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Examination of Prospective Teachers' Creative Comparisons for the Concept of "Science Education"

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***Abstract*:** Determination of prospective teachers' metaphoric perceptions of science education will contribute to the more effective and efficient organization of science education and the organize and structure of its teaching. In this aspect, this research aimed at determining prospective teachers' metaphoric perceptions toward science education in terms of various variables. This research was conducted on 301 prospective teachers. In this research, a phenomenological study, which is one of the qualitative research designs, was adopted. A creative comparison form was used as a data collection tool. The content analysis method, which is one of the qualitative data analysis methods, was used to analyze the collected data. As a result of this study, the creative comparisons of prospective teachers for science education were gathered under 5 categories: emotion, color, game, transportation vehicle, and technological tool. Prospective teachers produced several metaphors according to these categories. And some suggestions were made based on the results.
***Keywords*:** Creative comparisons, phenomenology, prospective teachers, science education.

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Introduction

Turkish education system, science lessons have been more difficult for students to understand than other lessons every semester (Yılmaz & Batdı, 2016). For this reason, in science education, it is important to increasingly concretize the abstract expressions, which are difficult to understand, with different methods and techniques, and to make them easier to understand (Arslan & Bayrakçı 2006; Hançer et al., 2007). To overcome these difficulties, researchers have made use of simulation, analogy, animation and simulations, and various methods and techniques such as concept maps, conceptual change texts, the six thinking hats technique, station project-based, cooperative learning, and 5E teaching model. Here, the main objective is to raise science-literate individuals within the science education program of the students (Minister of National Education [MNE], 2018). Science literacy requires individuals to understand and use the scientific concepts in the social, cultural, economic and decision-making process. One of the important dimensions of science literacy is to learn the scientific concepts. Concept learning is important in creating scientific principles by classifying the structures with similar characteristics and associating them with other concepts (Çepni et al., 1997). In today's understanding, teaching of the Science course is based on making the information meaningful and experiential for the students rather than the evaluation of the student's level of knowledge (MNE, 2018). The most important aim of the Science course is to train students to be science-literate. In this sense, it has been necessitated to use new methods and make explanations according to the multiple intelligence level while teaching science. If students are raised as science-literate individuals, they can find rational, logical and concrete solutions to the problems that they face in daily life by scientific means. Hence, students know how to access information and gain the ability to produce new information. In the process of acquiring these skills, it is important to endear the Science course to the students (Dönmez, 2017).

Scientific concepts are typically abstract constructs and they are difficult for students to understand` may be more appropriate than this sentece (Çepni & Keleş, 2006). Among the reasons for having difficulty, it can be stated that students cannot make information meaningful since they cannot establish a connection with another situation in their minds (Çepni & Keleş, 2006). Science teachers should be conscious about this issue and benefit from different methods in their lessons. The main objective of the Science course is to provide basic knowledge and skills about environment, earth, physics, chemistry, biology, astronomy, science and engineering applications during the primary and secondary education. It is possible to increase meaningful learning when students are enabled to establish the relationships between the concepts in their minds instead of perceiving the concepts as they are so that these skills can be gained by the students. When students visualize concepts in their minds, they can establish relationships between the concepts more easily. The aim of the Science course is to concretize it by associating abstract information with daily life, so as to make it concrete, understandable and clear (Jaakkola & Veermans, 2018). Thus, students' interest in learning increases; accordingly, they feel more curious when they associate so many objects, living beings and the space around them with what they have learnt. Therefore, as a technique in science education, metaphor-based teaching is used for the concretization of the abstract concepts (Arslan & Bayrakçı, 2006; Cameron, 2002; Saban, et al., 2006; Singh, 2010). Metaphor refers to the explanation of an abstract subject, concept or a term, which is difficult to understand, with a concrete concept, which is already known (Aydın, 2010). When-national-literature is reviewed, it is seen that there are researches conducted on metaphors in various fields. In the research conducted by Şenel and Aslan (2014), 54 valid metaphors were produced for the concept of science and 49 valid metaphors were produced for the concept of scientist regarding the prospective preschool teachers' concepts of science and scientist. In the research carried out by Deniş Çeliker and Akar (2015), secondary school students' perceptions towards the concept of "nature" were examined to identify the metaphoric perceptions of 238 secondary school students towards the concept of "nature", and it was concluded that they differed according to their education, socio-cultural

