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Perceptions and opinions of students studying at primary school mathematics teaching department about the concept of mathematics

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The purpose of this study is get opinions of students on the subject of mathematics. It is thought that determining the meaning of mathematics in students' minds, the things that students associate mathematics with and the things that come to their minds when you say mathematics is vital. In this way, it is thought that it can be possible to take some precautions for enabling students to develop positive attitudes towards mathematics, making mathematics more popular among students and reducing mathematics anxiety. This study is particularly important in terms of taking the opinions of students who will be responsible for teaching mathematics and making students become more interested in mathematics so that they can take necessary precautions before they start teaching at schools. This study is a qualitative research and the data obtained through coding the answers provided by students from the Department of Teaching Primary School Mathematics. Two questions in the opinion form were divided into categories and themes were displayed in tables by given percentages and frequencies. In this sense, content analysis from qualitative data approaches and phenomenology from qualitative research designs were used. The study group consisted of 153 students (from freshman to senior) who are studying at Kafkas University, Faculty of Education, Department of Teaching Primary School Mathematics. It was concluded that students mentioned 'nature', 'life', 'oxygen', 'everything complicated' and 'puzzle' for "mathematics, and they provided answers such as 'concepts related to mathematics', 'middle school mathematics teacher' and 'everything' for the question stated as "What is the first thing that comes to your mind when we say mathematics?"

Key words: Metaphor, opinion, perception, primary mathematics education, the concept of mathematics.

INTRODUCTION

Every person uses mathematics to solve the problems that are seen in everyday life. The success and development of a country depends on providing quality education to its citizens. It is thought that when we start doing some collective things for education rather than individual initiatives, there will be positive and fruitful

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results. Mathematics has significant importance for the society and the students as well because having and developing scientific thinking skills and implementing these skills when necessary in our lives is utmost important (Isık et al., 2008).

When we are able to answer the questions about why we have difficulties to learn mathematics, how we can make learning mathematics easier and how we can overcome our anxieties against mathematics, we can create a developed society and can employ its positive skills by transferring mathematical conscious to the students and public. Mathematics is necessary for everybody. However, learning occurs through loving. Mathematics has a place in all other disciplines. For this reason, it is important to take a look at how we can develop positive attitudes towards mathematics, how we can raise interest in mathematics and how we can help our students to have the habits of analysing and researching (Isik et al., 2008).

In accordance with the general objectives that Teaching Mathematics Program tries to achieve, the Basic Law of the National Education no.1739 aims for students to be able to improve their skills regarding mathematics literacy and to have students who can actively use these skills, who can understand and use mathematical concepts, who can use mathematical language and terminology properly to explain and share their mathematical thoughts logically, who can make sense from the correlation between objects and between human beings and objects by using the meaning and language of mathematics, who can create a confident approach to the mathematical problems by developing positive attitudes towards mathematics, who can realize the correlation of mathematics to art and aesthetics and who values mathematics in the knowledge that mathematics is a common value for the mankind (MEB, 2018).

In order to reach all of these goals, it is necessary to put forward students' thoughts about mathematics and to take some precautions in line with these considerations. When we check students' opinions about what mathematics is like or what is the first thing that comes to their mind in terms of mathematics, they can reveal some positive or negative thinking about mathematics. It is thought that we will have the opportunity to make various arrangements in accordance with the way students suggested with their opinions and some arrangements can also be made for mathematics courses. In this context, it is thought that mathematics teachers will also fulfill their responsibilities and make various plans about how they can make mathematics more effective and fun in the eyes of their students.

Today, many countries have serious studies in their education programs to remove the perception that mathematics is difficult. As a result of these studies, success and interest in mathematics courses are increasing in parallel. Besides, their perceptions about mathematics and mathematics courses are also changing. Today, in order to find out how mathematics is perceived, perception studies on mathematics and concepts related to mathematics are being made. Concrete concepts are used to show how we perceive an abstract feature. Metaphors are one of the types of perception used for this purpose (Sahin, 2013). The word metaphor stems from the Greek metapherein. Meta meaning "to change" and pherein meaning "to bear". This notion of using the metaphor as a "change bearing" agent can help students transform what they know into new understandings (Levine, 2005).

