. Accordingly, students' perceptions of the course can be revealed through metaphorical perception. Because by using metaphors, students have the opportunity to say what they want to say more effectively with fewer words.

It can be stated that metaphors can be used as a qualitative data collection method. The use of metaphors as a data collection method expresses their descriptive role (Altıntaş et al., 2015). Because metaphors provide a rich and solid framework about the phenomenon being studied (Yıldırım & Şimşek, 2013). In cases where metaphors are used as a qualitative data collection method, an abstract phenomenon that is wanted to be explained or given meaning is first determined in the metaphorical thinking process of individuals. Then, in order to explain this phenomenon, a concrete or distinct phenomenon is determined and special analogies are established between them (Eraslan, 2011; Tanık Önal & Kızılay, 2017).

In this research, it was aimed to reveal the mental perceptions of Trakya University science teacher candidates towards environmental problems through metaphors.

## 2. MATERIALS AND METHODS

This study was undertaken to reveal the metaphorical perceptions of prospective teachers studying at Trakya University Faculty of Education, Department of Mathematics and Science, Department of Science Teaching, in their view of environmental problems. Study permission was obtained from Trakya University Social and Human Sciences Research Ethics Committee with the letter numbered E-29563864-050.04.04-245850 on 20.04.2022.

In the research;

- What are the metaphorical perceptions of science teacher candidates towards environmental problems?
- What are the metaphors put forward by science teacher candidates regarding the concept of environmental problems?
- How many categories can the metaphors put forward by prospective teachers be grouped in terms of their general characteristics, and what are these categories? Answers were sought for the problem sentences.

### 2.1. Demographic Characteristics of the Working Group

The sample group in this study consists of N = 81 teacher candidates studying in the second, third and fourth grades in the Department of Science Teaching. No sampling method was used for the sample, and due to the small number of teacher candidates, it was aimed to sample the entire study group to collect data. Approximately the majority of teacher candidates in the classrooms participated in the study on a voluntary basis.

The demographic characteristics of the teacher candidates participating in the research according to gender are given in Table 1.

Table 1: Distribution of Demographic Characteristics of Science Teacher Candidates According to Gender Variable

Gender	N	%
Female	62	76,5
Male	19	23,5
Total	81	100,0

According to the demographic data obtained from Table 1, it is seen that of the 81 teacher candidates in the study 76.5% are female and 23.5% are male. Generally, students studying in science teaching departments are mostly females.

The demographic characteristics of the teacher candidates participating in the research according to the class variable in which they are studying are given in Table 2.

Table 2: Distribution of Demographic Characteristics of Science Teacher Candidates According to Grade Level Variable

Grade Level	N	%
Second Grade	29	35,8
Third Grade	27	33,2
Fourth Grade	25	30,0
Total	81	100,0

Although there is not much difference in the number of individuals between grades, it seems that the number of individuals in the second grade is higher than the other grades. According to the demographic data in Table 2, it is seen that of the teacher candidates 35.8% are second grade, 33.2% are third grade and 30.0% are fourth grade.

## 2.2. Collection of Study Data

In the study, the metaphors created by science teacher candidates in terms of environmental problems were discussed. In this research, "Environmental problems ..... similar/like; because ....." data was obtained by ensuring that the students filled out the metaphor form given as.

## 2.3. Analysis of Study Data

The metaphors created by the participants in the study were evaluated with the content analysis method designed according to the phenomenology pattern (Patton, 2002; Yıldırım & Şimşek, 2006). During content analysis, data were coded, categories were created, codes and categories were arranged, and the findings were defined and Table 3: Metaphors Developed by Teacher Candidates for the Concept of "Environmental Problems" and Their Frequencies

Metaphors	f
Family	1
Lung disease	1
Acne problem	1
Fire/flame	2
Swamp	1
My room	1

interpreted (Saban, 2008; Saban, 2009; Yıldırım & Şimşek, 2006).