level and the environment they lived in. In the study conducted by Arık and Özdemir (2014) with 72 prospective science teachers, an attempt was made to determine their metaphoric perceptions of the science laboratory. In their study, mostly the "kitchen" metaphor was obtained, and the metaphors of the female students were rather included in the categories of putting forward a new product and exploration. In the study conducted by Soysal and Afacan (2012) with 137 primary school students, it was tried to reveal the students' metaphoric perceptions of the Science and Technology course and the concept of science-technology teacher. As a result of the research, it was exhibited how strong the primary school students' imagination and ability of drawing an analogy were. In their study, Uslu, Kocakülah and Gür (2016) examined the secondary school students' metaphors for the concepts of science, scientist and teacher. As a result of this research, 42 metaphors were produced by the students. As a result of the research, it was revealed that students generally had positive perceptions towards these concepts. Moreover, it is seen that various studies were conducted to determine the metaphors regarding preschool students (Güler & Akman, 2006; Kılıç, 2010), primary school students (Deniş et al., 2015; Gömleksiz et al., 2012; Mertol et al., 2013; Özgelen, 2012), secondary school students (Aydın, 2010; Bıyıklı et al., 2015; Doğan Bora et al., 2006; Yapıcı, 2015), and prospective teachers (Aktamış & Engin 2006; Aydın, 2011; Arık & Yılmaz, 2017; Çermik, 2013; Güven,2014; Güvenli et al., 2011; Kaya, 2014; Levine, 2005; Saban, 2009; Tortop, 2013; Ürey et al., 2017) in Turkey. Determination of prospective teachers' metaphoric perceptions of science education will contribute to the more effective and efficient organization of science education and the structure of its teaching. In this aspect, this research aimed at determining prospective teachers' metaphoric perceptions of science education in terms of various variables. For the purpose of the research, answers to the following research questions were sought:

1. What are the prospective teachers' metaphoric perceptions of science education as an “emotion”?
2. What are the prospective teachers' metaphoric perceptions of science education as a “color”?
3. What are the prospective teachers' metaphoric perceptions of science education as a “game”?
4. What are the prospective teachers' metaphoric perceptions of science education as a “transportation vehicle”?
5. What are the prospective teachers' metaphoric perceptions of science education as a “technological tool”?

Methodology

In this research, a phenomenological study, which is one of the qualitative research designs, was adopted. Phenomenology studies explain and define the meanings imposed on an experience (McMillan & Schumacher, 2010). In such studies, the focus is set on the cases, which are noticed but not understood in depth and detail (Büyüköztürk et al., 2008; Yıldırım & Şimşek, 2008). By putting all his prejudgments aside, the researcher collects data about the meanings attributed to a certain situation or experience by the individuals (McMillan & Schumacher, 2010). In this research, it was tried to determine the prospective teachers' perceptions of science education with creative comparisons. The researchers put their own prejudgments and opinions aside and tried to determine the meanings attributed to science education by the prospective teachers.

Research Group and Ethical Principles

This research was conducted on 301 prospective teachers enrolled in the Departments of Preschool Teaching, Classroom Teaching and Science Teaching at a public university in the Southeastern Anatolia Region during the spring semester of the 2016-2017 academic year. In the research, convenience sampling method, which is one of the non-random (Büyüköztürk et al., 2008) purposive (Yıldırım & Şimşek, 2008) or nonprobability (McMillan & Schumacher, 2010) sampling methods, was used to determine the research group. Convenience sampling method is widely used in qualitative researches, and it includes individuals and groups that are close, easy to reach and voluntarily participate in the research (Büyüköztürk et al., 2008). This sampling method enables to better understand the existing situations or relationships beyond generalizing in the studies (McMillan & Schumacher, 2010). It was primarily ensured in this research that the prospective teachers had taken the Science course. In the research, all the prospective teachers participated voluntarily, and sample selection was made from the immediate environment to make it easily accessible.

While conducting this research, the attention was paid to adhering to all the ethical principles. In this context, the volunteering was taken as a basis in the participation, all the data collected from the participants were used only within the scope of the research, it was made sure that the data would not be shared with third parties and the identities of the participants would remain confidential. In addition, the participants were assured that the research results would not be used against them.

The demographics of the research group are given in Table 1. Since some teacher candidates did not respond to some metaphors, results below 301 were given in the analysis as in Table 2, Table 4, and Table 6.