Metaphor is used as a bridge between two cases. The first case is generally a phenomenon that everyone knows its properties very well. By using a known feature of this phenomenon, it is tried to explain the other people that the new phenomenon has also the same characteristics (Guner, 2013) and to help the students to express abstract concepts with concrete concepts (Aubry, 2009; Sosyal and Afacan, 2012). In this way, metaphors can be seen in formal and informal learning when the difficult concepts are understood by means of analogy with known concepts (Gecit and Gencer, 2011).

Understanding new images of mathematics is very challenging and can contribute to teacher resistance. Personal views of mathematics may be necessary for pedagogical change. Mathematical metaphors are the possible ways for exploring these images. Because metaphors focus on similarities, they can be used to express already-held perceptions about the nature of mathematics. The analogous dimensions of metaphors can prompt new ways of thinking about current views of mathematics (Sterenberg, 2008).

The following conclusions were reached as a result of the literature scan carried out within the scope of this study: In the studies carried out with prospective teachers and students metaphors expressing that mathematics is fun, joyful and enjoyable activity, in other words, mathematics provides enjoyable learning (Guner, 2013; Sahin, 2013; Kilic and Yelken, 2013; Erdogan et al., 2014; Keles et al., 2016; Sevindik and Cenberci, 2016; Kaba and Sengul, 2017; Latterell and Wilson, 2017). It was concluded in a study carried out with prospective mathematics teachers and prospective pre-school teachers that mathematics is the life itself, in other words mathematics is the source of life (Guner, 2013; Keles et al., 2016; Kaba and Sengul, 2017), in another study carried out with prospective mathematics teachers themes expressing that mathematics make our lives more difficult were found (Guner, 2013).

Prospective mathematics teachers and prospective teachers from other branches (Science, classroom, pre-school, German, English, Turkish, music, art and social sciences teachers) related the concept of "mathematics" to difficult metaphor that makes learning difficult (Guveli et al., 2011; Sahin, 2013; Erdogan et al., 2014; Keles et al., 2016; Latterell and Wilson, 2016; Kaba and Sengul,

2017; Latterell and Wilson, 2017). In addition to this, prospective teachers (Mathematics, Science, Class, Pre-school, German, English, Turkish, music, art and social sciences teachers) and class teachers related mathematics to intelligence metaphor that is something which is mind-developing, a brain box (Sahin, 2013; Erdogan et al., 2014; Tarim et al., 2017).

Teachers from different branches (Science, Class, Pre-School, German, English, Turkish, Music, Art, and Social Sciences Teachers) associated the concept of "mathematics" with "ability" and "success" metaphors. The least preferred metaphors were "unnecessary" and "authority" (Sahin, 2013). Teachers from different branches (Science, Class, Pre-School, German, English, Turkish, Music, Art, and Social Sciences Teachers) associated the concept of "Mathematics" with "Easy" metaphor (Sahin, 2013; Kaba and Sengul, 2017; Latterell and Wilson, 2017).

Prospective mathematics teachers perceive mathematics as infinite (Erdogan et al., 2014; Kaba and Sengul, 2017), related to one another, cumulative, obligatory and the basis of other disciplines. Some of the prospective mathematics teachers perceive mathematics as something which guides, which requires continuity, which is about to be solved and which has only one correct answer (Erdogan et al., 2014). In addition to this, mathematics is expressed as a language (Erdogan et al., 2014; Latterel and Wilson, 2016; Latterell and Wilson, 2017).