## 2.4. Validity and Reliability of Data

This study was carried out with a qualitative design. In the qualitative approach, since the design and data of the study are different, different criteria are used in the validity and reliability process (Büyüköztürk et al., 2014). In ensuring the reliability of the data, some factors accepted for quantitative research are not applicable for qualitative research. In addition, in terms of qualitative research, it is stated that facts are constantly changing depending on individuals and the environment they are in, and repeating the research in similar groups does not make it possible to reach the same results (Yıldırım & Şimşek, 2013). In order to increase reliability in qualitative research, each stage of the research and the path followed are defined in detail by the researcher (Büyüköztürk et al., 2014). In this study, each stage of the research process has been tried to be explained in detail. However, it is stated that in qualitative research, examining the research data by two different people can increase the validity of the study (Büyüköztürk et al., 2014). In this context, the data of this study was analyzed by two field experts and the analysis process was terminated in line with the common opinion formed as a result of the analysis.

## 3. RESULTS AND DISCUSSION

Participating teacher candidates who continue their education at Trakya University Science Teaching Department produced 81 metaphors for environmental problems that were included in the research. 49 of the metaphors produced were similar to different concepts and 32 of them consisted of repetitive concepts. The metaphors and frequency (f) values produced by teacher candidates are presented in Table 3.

When Table 3 is examined, the metaphors with the highest frequency are; disease (f: 6), avalanche (f: 4), boomerang (f: 3), dominoes (f: 3), cancer (f: 3), virus (f: 3), flame/fire (f: 2), human health (f: 2), hourglass (f: 2), traffic (f: 2) and life threat (f: 2).

An ignorant person	1
Herb	1
A broken human body	1
A murky water	1
Boomerang	3
Various disasters	1
Avalanche	4

Flower	1
A messy room	1
Natural disaster	1
Dominoes stones	3
Washing our hands with soap when they are dirty	1
Infection	1
Home	1
The garbage we keep in our home warehouse	1
Illness	6
Human body	1
A dark cloud	1
Human behavior	1
Human health	2
People's self-care	1
People's problems	1
Ball of string	1
Blood loss	1
Cancer	3
Ant community	1
A pot of boiling milk	1
Hourglass	2
A glass cup standing at the end of the table	1
Matryoshkas	1
Germ	1

A flower about to die	1
Patient on death bed	1
Interference	1
A killer running after us	1
Psychological problem	1
Color scale	1
Take risks	1
Health	1
Health problems	1
Ivy	1
Cigarette	1
Smoker's lungs	1
A flower that is not watered	1
Social problems	1
Traffic	2
Tumor	1
Virus	3
Oily skin	1
Wound	1
Life threatening	2
To eat eat	1
Poison	1
A poisonous smoke	1
<b>Total</b>	<b>81</b>

Categories formed with environmental problems as a result of the analysis of metaphors; They were determined as "return", "feel", "progress/increase", "pessimism", "death", "precaution", "cleaning up" and "expansionism". These categories reveal the perceptions of science teacher candidates regarding the concept of environmental problems. The created categories and their frequencies are given in Table 4.

When Table 4 is examined, it is seen that the majority of teacher candidates participating in the research have a perception that environmental problems are progressing/increasing. In addition, prospective teachers equally view environmental problems pessimistically. Teacher candidates' (TC) perceptions of environmental problems are discussed in detail below within the categories.

Table 4: Categories Created Regarding the Concept of "Environmental Problems" and Their Frequencies

Categories	Frequency
Expression of cleanliness	7
Expression of death	8
Expression of expansionism	5
Expression of feel	1
Expression of pessimism	21

Expression of precaution	13
Expression of progress/increase	21
Expression of return	5
<b>Total</b>	<b>81</b>

### 1. Expressions in the "progress/increase" category of environmental problems

The category in which teacher candidates produced the most metaphors for the concept of "environmental problems" was "progress/increase". The metaphors stated by 21 teacher candidates (TC) were grouped under this category. Some participant expressions under this category are given below.

TC4- "Environmental problems are like oily skin; because the more the problem gets worse, the bigger the acne gets."

TC11- "Environmental problems are like an avalanche; Because a small snowflake can grow larger over time and cause an avalanche-like disaster."

TC20- "Environmental problems are similar to traffic; Because if there is a problem somewhere, the rest will affect everyone."



TC33- "Environmental problems are like an avalanche; because it leads to bigger and bigger disasters."

TC37- "Environmental problems are like plants; because if it is not prevented, it will continue to grow forever."

TC43- "Environmental problems are like dominoes; Because when one falls, the others are also affected, environmental problems trigger each other."