Table 1
Demographics of the Prospective Teachers

Prospective Teachers	Male	Female	f
Primary Classroom	28	30	58
Pre-school	16	118	134
Science	15	94	109
Total			301

Data Collection Tools and Process

Before the research, theoretical information was first given to the prospective teachers about creative comparison. Thus, it was aimed to inform the prospective teachers about creative comparison. Afterwards, implementation was carried out. The creative comparison form was distributed to the students. Prospective teachers were not requested to write their names on the form so that they could write down their opinions openly. To determine demographic characteristics, students were asked to write their departments, classes, genders and ages. In order to learn the creative comparisons made by prospective teachers about science education in terms of various variables, the following questions are directed:

1. If science education were an “emotion”, it would be…. because...
2. If science education were a “color”, it would be…. because...
3. If science education were a “game”, it would be…. because...
4. If science education were a “transportation vehicle”, it would be…. because...
5. If science education were a “technological tool”, it would be…. because...

A total of five questions were asked. Prospective teachers were asked to fill in the blanks. Here, the prospective teachers' creative comparisons were limited to be an emotion, color, game, transportation vehicle and technological tool to enable them make associations more easily. Prospective teachers were given about 20 minutes to write their creative comparisons for science education.

Data Analysis

The content analysis method, which is one of the qualitative data analysis methods, was used to analyze the collected data. The basic process in the content analysis is to gather similar data within certain concepts, themes and codes, and to organize and interpret them so that the reader can understand them (Yıldırım & Şimşek, 2008). In the content analysis, the existence of certain words or concepts within a set of text or texts is identified, and their existence, meanings and relationships are specified and analyzed to make inferences about the message in the texts (Büyüköztürk et al. 2008). In the data analysis, first, the categories (emotion, color, game, transportation vehicle, technological tool) were examined in detail.

Creative comparisons written by prospective teachers were listed one by one. Invalid and valid comparisons were determined, and invalid ones were excluded. Afterwards, the collected data were analyzed independently by both authors. In the comparisons, *the numbers of consensus* and *dissensus* were determined and the reliability of the research was calculated via Miles and Huberman's formula (*Reliability*= consensus / consensus + dissensus), and an value of 80% and above refers to an acceptable reliability (Miles & Huberman, 1994). In the content analysis conducted by the authors, a great deal of consensus was reached among them, and this rate was found to be well above 80 % and the differences, though few, were agreed upon, and the analysis was concluded. This has shown that the data obtained from the research are reliable. Besides, the reliability of the study was supported and tried to be increased with frequent quotations from the prospective teachers' statements on science education for creative comparison. The frequency (f) and percentage (%) of the data obtained at the end were calculated and presented in tables.

Result

In this research, prospective teachers' perceptions of science education were determined by making creative comparisons. The percentages and frequencies of the data were determined and presented in tables. While transferring the data into tables, the reasons that came into prominence in creative comparisons, that is, the explanations and expressions of the prospective teachers were also included. The data were organized in 5 tables.

Table 2
Prospective Teachers' Metaphoric Perceptions of Science Education as an "Emotion"

Positive Emotions	f	%	Explanations of the prospective teachers (Because...)
Curiocity	72	29.51	"We are constantly progressing curiously", "curiosity is in the center of all the researches", "research encourages examination"
Excitement	58	23.78	"it gives excitement because learning comes from experience", "new information is new excitement", "each stage of it is exciting"
Happiness	33	13.53	"Science education is a fun and enjoyable course", "exploring something makes people happy", "people are happy as much as they can research and examine"
Surprise	18	7.38	"we always learn new things", "exploring surprises people", "it is a surprising education in every aspect"
Joy	13	5.33	"it can make different contributions in every sense", "it is fun, and makes people happy"

Love	12	4.92	"you see what you want to see", "you are involved as you progress", "it wants to be chased as you run after it"
Affection	4	1.64	"overcoming the difficulties in life starts with loving yourself", "research cannot be conducted without loving science", "it gives people peace"
Perseverance	3	1.23	"the desired result is achieved with a little effort and patience"
Enthusiasm	2	0.82	"excitement never comes to an end", "it is an education that excites people"
Serenity	2	0.82	"new findings give peace"
Sub-Total	*217*	*88.93*	