Pre-school teachers categorized mathematics as something which uses mental process skills (Keles et al., 2016) and pre-school, primary school and mathematics prospective teachers categorized mathematics as boring (Guveli et al., 2011; Kilic and Yelken, 2013; Keles et al., 2016; Latterell and Wilson, 2017; Kaba and Sengul, 2017). Primary class teachers produced sing language and emotion metaphors for mathematics (Kilic and Yelken, 2013). "Mathematics as an exciting lesson" is among perceptions of primary school class and middle school mathematics prospective teachers' perceptions about mathematics (Guveli, Ipek, Atasoy and Guveli, 2011; Kaba and Sengul, 2017) and primary school class teachers perceive mathematics as "something which consists of many different topics" (Guveli et al., 2011).

Middle school mathematics prospective teachers and primary school class teachers produced life metaphor for the concept of mathematics (Kaba and Sengul, 2017; Tarim et al., 2017). One of the metaphors produced by middle school mathematics prospective teachers are the universe metaphor. Generally, it was concluded that "prospective teachers perceive mathematics as intense, cruel, challenging, requiring memorization and the source of stress" and "the others have prejudices against mathematics". It appeared that mathematics is a lesson which requires one to have interest and pay attention, and one need to spend some time thinking of ways to solve it. It was revealed that prospective teachers also made mentioned of loving some of their previous mathematics teachers, but not loving some others. They think that not all the mathematics teacher can explain topics of mathematics properly. The conclusion which was stated as "There are some students who hate mathematics" was obtained (Kaba and Sengul, 2017).

More than half of the vocational high school students think that mathematics is something negative. Mathematics was categorized as terrible, aesthetics, identified with human beings, necessity and an incomprehensible topic (Sevindik and Cenberci, 2016). "Puzzle and computer" metaphors were used for the concept of mathematics (Guner, 2013). When we analyse metaphors; it is understood that mathematics is perceived as something which makes our lives easier, in other words necessary after seeing the expressions of "process" (Tarim et al., 2017) and "necessity" (Guner, 2013; Sahin, 2013; Erdogan et al., 2014; Keles et al., 2016; Latterell and Wilson, 2016; Tarim et al., 2017; Latterell and Wilson, 2017) in the perception list.

Mathematics was defined as a game (Tarim et al., 2017; Brady and Winn, 2014). It was stated that mathematics requires effort, interest and hard-work (Brady and Winn, 2014; Latterell and Wilson, 2017; Kaba and Sengul, 2017). It was expressed that mathematics is seen as a puzzle (Brady and Winn, 2014; Latterell and Wilson, 2016; Latterell and Wilson, 2017). It was mentioned that mathematics is discouraging/obstructive and something which is not desired but inevitable situation. It was seen that there are no positive metaphors for mathematics. Mathematics was defined as a structure, a skill, sports or an environmental feature (Brady and Winn, 2014). Besides, it was stated that there are ups and downs in mathematics and students experienced being uncontrolled (Brady and Winn, 2014; Latterell and Wilson, 2016; Latterell and Wilson, 2017). Mathematics is a form of thinking and it is a fight (Latterell and Wilson, 2017). Participants expressed mathematics as dangerous, impossible and nasty (Latterell and Wilson, 2016).

It important to determine the meaning of mathematics for students and with what students associate mathematics and what comes to their minds when you say mathematics. In this way, it can be possible to take some precautions for making students love mathematics and helping them to develop positive attitudes towards mathematics and reducing their anxieties about mathematics. This study is particularly important in terms of taking the opinions of students who will be responsible for teaching mathematics and making students become more interested in mathematics so that we can take necessary precautions before they start teaching at schools.

The purpose of this study is to ask students who are studying at the department of Teaching Primary school Mathematics to state their explanations regarding their metaphors about what mathematics is like together with

their justifications and in terms of making this study more comprehensive to express their thoughts about the first thing which comes to their minds when you say mathematics. In this sense, the problem sentence of the study is as follows: What are the metaphors of students who are studying mathematics and what are their thoughts about the first thing that comes to their minds when you say mathematics? In accordance with this problem, the answers of the following sub-problems are also examined:

(1) What are the metaphors of students who are studying at Departments of Teaching Mathematics about what mathematics is like?
(2) What are the thoughts of students who are studying at Departments of Teaching Mathematics about the first thisn that comes to their minds when you say mathematics?