TC50- "Environmental problems are like a tumor; Because it seems like a small problem at first, but then it grows, spreads and can become a global problem."

TC57- "Environmental problems are like cancer; because it grows over time and cannot be prevented if precautions are not taken."

TC58- "Environmental problems are like a disease; Because if it is not diagnosed early, it can cause bigger problems."

TC70- "Environmental problems are like an hourglass; because small grains form a big mountain in the future." TC76- "Environmental problems are like an avalanche; because it gradually leads to great disasters."

TC81- "Environmental problems are like microbes; Because as their numbers increase, their damage also increases and it becomes impossible to stop them."

## 2. Statements in the "pessimism" category of environmental problems

The metaphors that prospective teachers produced for the concept of environmental problems were pessimism at the same level as the progress/increase category. Some of the metaphor expressions stated by 21 teacher candidates are given below.

TC1- "Environmental problems are similar to various disasters; because it can cause negative effects on all living things."

TC10- "Environmental problems are like matryoshkas; Because even if we eliminate a problem, a new smaller problem will of course arise."

TC14- "Environmental problems are like an uninformed person; because an uninformed person can harm anything."

TC16- "Environmental problems are like a person being sick; because environmental problems also make the world sick."

TC26- "Environmental problems are like a killer chasing us; Because if we get caught in both of them, we will have a bad ending."

TC32- "Environmental problems are like a swamp; because it swallows everything around it."

TC36- "Environmental problems are like taking risks; because the worse we use it, like making bad investments, we lose some things."

TC40- "Environmental problems are like fire; Because if we cannot control it, we may lose everything."

TC68- "Environmental problems are like ivy; Because as it increases, it will start to suffocate us even more."

TC74- "Environmental problems are like a cloud in the dark; Because it gets dark everywhere and we don't know when it will go away, we are deprived of daylight."

## 3. Statements in the "measure" category of environmental problems

The metaphors stated by 13 teacher candidates were collected under the precaution category. Some participant expressions under this category are given below.

TC3- "Environmental problems are like the human body; Because when one organ of a person becomes ill and is not treated, the disease spreads to the whole body. In fact, early diagnosis of diseases is very important. If environmental problems are not intervened early, as in this example, we will face much bigger environmental problems."

TC7- "Environmental problems are like cancer; because if early precautions are not taken, it can cause serious problems."

TC17- "Environmental problems are like wounds; Because wounds can occur for various reasons. "Both of them can be cured with certain methods, or the possibility of recurrence can be reduced by taking the necessary precautions for both."

TC34- "Environmental problems are similar to traffic; "Because people have a great impact on the environment, it can be prevented, but first conscious people must stop this problem, starting with themselves."

TC53- "Environmental problems are like a boiling pot of milk; because if care is not taken and necessary precautions are not taken, the pot will overflow."

TC63- "Environmental problems are like a ball of yarn; Because once you lose control and drop it, it is difficult to pick it up and get it back to its previous state."

TC64- "Environmental problems are like a glass cup sitting at the end of the table; Because if we take precautions and take it from there, the glass will not break, but if we leave it there, it will fall and break and cause problems."

TC75- "Environmental problems are like flowers; Because if you don't take the necessary care, things can go very bad."

TC77- "Environmental problems are like fire/flare; Because if no precautions are taken, it will grow and destroy the environment."

TC79- "Environmental problems are similar to natural disasters; because if the necessary precautions are not taken beforehand, the destruction can be very great."

#### 4. Expressions in the "death" category of environmental problems

The metaphors stated by 8 prospective teachers regarding environmental problems were grouped under the category of death. Some participant expressions under this category are given below.

TC22- "Environmental problems are like the lungs of a smoker because they kill people over time."

TC24- "Environmental problems are like poison because they kill people."

TC30- "Environmental problems are like a flower that is not given water because if they are not careful, it will fade and disappear, and environmental problems are like that."

TC47- "Environmental problems are similar to people's problems; Because if there is no solution to the problems, human life will end, just as the world may come to an end."

TC55- "Environmental problems are similar to our health problems; Because just as our lives are negatively affected when we are sick, as environmental problems continue and these problems progress, our lives will be negatively affected and perhaps become unlivable."

TC72- "Environmental problems are similar to human health; Because when human health deteriorates, people die, and when environmental health deteriorates, the environment dies."