Negative Emotions	**f**	**%**	**Explanations of the prospective teachers (Because...)**
Sadness	12	4.92	"I get bored when I see it", "science makes you unhappy, necessary but difficult", "boring and sad"
Anger	6	2.46	"it is a boring course, it makes you get bored", "it constantly renews itself"
Hate	6	2.46	"it is never loved", "I hate it"
Fear	2	0.82	"it scares people with its difficult aspects and unknown parts"
Worry	1	0.41	"it is a difficult education to comprehend"
Sub-Total	*27*	*11.07*	
Total	244	100	

Table 2 presents the creative comparisons of the prospective teachers for science education as an emotion. When Table 2 was examined, it was determined that prospective teachers had a positive emotion by 88.93%, and among these, they mostly emphasized "curiosity" by 29.51% (f=72), "excitement" by 23.78% (f=58) and "happiness" by 13.53% (f=53). The justifications were based on the fact that science education was a course requiring continuous research, inquiry and examination. In the concept of “excitement” which was the answer that was mostly given following “curiosity”, Science was observed to be a course learned by doing and experiencing and encountered several times in life. In the concept of "happiness", science education was emphasized as a fun and enjoyable course that made people happy. Furthermore, as can be seen from Table 1, it was determined that prospective teachers had negative emotion by 11.07%, and among these, emphasis was on "sadness" with 4.92% (f=12), which was followed by "anger" "anxiety", 2.46% (f=6), "fear", 0.82% (f=2), and "anxiety", 0.41% (f=1). In the answers given by the prospective teachers, it was found that they expressed negative or conflicting emotions, tough very few, such as sadness, anger, anxiety, fear and anxiety.

Table 3
Prospective Teachers' Metaphoric Perceptions of the Science Education as a “Color”

Color	**f**	**%**	**Explanations of the prospective teachers (Because...)**
Blue	103	34.22	"it is a color that gives people peace", "it has an area as wide as the sky", "it is endless like the blueness of the sky"
White	57	18.94	"it contains every color", "it includes all the situations like probability, certainty, excitement", " it is white, including all the other colors"
Green	46	15.28	"Science education allows us to look at events positively", "science means nature", "science means natural science, the color of the nature is green"
Red	29	9.64	"it is the most intense course", "it attracts attention"
Black	22	7.31	"It absorbs people like a depth without boundaries", "precise and general"
Grey	15	4.98	"it contains rights, wrongs and information that is not right and wrong", "not everything is clear", "it is uncertain"
Yellow	8	2.66	"it is the most charming color"
Purple	8	2.66	"it is mysterious like the purple ", "it is a rich field", "purple is a noble color, science education is also noble"

All colors	3	1.00	"There are different colors in nature", "t is a very wide area", "science contains everything"
Orange	3	1.00	"Is the color of energy", "it brightens us like the sun"
Navy blue	3	1.00	It is "formal", "it evokes an order and system"
Brown	2	0.67	"it is joyless and boring", "it is the earth that signifies the nature, the color of the earth is brown"
Magenta	1	0.33	"it is not as empty as light pink, and it is not as heavy and formal as dark blue"
Pink	1	0.33	"it makes our lives colorful"
Total	**301**	**100**	

Table 3 presents the creative comparisons of the prospective teachers for science education as a color, and frequencies and percentages together with their reasons. When Table 3 was examined, it was discovered that prospective teachers mostly perceived "blue" with 34.22% (f=103), which was followed by "white", 18.94% (f=57) and "green", 15.28% (f=46), respectively. It was noteworthy that the prospective teachers perceived “blue” as a peaceful color and associated it with the creative comparison of 'sky'. On the other hand, they associated the "white" color they saw in life in terms of forming all the other colors. When we look at the "green" color, they found a resemblance between Science and nature, and saw it as a color within the nature. Moreover, when we look at the creative comparison of all the colors in the answers given by the prospective teachers, it was expressed that Science was attributed to different colors, it is a huge area and Science includes everything.