METHODOLOGY

The study model

Qualitative researches are studies in which a qualitative process is followed to present perceptions and events in a natural environment and in a realistic holistic way (Yildirim and Simsek, 2008). This study is a qualitative research and the data obtained through coding the answers provided by students from teaching primary school mathematics departments were divided into categories and themes were displayed in tables by given percentage and frequency values.

In this context, content analysis is used in qualitative data analysis approaches. The main goal in content analysis is to reach the concepts and associations that can explain the collected data. For this purpose, similar expressions are grouped together on the basis of certain concepts and themes, and then interpreted in a way that readers can understand (Yildirim and Simsek, 2008).

Within the scope of the current study, phenomenology was used from qualitative research designs. Phenomenology focuses on phenomena which we are aware of, but we do not have an in-depth and detailed understanding. We can encounter various forms of these phenomena in our everyday life. Phenomenology constitutes an appropriate research area for studies aiming to investigate phenomena that are not completely foreign to us, but which we cannot fully understand (Yildirim and Simsek, 2008).

The study group

The study was carried out in 2017 to 2018 academic years. The study group of this research consists of 153 students (from freshman to senior students) who were studying at Kafkas University, Faculty of Education, Department of Teaching Primary School Mathematics. Within the scope of the present study, convenience sampling was used for non-random sampling methods. Researchers are working in the same faculty and the same department as the study group. Within the scope of the convenience sample, because of the limitations in terms of time, money and labour, the sample is selected from easily accessible and practicable units (Buyukozturk, 2012).

Data collection

We ask primary school mathematics prospective teachers to state what mathematics is like with their justifications and to express the first thing that comes to their minds when you say mathematics. Students had 15 minutes to answer the questions used in the opinion form. The participants of the study are 2 lecturers and 153 students who are studying at the Department Teaching Mathematics.

Data collection instruments

Within the scope of this study, students (from freshman to senior students) who are studying at the Department of Teaching Primary School Mathematics answered an opinion form consisting of 2 questions. The questions were a s follows:

(1) Mathematics is like …….. because…….
(2) What is the first thing that comes to your mind when you say mathematics?

The opinions of an expert were taken for the validity of the opinion form, and the form was finalized after doing necessary changes.

Data analysis

We used an opinion form consisting of two questions to learn the metaphors and thoughts of students who are studying at teaching primary school mathematics about mathematics. The content analysis was used with the answers of the students in terms of qualitative analysis. While the researchers were analysing the students' answers, they divided the answers into categories and themes, and they tabularised the results by showing their percentage and frequency values. Double coding was used in this study while analysing the data in this study, and the purpose of doing this is to ensure reliability between researchers. The consistency value was found as 0.78 by using the method developed by Miles and Huberman (1994). The researchers shared and evaluated the opinion forms of the students after that they exchanged the forms and re-evaluated the forms. Finally, the consistency value was calculated. The consistency value obtained showed that there is cohesion between the raters. The conformability was ensured by employing interrater reliability. The transferability was proved by citing from students' opinions to prove that they reflect the opinions of the participants after the explanations about the findings of each question. In order to prove cogency, we employed expert analysis and tried to take the opinions of different experts.

FINDINGS

The findings of the first sub-problem

When we analyse Table 1, it is seen that the metaphors used by students studying at the Department of Teaching Primary School Mathematics for "mathematics is like …… because ……" was grouped under 14 themes. The themes are: Environment, Individual, Features of People, About Life, Organ, About Food, Universe, Emotion, Thinking, Every-No, Game, Time, Science-Art, Tools and Equipment. The categories under environment theme are: Nature, Flat, Climate events, Water, The Sun, Sea, Air, Lake, Flower, Tree, The Sun in Kars and Oxygen. The categories under individual theme are: Person, Kid, Woman, Family. The categories under features of people theme: Breathing, Dead, Hobby,

Table 1. The Distribution of the metaphors used by students for "mathematics is like ……because……" according to themes and categories.