TC80- "Environmental problems are similar to blood loss; Because as we lose blood, death occurs in a shorter time, meaning that as environmental

problems increase, the world becomes uninhabitable."

#### 5. Expressions in the "cleanliness" category of environmental problems

The metaphors stated by 7 teacher candidates regarding environmental problems were collected under the cleanliness category. Some participant expressions under this category are given below.

TC15- "Environmental problems are like acne problems; Because if you don't keep the surface clean, it will always appear."

TC23- "Environmental problems are similar to people's self-care because when we take care of ourselves badly, we may experience some health problems. Similarly, if we take good care of our environment, a more beautiful environment will be created."

TC39- "Environmental problems are like washing our hands with soap when they are dirty; Because if we can turn this problem into a habit in our daily lives, such as washing hands, this problem will be eliminated."

TC35- "Environmental problems are like my room; because it is difficult to clean my room, such as environmental problems."

TC45- "Environmental problems are like a community of ants; Because we shouldn't ask why ants invaded our house when we spilled sugar everywhere."

#### 6. Statements in the "return" category of environmental problems

Some of the statements of 5 teacher candidates under this category are given below.

TC9- "Environmental problems are like boomerangs; Because even if you think he is moving away from you, he will come back to you after a while."

TC25- "Environmental problems are similar to human behavior because if we treat the environment well, it will give us good returns, but if we act badly, the response will be bad."

TC27- "Environmental problems are like psychological problems; because as it increases, it becomes difficult to collect/return it."

TC56- "Environmental problems are like boomerangs; Because whatever we humans do, good or bad, we face the consequences, but it may not only be us but all living things that are affected."

#### 7. Expressions in the "expansionism" category of environmental problems

The statements of 5 teacher candidates under this category are given below.

TC54- "Environmental problems are similar to viruses; because it spreads constantly."

TC62- "Environmental problems are like parasites; because it is both invasive and contagious. It not only harms people but also spreads to those around them. For example, a factory that does not install a filter on its chimney sets a bad example for other factories, and this behavior has a contagion effect."

TC66- "Environmental problems are like viruses; because it spreads among people and harms people."

TC67- "Environmental problems are like family; because the place where the problem occurs affects the other and the problem grows."

TC69- "Environmental problems are like lung disease; Because if a person's lungs are sick, his whole body is also sick."

#### 8. Expressions in the "feel" category of environmental problems

Within the scope of this category, the statement of 1 teacher candidate is given below.

ÖA61- "Environmental problems are like eating; because it can only be felt at a certain time."

#### 4. CONCLUSION

In this research, it was aimed to reach the way science teacher candidates perceive environmental problems by examining the metaphors they produced about environmental problems. Various environmental problems experienced today have become borderless and have reached global dimensions, resulting in the need to take urgent measures in this regard. There must be a correlation between all measures to be taken to prevent environmental problems and the institutions that will take the measures. Efforts to prevent environmental problems before they occur can only be achieved through environmental education (Ek et al., 2009; Sever & Yalçınkaya, 2012).

When the number of metaphors written in metaphor studies conducted in the context of environment in Turkey was examined, it was seen that a maximum of 51-75 metaphors were written by the participants and these metaphors were placed in categories with titles in the range of 6-10. The concept of environment, which creates a wide field of meaning, combined with the unlimited imagination of the participants and strengthened the diversity of the environment-metaphor network. In addition, the diversity of metaphors

created regarding the concept of environment reveals that it is difficult to express this concept comprehensively by a single metaphor (Ateş & Karatepe, 2013; Çakmak, 2018).

In this research, 81 teacher candidates developed 60 different metaphors for environmental problems (Table 3). When 60 metaphors were examined, it was determined that 49 metaphors were produced once. The fact that students produce such a variety of metaphors shows the difference in their cognitive perceptions. When the tables were examined in the study, among the themes related to all the concepts, the most metaphors were created in the theme of disease (6), followed by the theme of avalanche (4). The metaphors produced were divided into a total of 8 categories according to the explanation section in the because section (Table 4). These categories related to environmental problems have been determined as "return", "feel", "progress/increase", "pessimism", "death", "precaution", "cleaning up" and "expansionism". Especially the number of metaphors collected in the categories of progress/increase and pessimism was found to be high and in the same proportions.