Table 4
Prospective Teachers' Metaphoric Perceptions of the Science Education as a “Game”

Game	**f**	**%**	**Explanations of the prospective teachers (Because...)**
Hide and seek	173	59.25	"As we learn about science education, it is about new and successive subjects", "it is full of secrets", "it tries to find what is hidden", "there is a mysterious aspect", "it is necessary to find it where it is hidden"
Chess	16	5.48	"it is the course that best strengthens the development of intelligence ", "it is an area that requires intelligence", "unexpected processes may develop while playing"
Puzzle	13	4.45	"it becomes integrated as it unites the parts", "it can be formed like the connection of the spheres", "Nature is something that parts, when they unite, the jigsaw puzzle of the nature is formed", "we find the right by making mistakes", "every information brings forth another information"
Tag	10	3.43	"it is necessary to catch, to explore new things"
Crossword	9	3.08	"all the science lessons are interconnected", "they involve an effort on continuous discovery like puzzles"
Football	6	2.06	"it requires discipline and a lot of work", "it is both tiring and enjoyable"
HopScotch	5	1.71	"as progress is made step by step", "science education progresses with certain steps", "you jump from one branch to another"
Box box plier	4	1.34	"everything is in a circular interaction", "not all the students participate"
Burning ball	4	1.34	"it catches those around"
Car race	3	1.03	"it tires the eyes", "it is attention-grabbing, exciting and inspiring"
Knowledge game	3	1.03	"it has a lot of questions and answers for these questions", "it teaches new information"
Halay	3	1.03	"it is very colorful and fun", "everyone is somehow involved"
Boxing	3	1.03	"it is a scientific discipline containing conflicts", "it is a heavy sport"

Theater	2	0.68	"everyone is given a task", "we connect many topics with ourselves"
Spin the bottle	2	0.68	"play is never over", "existing truths can also be used"
7 towers	2	0.68	"the whole information that everyone accumulates and creates is reorganized when someone new puts forward new ideas"
Okay	2	0.68	"it is colorful"
Taboo	2	0.68	""it is not known what will come out", "the things are like a chain"
Basketball	2	0.68	"new methods are sought every time", "it requires intelligence"
Rubik's Cube	2	0.68	"science education requires intelligence"
Survivor	2	0.68	"it is very adventurous", "science education is exciting"
Jumping	2	0.68	"it is in a cycle", "it means to jump with eyes closed"
Volleyball	1	0.34	"the right move should be in the right place"
Pinball	1	0.34	"victory is achieved only with a specific combination"
Lego	1	0.34	"by combining a lot of little information in science education, we can reveal new projects, new and different information and ideas"
Computer game	1	0.34	"it is addictive"
Labyrinth	1	0.34	"science education is finding a way"
Pes 2013	1	0.34	"it requires talent"
Treasure hunter	1	0.34	"science is full of mysteries, different results come out of every experiment"
Corner grab	1	0.34	"there are many fields in science, and everyone is trying to grab an area"
Snowball	1	0.34	"it is very complex and connected"
Hangman	1	0.34	"it requires constant prediction"
Salsa	1	0.34	"integration is provided by going back and forth"
Silent cinema	1	0.34	"first you know, then you try to prove"
Monopolly	1	0.34	"in nature, everything has a stage of attempt "
Sudoku	1	0.34	"I never understand it"
Stall	1	0.34	"its has such continuity that its names are countless"
High above ground	1	0.34	"it always changes"
Passionflower	1	0.34	"science education has more than one subject"
Wolf dad	1	0.34	"it gives information about self-care skills"
I sell oil	1	0.34	"it is in a continuous cycle"
Turn around butterfly	1	0.34	"we live in our own cycle"
Jumping by	1	0.34	"it means jumping where you are"
Guess	1	0.34	"a judgment is made as a result of clues"
Total	**292**	**100**	

Table 4 presents the creative comparisons of prospective teachers for science education as a game, and frequencies and percentages together with their reasons. When Table 4 was examined, it was determined that in the first three ranks of prospective teachers' perceptions towards science education as a game, there were hide-and-seek/blindman's buff with a rate of 59.25% (f=173), chess with 5.48% (f=16) and puzzle with 4.45% (f=13). It was discovered that, as the prospective teachers received science education with "hide-and-seek/blindman's buff", they obtained information about the new and successive subjects, revealed hidden things, and there is a mysterious aspect of science education, people try to find things with eyes closed. Besides, they had a perception that science education was the course that best strengthened the development of the intelligence. When we reviewed other creative comparisons in the table, it was observed that the answers with low frequencies such as duck duck goose, turn turn butterfly and wolf dad belonged to prospective preschool teachers.