Themes	Categories	Frequency (f)	Percentage
Environment	Nature	20	13.07
	Flat	2	1.31
	Climate events	2	1.31
	Water	5	3.26
	The sun	3	1.96
	Sea	2	1.31
	Air	2	1.31
	Lake	2	1.31
	Flower	2	1.31
	Tree	2	1.31
	The sun in Kars	2	1.31
	Oxygen	9	5.88
Individual	Person	3	1.96
	Kid	1	0.65
	Woman	1	0.65
	Family	2	1.31
Features of people	Breathing	2	1.31
	Dead	1	0.65
	Hobby	1	0.65
	Counting money	1	0.65
About Life	Life	20	13.07
	Understanding life	2	1.31
Organ	Brain	2	1.31
	Heart	1	0.65
About food	Sweet	1	0.65
	Soup	1	0.65
	Apple	1	0.65
	Sour-sweet	1	0.65
	Eating	1	0.65
Universe	Space	10	6.53
	Earth	5	3.26
Emotion	Self-expression ability	2	1.31
	Enjoy	1	0.65
	Fun	1	0.65
	Love	4	2.61
	Romance	1	0.65
Thinking	Thinking	2	1.31
	Philosophy	3	1.96
Every-No	Everything	2	1.31
	Everything complicated	5	3.26
	Everything that can be seen	1	0.65
	Nothing	1	0.65

Table 1. Contd.

Game	Playing games	2	1.31
	Puzzle	5	3.26
	Brain box	1	0.65
	Playing with numbers	1	0.65
Time	Time	1	0.65
	Time machine	1	0.65
Science-art	Science	1	0.65
	Art	1	0.65
	Painting	1	0.65
	Opposite pole	1	0.65
	Foreign language	1	0.65
	Numbers and symbols	1	0.65
	Korean TV series	1	0.65
Tools and equipment	Key	1	0.65
	Basic tool necessary for a job	1	0.65

Counting money. The categories under about life theme are: Life, Understanding Life. The categories under organ theme are: Brain, Heart. The categories under about food theme are: Sweet, Soup, Apple, Sour-Sweet, Eating. The categories under universe theme are: Space, Earth. The categories under emotion theme are: Self-expression ability, Enjoy, Fun, Love, Romance. The categories under thinking theme are: Thinking, Philosophy. The categories under every-no theme: Everything, everything complicated, every that can be seen, Nothing. The categories under game theme are: Playing games, Puzzle, Brain box, Playing with numbers. The categories under time theme are: Time, Time machine. The categories under science-art theme are: Science, Art, Opposite Pole, Foreign Language, Numbers and symbols, Korean TV series. The categories under tools and equipment theme are: Key, The basic tool necessary for a job.

It is seen that students mentioned nature and oxygen categories under environment theme, breathing category under features of people theme, life category under about life theme, brain category under organ theme, space category under universe theme, love category under emotion theme, philosophy category under thinking theme, everything complicated category under every-no theme and puzzle category under game theme. The samples from the answers of the students provided about what mathematics is like are stated below:

"Mathematics is like the sun because if there is sun, you can benefit its light, or you are plunged into darkness."
"Mathematics is like life because you can see it everywhere in life."
"Mathematics is like a woman because if you do not care, she will dump you."
"Mathematics is like heart because it has a significant importance for both itself and other parts"
"Mathematics is like eating because we cannot give up eating and so is mathematics."
"Mathematics is like the experiment about the rice in the water because it becomes white as you love it."