Students likened the diseases that affect the quality of life and the organisms that cause these diseases to environmental problems, and they inferred that environmental problems may ultimately cause irreversible problems and will constantly increase and spread. Teacher candidates' views on environmental problems do not look good, as can be seen from the metaphors produced. Generally negative expressions were used. They evoked death, as there is continuity and gradual increase, and this situation brings the end of humanity and therefore the world.

According to Kızılay (2020), as a result of the analysis of metaphors, teacher candidates' perceptions of environmental problems; Environmental problems are grouped under categories such as "spreads / progresses", "it is the end of life", "it is global", "it returns to people", "it has irreversible consequences". These categories show that classroom teacher candidates are focused on and concerned about the possible consequences of environmental problems. The category "environmental problems are the end of life" took the second place in teacher candidates' perception of environmental problems.

In the study conducted by Ek et al. (2009), it was stated that most of the students studying at the university have opinions that the depletion of the ozone layer threatens all people. Kaya (2014) evaluated 48 valid metaphors and 5 different conceptual categories in social studies teachers'



perceptions of environmental problems. It has been shown that social studies teacher candidates perceive environmental problems as a situation that requires more precautions. Apart from this, the majority of teacher candidates focused on the consequences of environmental problems, the disruption of natural balance and the effects of environmental problems on people.

Arık and Yılmaz (2017) stated in their study that prospective science teachers produced metaphors expressing that environmental pollution mostly negatively affects living things. These indicators show that the perceptions of prospective teachers can be shaped with environmental education based on the possible consequences of environmental problems. It was determined that the majority of the teacher candidates who participated in the research had a perception that environmental problems are spreading and progressing. In this study, the research results showed that the perceptions of prospective teachers about environmental pollution indicate that its harm increases over time. These perceptions show that prospective teachers think of environmental problems as a situation that spreads from the private to the general. Therefore, in environmental education courses, it can be assumed that environmental problems are caused by individual problems (Kızılay, 2020).

In the study conducted by Yapıcı (2009), it was investigated whether the awareness, responsibility and interest levels of teacher candidates towards environmental problems differ according to their academic fields, socio-demographic characteristics, political views and proximity to nature. According to the research, prospective teachers are generally responsible for environmental problems in Turkey and the world, but it has been determined that soil pollution in the world is seen as a more serious problem by students studying geography and physics. The result of the research showed that the Environmental Science course given in the Department of Science Teaching did not change the students' thoughts about soil pollution.

Köseoğlu and Mercan (2016) evaluated university students' perceptions of the concepts of "air and air pollution" in their study using metaphors, in 2 different conceptual categories regarding the concept of air and 3 different conceptual categories regarding the concept of air pollution. In his study by Köseoğlu (2017), university students' perceptions of the concepts of "water and water pollution" were evaluated in 4 different conceptual categories regarding the concept of water and 3 different conceptual categories regarding the

concept of water pollution in their study with metaphors. It can be said that the conceptual categories obtained as a result of the research support the findings of the research.

When metaphors were examined in this study and the studies of other researchers, it was observed that environmental problems were perceived by students as a process that brought the end of the world. Additionally, students see humans as the main cause of environmental problems. In particular, people's greed, unconsciousness and insensitivity have a great impact on this issue. The general feeling about environmental problems is hopelessness, helplessness and anxiety. The most effective method in creating environmental awareness is education. It is thought that it is important to determine these perceptions from an early age so that perceptions about the environment can be structured in a healthy way, to eliminate incomplete and incorrect learning, to ensure the development of positive attitudes and to acquire environmentally friendly behaviors. Effective education planning on environmental issues ensures that concerned, knowledgeable and protective individuals are brought into society. Dissemination of environmental issues in different course contents and at every grade level enables individuals to interact more with environmental issues. This is of great importance in terms of developing awareness about the environment and environmental problems. In addition, environmental topics can be made more attractive with different methods, techniques and materials that will attract the attention of the students and their interests can be kept constantly sharp. It is thought that our children, who are our future, will set sail for brighter and happier futures with the training they will receive to increase their sensitivity to environmental awareness and prevention and elimination of environmental problems, as they will be role models in the tasks, positions and positions they will assume in the future.

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