Table 5
Prospective Teachers' Metaphoric Perceptions of the Science Education as a "Transportation Vehicle"

Transportation Vehicle	**f**	**%**	**Explanations of the prospective teachers (Because...)**
Airplane	105	34.88	"it is like going further in the vast sky", "all parts of the world can be reached", "nice things come out due to high efforts"
Train	51	16.94	"it contains a very fast-progressing science", "if you come out of one of the tracks, you cannot go anywhere you want to reach", "science education is like the train wagons connected to each other."
Bus	31	10.30	"science education can be achieved with the society, not with a single person", "it contains a lot of things in it", "it has a huge content"
Bicycle	28	9.30	"it has peace", "it tries to reach the desired goal", "it is an instrument used by all the age groups"
Car	14	4.65	"science education makes our life easier like a car", "science education enables accessing information from information", "it is necessary to use it properly to reach it"
Steamboat	13	4.32	"Science is like navigating in an open sea", "it is found by trial and error", "it calmly moves forward and broadens the horizon"
Space shuttle	12	3.99	"it is useful for traveling to other horizons", "it always seeks the unknown and finds it", "it is about seeking and finding everything different"
Truck	9	2.99	"it takes a bit time, but firm steps are taken", "its background is full of information", "its load is heavy, it contains a lot of information"
Motorcycle	6	1.99	"whoever accelerates wins", "it helps us reach even the farthest points"
Metro	6	1.99	"I saw a resemblance between science and the underground as technology progresses very fast like the underground", "it advances very quickly, and it progresses fast"
Helicopter	3	1.00	"it can enter any area"
Cart	3	1.00	"it moves slowly, but constantly"
Aircraft	2	0.67	"science education explores the space"
Tumbrel	2	0.67	"it is cumulative, it progresses slowly", "everything settles down slowly"
Tram	2	0.67	"it is easy and fun in terms of transportation"
Human feet	2	0.67	"everything is revealed slowly with patience", "it is the people who will carry science to the future"
Jet	2	0.67	"it can be taken anywhere"
Ambulance	1	0.33	"one aspect of science education is about health", "science education is everything we have"
F 16	1	0.33	"it must be advanced and the best"
Vosvos	1	0.33	"it is both beautiful and attractive"
Caravan	1	0,33	"it is a personal course", "not everyone can take it by having fun and enjoying.
Wheelbarrow	1	0.33	"it is tiring and long"
Cable car	1	0.33	"it is not like any transportation vehicles"
Tractor	1	0.33	"too much talking is involved in it, sounds disturb you"
Navigation balloon	1	0.33	"it reaches infinite heights and explores science"
Ufo	1	0.33	"it is impressive, very beautiful"
Car tow truck	1	0.33	"it attracts everything it finds"
Toplam	**301**	**100**	

Table 5 presents the creative comparisons of the prospective teachers for science education as a transportation vehicle, and frequency and percentages together with their reasons.

When Table 5 was examined, it was found out that the first three ranks of the prospective teachers' perceptions towards science education as a transportation vehicle included airplane with a rate of 34.88% (f=105), train with 16.94% (f=51) and bus 10.30% (f=31). It was determined that prospective teachers considered science education as a science that continuously advanced and progressed when it comes to their comparison with "airplane". Their comparison to "train" showed that they had a perception such as "it contains a very fast-progressing science", "if you come out of one of the tracks, you cannot go anywhere you want to reach", "science education is like the train wagons connected to each other." Regarding their comparison to "bus", they had a perception that "science education can be achieved with the society, not with a single person", "it contains a lot of things in it", and "it has a huge content".

Table 6
Prospective Teachers' Metaphoric Perceptions towards the Science Education as a "Technological Tool"