The findings about the second sub-problem

When we analyse Table 2, it is seen that the responses provided by students who are studying at the Department of Teaching Primary School Mathematics for "What is the first thing that comes to your minds when you say mathematics?" were grouped under 11 themes. The themes are; Numbers and Operations, Mathematical Expressions, Teacher, Cognitive, Anxiety, Environment, About Life, Problem, Science-Art, Emotion and Personal. The categories under the numbers and operations theme are: The Magic of Numbers, Operations requiring Long Time, Zero and Numbers. The categories under the mathematical expressions theme are: Topics related to Mathematics, Concepts related Mathematics, Courses related to Mathematics and Famous Mathematicians. The categories under the teacher theme are: High school mathematics teacher and middle school mathematics teacher. The category under the cognitive theme is: the whole of the mind studies. The categories under the anxiety theme are: Mathematics Fear in People, How

Table 2. The distribution of the students responses to "What is the first thing that comes to your minds when you say mathematics? According to Themes and Categories.

Themes	Categories	Frequency (f)	Percentage
Numbers and operations	The magic of numbers	2	1.31
	Operations requiring Long Time	2	1.31
	Zero	2	1.31
	Numbers	3	1.96
Mathematical expressions	Topics related to mathematics	13	8.49
	Concepts related mathematics	12	7.84
	Courses related to mathematics	8	5.22
	Famous mathematicians	3	1.96
Teacher	High school mathematics teacher	3	1.96
	Middle school mathematics teacher	10	6.53
Cognitive	The whole of the mind studies	1	0.65
Anxiety	Mathematics fear in people	4	2.61
	How can I pass my lessons	1	0.65
	The difficulty of mathematics	1	0.65
	Examination	1	0.65
	Summer school	1	0.65
Environment	The balance of the nature	1	0.65
	Market	1	0.65
About life	Everything	10	6.53
	Vital Need	7	4.57
	Explaining everything in life with some certain suppositions	1	0.65
	The existence of human beings	4	2.61
	The act of abstracting life	1	0.65
	Reality	1	0.65
	Universe	7	4.57
	Order	1	0.65
Problem	A huge question mark	1	0.65
	Problems	6	3.92
	Finding solutions for the problems	6	3.92
	Unknowns	6	3.92
Science-art	Art	5	3.26
	A discipline which helps us to interpret life	5	3.26
	The necessary language to understand universe	5	3.26
	The discipline which is related to life	1	0.65
Emotion	Fun	3	1.96
	Enjoyable but difficult	1	0.65
	An Indispensable thing	1	0.65
	A good activity	1	0.65
Personal	The target to be a good mathematician	1	0.65
	Patience	1	0.65
	The talent inside the human beings	1	0.65
	Imagination	5	3.26
	The section I am reading	1	0.65
	Dealing with	1	0.65

Can I Pass my Lessons, The Difficulty of Mathematics, Examination and summer school. The categories under the environment theme are: the balance of the nature and market.

The categories under the about life theme are: Everything, Vital Need, Explaining Everything in Life with Some Certain Suppositions, The Existence of Human Beings, The Act of Abstracting Life, Reality, Universe and Order. The categories under the problem theme are: A huge Question Mark, Problems, Finding Solutions for the Problems and Unknowns. The categories under the science-art theme are: Art, A Discipline which helps us to interpret Life, The Necessary Language to Understand Universe and The Discipline which is related to Life. The categories under the emotion theme are: Fun, Enjoyable but Difficult, An Indispensable Thing and A Good Activity. The categories under the personal theme are: The Target to be a Good Mathematician, Patience, The Talent inside the human beings, Imagination, The Section I am reading and Dealing with. Students gave the following responses especially under the Mathematical expressions theme: road calculations, equations, integral and derivative, number systems, fractions, complex numbers, matrices, functions, Pythagorean relation and calculations. They provided the following responses for the concepts related to the mathematics category: money, change, Pi number, time, symbols, proofs, paradoxes, formulas, proof, eternity and concretes that can be abstracted. They provided the following responses for the Courses related to Mathematics category: general mathematics, geometry (square, angles), the futility of algebra and codes for computers. For the famous mathematicians they named Cahit Arf and Omer Bin Hayyam as the famous mathematicians.