Technological Tool	**f**	**%**	**Explanations of the prospective teachers (Because...)**
Computer	124	43.66	"it contains almost all kinds of information", "it makes our life easier", "it is completely informational"
Telephone	72	25.35	"everything you want will be in your pocket instantly", " it is always with us", "when you are deep in it, you cannot come out"
Microscope	16	5.63	"it is open to examination and investigation", "we can access everything down to the last detail"
Television	8	2.82	"it looks like how it desires", "it has benefits as well as harms", "each section of it is different and complex"
Spacecraft	6	2.11	"it is wide and comprehensive", "it wants to have new explorations"
Robot	5	1.76	"it makes people's lives easier with efforts", "robots have been invented over the field of science", "it is an order machine system"
Washing machine	4	1.41	"we collect and organize things and do them when we want", "you cleanse your spirit"
Mixer	4	1.41	"it unites all the sciences and reveals them with a logical reason"
Camera	3	1.06	"we can catch great things", "it is good for proving, documenting and keeping for a long time"
Tablet	3	1.06	"it shows us every experiment visually", "it is addictive"
Airplane	3	1.06	"as you accumulate knowledge, you feel like you are going to fly"
Speaker	2	0.71	"science sets forth the causes, and people who studied science give us the answers of the questions like 'why did this happen so?"
Telescope	2	0.71	"it is necessary to see distant points", "while the sky is examined, newer things are always found and learned, and science education is like this"
Engine	2	0.71	"it is complex", "it is indispensable for many technological tools"
Weapon	2	0.71	"if you fill it with your knowledge, you can shoot or you cannot shoot"
Fruit juicer	2	0.71	"it strains every information", "it investigates a case in pieces and then reaches a conclusion"
Hard disk	2	0.71	"it has thousands of hidden details", "it contains a lot of information"
Internet	2	0.71	"you can find everything"
X-ray machine	2	0.71	"it reflects everything as it is, realistically"
Telegram	1	0.35	"it is difficult"
Calculator	1	0.35	"it is the technological tool that I like the most in this field as it deals with a lot of operations"
Smart board	1	0.35	"it makes our lives easy"
Heater	1	0.35	"it is the favorite thing of many experiences"
Iron	1	0.35	"it fixes the wrinkles, and science education answers all the questions in our heads and fixes them"

Shock device	1	0.35	"it brings people to life"
Monitor	1	0.35	"when we look at the monitor, it shows us everything"
Missile	1	0.35	"it always progresses"
Lying machine	1	0.35	"it distinguishes the right and the wrong"
Bakery	1	0.35	"all kinds of ingredients are cooked in it"
Compass	1	0.35	"it is taken to the end of the activity"
Toy	1	0.35	"we perceive it as a toy"
Projection	1	0.35	"it reflects our life"
Dialysis machine	1	0.35	"it makes our life easier and allows us to live happily"
Wheel	1	0.35	"everything begins with science"
Centrifuge device	1	0.35	"it protects us from confusion and doubt"
Vacuum cleaner	1	0.35	"it gives us a headache"
Typewriter	1	0.35	"it does not come to an end by writing"
radio	1	0.35	"it sounds good"
Lamp	1	0.35	"every darkness needs a light"
Toplam	**284**	**100**	

Table 6 presents the creative comparisons of the prospective teachers for science education as a technological tool, and frequencies and percentages together with their reasons. When Table 6 was examined, it was found that the first three ranks of the creative comparisons of prospective teachers for science education as a technological tool included "computer" with a rate of 43.66% (f=124), "telephone" with 25.35% (f=72) and "microscope" with 5.63% (f=16). Considering the creative comparisons of the prospective teachers, it was revealed that they perceived science as a computer because it contains all kinds of information, as a phone because it is technological tool an accessible at any time, as a microscope since everything can be seen down to the last detail due to examination and investigation performed in the Science course. Moreover, via the creative comparisons with low frequencies such as irons, centrifugals, lamps and lie detectors, they were found to perceive Science as a course that facilitated life, made people happy and shed light on things.

Discussion, Conclusion and Suggestions

Creative comparisons, which facilitate the perception of abstract concepts, are the metaphors using the thoughts, analogies and figures of speech about an event or a subject. There are many benefits of using creative comparisons in the field of education. They are useful methods for learning and they increase motivation. They enable us to keep information in the mind permanently, develop intuitions, eliminates fear of class and unwillingness, and provides creative and investigative learning (Aktamış & Dönmez, 2016; Jeppsson et al., 2013).

Prospective teachers' perceptions, which develop with their education at the university towards events, situations or facts, form the basis of their professional perspectives. Selection of the right creative comparisons is very important in teaching a complex course such as science education. In this sense, the perceptions and attitudes of prospective teachers towards the concepts they are obliged to teach provide significant information about how to convey those concepts. It is apparent that it is not possible to explain a concept as a whole with a single creative comparison. In our study, the purpose of using different categories for creative comparisons is to put forward different and richer results. As a result of this study, the creative comparisons of prospective teachers for science education were gathered under 5 categories: emotion, color, game, transportation vehicle and technological tool.

In emotion-related creative comparisons, it was concluded that 10 out of 15 emotions evoked positive emotions (88.93%) and 5 evoked negative emotions (11.08%). It was concluded that prospective teachers had a positive emotion towards science education, and among these emotions, they mostly emphasized curiosity (29.51%). It was observed that, although rarely, prospective teachers also expressed sadness, which can be considered a negative emotion, (4.92%). This study is in parallel with the study conducted by Demirci-Güler (2012) on prospective classroom teachers, and it was seen that prospective teachers mostly had positive emotions towards the Science and Technology course whereas, less frequently they had negative emotions.

In the color-related creative comparisons, it was concluded that prospective teachers emphasized 14 different colors in total, and among these, the most common being the blue color (34.22%). It was concluded that science education was peaceful, as vast as the sky and infinite according to the views of the prospective teachers. In the game-related creative comparisons, it was concluded that prospective teachers emphasized 46 different games in total, and among these, the most common being the hide-and-seek/blindman's buff (59.25%). According to the opinions of the prospective teachers, science education is full of secrets, it is a science that enables the learning of new subjects, and the mysteries of life can be revealed with science education. The results obtained from this study are in parallel with the study conducted by Afacan (2011) on prospective science teachers and the study conducted by Demirci-Güler (2012) on prospective classroom teachers, and the creative comparisons, where a connection was built between life and science and life itself was considered science, were emphasized by the prospective teachers.

In the creative comparisons related to transportation vehicles, it was concluded that prospective teachers emphasized 29 different vehicles in total, and among these, most common was 'airplane' (34.88%). According to the opinions of the prospective teachers, it was concluded that science education was going further in the vast sky. It was a technological development through which everywhere can be reached. This reveals that science education has a structure that facilitates human life with technological advancements and developments. In the creative comparisons related to technological tools, it was concluded that prospective teachers emphasized 39 different tools in total, and among these, most common one being ‘computer’ (43.66%). According to the opinions of the prospective teachers, it was concluded that science education contained all the information that would facilitate human life. This study has similar results with the study conducted by Soysal and Afacan (2012) on primary school students and the study conducted by Demirci-Güler (2012) on prospective classroom teachers, and students and prospective teachers emphasized the creative comparisons such as 'computer' since the Science and Technology course embodies everything.

Furthermore, according to the results of this study, it was seen that the creative comparisons of prospective classroom teachers for science education were more historical and interesting. Prospective preschool teachers were found to perceive the creative comparisons for science education as creative, emotional and like a game. On the other hand, prospective science teachers were observed to perceive science education as an area, which constantly progresses, requires research and examination and contains hidden problems that need to be revealed. The selection of the prospective teachers from different departments increased the content validity of the research. Additionally, while the creative comparisons of female prospective teachers were more emotional (love, like, all colors, pink) than men, men were found to make more logical explanations (blue, microscope, white, black, gray, f-16). Besides, while prospective science teachers gave more traditional answers to games (hide-and-seek, blindman's buff, riddle, puzzle, PES 2013 etc.), prospective classroom and preschool teachers wrote more unfamiliar interesting answers (turn turn butterfly, wolf dad, duck duck goose, jumping, predicting etc.).

Consequently, it has been revealed through the findings that prospective teachers generally had positive perceptions towards the concept of science, however, there were still negative perceptions although very few. Together with the developing and changing world, the creative comparisons used by the prospective teachers for science education also differentiate.

Considering the results of the research, the following suggestions have been proposed for science education and for the studies to be conducted: A similar study can be conducted on students studying at primary and secondary school and different departments of the universities. The content of the study can be of a different type, and rich contents can be created about creative comparisons. Similarly, the creative comparisons of newly graduate or experienced teachers for science education can be studied. These findings can also be used to compare perceptions existing before starting to practice the profession to those existing during the practice of the profession. Different studies can be conducted in order to know the reasons of prospective teachers' negative perceptions towards science education. Moreover, while designing science education, it is recommended to consider prospective teachers' emotions, colors they have adopted, games they have suggested, transportation vehicles and technological tools. Thus, it is thought that this will result in more effective and efficient science education.

The convenience sampling method was used for this study, which is one of its limitations. This has an impact on the study's generalizability. However, because the study was conducted using phenomenology, one of the qualitative research designs, there are no generalizability concerns. Thus, because it was conducted using the phenomenological method, this study contributes significantly to the literature by revealing the current perceptions of science teachers toward the concept of science education.

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