It is seen that students especially mentioned numbers category most under Numbers and Operations theme, topics related to mathematics under mathematical expressions theme, middle school mathematics teacher category under teacher theme, mathematics fear in people category under anxiety theme, everything category under about life theme, problems, finding solutions to problems and unknowns categories under problems theme, art, a discipline which helps us to understand life, language which is necessary to understand universe categories under science-art theme, fun category under emotion theme and imagination category under personal theme.

RESULT AND DISCUSSION

It is seen that students who are studying at teaching primary school mathematics have frequently referred to “nature” under “environment” theme, “person” under “individual” theme, “breathing” under “features of people” theme, “life” under “about life” theme, “brain” under “organ” theme, “sweet” “soup”, “sour-sweet” “eating” under “about food” theme, “space” under “universe” theme, “love” under “emotion” theme, “philosophy” under “thinking” theme, “everything complicated” under “every-no” theme, “puzzle” under “game” theme, “time” and “time machine” under “time” theme, “science, art, painting, opposite pole, foreign language, numbers and symbols and Korean TV series” under “science-art” theme and “key and basic tool which is necessary for a job” under tools-equipment” theme for the expression of “ Mathematics is like ……. Because ……”.

For the question “What is the first thing that comes to your minds when you say mathematics?”, students have frequently referred to “numbers” under “Numbers and Operations” theme, “topics related to mathematics” under “mathematical expressions” theme, “middle school mathematics teacher” under “teacher” theme, “the whole of the mind studies” under “cognitive” theme, “mathematics fear in people” under “anxiety” theme, “the balance of the nature and market” under “environment” theme, “everything” under “about life” theme, “problems, finding solutions to problems and unknowns” under “problems” theme, “art, a discipline which helps us to understand life, language which is necessary to understand universe” under “science-art” theme, “fun” under “emotion” theme and “imagination” under “personal” theme.

Similar results were obtained with Guner (2013), Sahin (2013), Kilic and Yelken (2013), Erdogan et al. (2014), Keles et al. (2016), Sevindik and Cenberci (2016), Kaba and Sengul (2017) and Latterell and Wilson (2017) due to the idea that mathematics is a fun and entertaining activity. The ideas that mathematics is like life, it is everywhere in our lives and everything about life are the first things that comes to students’ minds when you say mathematics is in line with the studies of Guner (2013), Keles et al. (2016), Kaba and Sengul (2017) studies. Although a metaphor about the difficulty of mathematics have not appeared, one of the first things that comes to students’ minds about mathematics are the difficulty of mathematics category under anxiety theme, and enjoyable but difficult category under emotion theme.

In this case, we can talk about the existence of students who find mathematics difficult at various levels. In this sense, this study is in line with the studies of Guveli et al. (2011), Sahin (2013), Erdogan et al. (2014), Keles et al. (2016), Latterell and Wilson (2016), Kaba and Sengul (2017) and Latterell and Wilson (2017). One of the metaphors that students produced for mathematics is brain box. In this sense, this study is similar to the studies of Sahin (2013), Erdogan et al. (2014) and Tarim et al. (2017). While students were stating the first thing that comes to their minds about mathematics, they used the expression like “the talent inside the human beings”. In this case, we can say they that they thought the concept of mathematics together with the concept of “talent”. This is in line with the study of Sahin (2013). However, they expressed that they did not think that mathematics is

unnecessary, on the contrary they thought that mathematics is needed in every part of our lives and when you say mathematics they first think it is a vital need. It is seen that in Sahin (2013) study, students used the expression of unnecessary very little though. It is seen that students did not think that mathematics is easy, and they uttered everything complicated expression for mathematics. In this case, this study contradicts with Sahin (2013), Kaba and Sengul (2017) and Latterell and Wilson (2017). Even, when you say mathematics, the first thing that comes to their minds is an enjoyable but difficult activity.

Students expressed eternity by correlating mathematics with space and universe metaphors, and they stated that eternity is the first thing that comes to their minds when you say mathematics. In this way, this study is in line with the studies of Erdogan et al. (2014) and Kaba and Sengul (2017). Having the idea that mathematics is a discipline that helps us to interpret life as the first thing when you say mathematics shows that mathematics is seen as the basis of other disciplines. For this reason, this study is in line with Erdogan et al. (2014). When you say mathematics, thinking the idea is necessary for understanding the universe and using foreign language metaphor shows us that mathematics is perceived as a language. In this way, this study is in line with the studies of Erdogan et al. (2014), Latterel and Wilson (2016) and Latterell and Wilson (2017).

The whole mind studies come to students minds when you say mathematics. In this sense, this study is in in line with Keles et al. (2016). Thinking mathematics as fun and as an indispensable and good activity, the idea that students enjoy doing mathematics, and reveal that students are not getting bored from mathematics. In addition to this, students did not use boring metaphor. In this sense, this study contradicts with the studies of Guveli et al. (2011), Kilic and Yanpar Yelken (2013), Keles et al. (2016), Latterell and Wilson (2017) and Kaba and Sengul (2017). Seeing mathematics as a foreign language and using necessary language for understanding universe metaphor and due to producing various metaphors about emotions, this study is parallel with the study of Kilic and Yelken (2013).

Because of the metaphors that say mathematics includes many topics, concepts and courses, this study is in line with Guveli et al. (2011). Due to expressing the first thing when you say mathematics is everything about life, accepting mathematics as a vital need, having understanding life and life metaphors, this study is similar to that of Kaba and Sengul (2017) and Tarim et al. (2017).

As students produced universe metaphor and having the universe expression first when you say mathematics, this study is in line with Kaba and Sengul (2017). Having students who perceive mathematics as a huge question mark even a little and who have some worries (such as mathematics fear in people, how can I pass my lessons, the difficulty of mathematics, examination, summer school etc.) shows us that they see mathematics as a source of stress a bit. For this reason, this study is in line with the study of Kaba and Sengul (2017). Besides, it is seen that students made mentioned of their mathematics teachers whom they had in their teaching experiences, and they did not forget their middle school mathematics teachers. In this sense, it is thought that this study is in line with Kaba and Sengul (2017).

Students here generally do not have negative feelings about mathematics. Maybe, this is because of the fact that they preferred mathematics as their professions and they are studying at the Department of Teaching Primary School Mathematics. This side of the study contradicts with the studies of Sevindik and Cenberci (2016). However, the opinions of vocational high school students were taken in their studies. Because of having puzzle metaphor, this study is in line with Guner (2013). Because of the expressions like mathematics help us to interpret life and makes us understand life, it can be said that mathematics is a necessity. For this reason, the idea that mathematics makes our lives easier was seen. Because of all these results, this study is in line with Guner (2013), Sahin (2013), Erdogan et al. (2014), Keles et al. (2016), Latterell and Wilson (2016), Tarim et al. (2017) and Latterell and Wilson (2017).

The metaphors like playing games, brain box, playing with numbers show that mathematics is seen as a game. In this sense, this study is similar to the studies of Tarim et al. (2017) and Brady and Winn (2014). There are some contradictory parts with the studies of Brady and Winn (2014) as they did not find any positive metaphors about mathematics because in our study metaphors are mostly positive. It is appeared that mathematics is seen as a thinking system because of the metaphors for example, thinking and philosophy. For this reason, similar results were obtain in the study of Latterell and Wilson (2017). The results of this study contradict with that of Latterell and Wilson (2016) because students in this study did not produce negative metaphors like dangerous and nasty.

SUGGESTION

How metaphors change by the grade levels of the students:

(1) Students can be asked to state solution strategies especially for their negative metaphors.
(2) Students can be asked to produce metaphors for each topic or course of mathematics.

One can conduct semi-structured interviews with the students about their metaphors. In this way, you can have more in-depth information. A similar study can be carried out regarding mathematics teachers and you can have a comparison between two groups. In particular, a comparison can be made between senior students who are studying mathematics and teachers who have just started teaching.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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