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## THE EFFECTS OF MATHEMATICS SCHEMAS ON MATHEMATICS ANXIETY

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To cite this article: Ertem-Akbaş, E., & Alan, K. (2024). The effects of mathematics schemas on mathematics anxiety *Futuristic Implementations of Research in Education (FIRE)*, 5(1), 21-31.

To link to this article: <http://firejournal.org/index.php/fire/article/view/95/>



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Published online: 13 July 2024

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Received: 14 November 2023  
Accepted: 18 April 2024  
Published: 13 July 2024

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## PROFESSIONAL EDUCATION & TRAINING | RESEARCH ARTICLE

### The effects of mathematics schemas on mathematics anxiety

Elif Ertem-Akbaş & Kübra Alan

**Abstract:** Mathematical schemes are a set of concepts that people often use in daily life but are not aware of. According to the research, hating mathematics and prejudice against mathematics arise from the inability to identify the concept messages with the schema in the mind. It also sometimes manifests itself as a result of anxiety. This study aims to determine the mathematics anxiety of pre-service primary and elementary mathematics teachers and society with the help of mathematical schemes in mind. The qualitative research method was used for this purpose. Within the scope of the study, interviews were conducted with a total of 18 people. The answers received as a result of the interview were subjected to content analysis. According to the results of the analysis, certain concepts related to mathematics anxiety came to the fore. It was concluded that there are concept confusions associated with these concepts. Based on these findings, suggestions were made that mathematics should be updated.

**Keywords:** Achievement, Mathematics Anxiety, Mathematics Schema, Misconceptions, Prejudice

Mathematical schemes are the first port of call for mathematical concepts. Concepts are shaped here, assimilated and, if necessary, placed. The shape of the established concepts in the mind is now finalised. However, it is difficult to reveal the purposes of use of the concepts that are not settled, that is, concepts that cannot find themselves in a schema, to try to find their concept equivalents, and most importantly, to endeavour to open a schema in the mind for them. Moreover, if we consider that the child is trying to do this burden, the work becomes more complicated. This situation normally leads to anxiety and behaviours such as apathy towards the lesson and inferiority psychology become visible. This psychology that starts in childhood continues until it finds a meaning in daily life. If the meaning is not found, that concept is constantly associated in the mind of the child and the boundaries of the mind are drawn.

This is exactly the case in mathematics, a field where concepts and concept confusion are intensely observed. The anxiety that starts when we are still children continues as we grow older and makes the situation of maths anxiety, which we can observe in society today, clear for us. "Richardson and Suinn defined mathematics anxiety as a feeling of tension and anxiety that interferes with the manipulation of numbers and the solution of mathematical problems." (Uğurel & Morali, 2006). This shows us that mathematics anxiety is directly related to mathematics concepts. People find their own way with concepts. He/she defines every emotion, situation and event with the help of concepts. Therefore, concept is an inseparable part of our lives that we encounter and will encounter everywhere in daily life. This situation is no different in mathematics concepts. The concepts of mathematics, in which we find ourselves everywhere in life, do not neglect to remind ourselves everywhere in life. For this reason, this science, which we have described as abstract, actually makes sense of itself in concrete objects and situations. After the concepts that are made meaningful are attached to a schema, they are now ready to shape our way of speaking and our perspective on life. While our spoken language becomes the language of mathematics, our perspective takes on a form in which different perspectives are brought together. This situation brings with it a broad interpretation style and the power of questioning. Unfortunately, what is understood from mathematics today is very narrow in scope and consists of

concepts that are spoken without actually getting into the spirit of mathematics. This situation not only leads to the accumulation of hatred towards mathematics and its concepts but also prevents us from integrating with nature and discovering nature. While there are so many things in nature that need to be discovered, looking at it and passing by does not seem to be an event that human beings would do in an ordinary situation. However, when we think about it, mathematics is embodied in every object we look at and try to see in nature. Therefore, there is a dance of mathematical concepts on objects. Therefore, when we look at the object and do not endeavour to understand it, it is just looking at the object and passing by.

In order to understand oneself and nature, one must be able to make sense of mathematics and therefore of mathematical concepts. If a person learns mathematics for the sake of doing mathematics, without worrying about an exam, he or she will enjoy the magical world of mathematics. Teachers have the power to make this happen in society. Because teachers are the educators of a generation. If first the classroom teachers and then the mathematics teachers create mathematical concepts in the minds of children in a way that pushes them to investigate and question, then the child will first wonder and investigate that concept and then what is behind that concept. When the teacher supports the results obtained, it means that there is no obstacle in front of the child. All these also show us what the teacher can do. There are endless concepts behind a mathematical concept. Arousing excitement for any one of them may be enough to open the door to mathematics. Even this hope is enough to arouse curiosity. After all, we give one to a child, but the return to us is ten times bigger. As we can turn mathematics into a way of life with such simple beauties, it is also in our hands to turn it into a house of anxiety. When we look at today, it is already possible to see this in most places. Individuals who rage against mathematics, cannot tolerate it, and call it a nightmare are not wrong. Because what they are taught is exam-oriented mathematics. What they do is to endure until the exam time(!) and then get rid of it. Under the conditions of the exam, the effort not to make sense of mathematics and mathematical concepts manifests itself as usual. Failure in the exam is a product of this result. The blending of success and mathematics increases the anxiety for the society. "Being successful in mathematics does not only mean mastering the field, having problem-solving skills or only understanding definitions, topics and proofs. It is also a matter of restructuring and internalising the thought" (Coşkun & Yıldız-Demirtaş, 2014).

This study aimed to determine the effect of mathematics schemas in the minds of primary school mathematics teacher candidates and individuals in society on mathematics anxiety. In line with this study, answers to the following questions were sought:

- What is the first schema that comes to your mind when mathematics is mentioned?
- What are the associations in your mind when a mathematical symbol is mentioned?
- What do maths symbols make you feel?
- Is mathematics more meaningful and enjoyable in an abstract framework or when it is handled in a concrete framework?

## 2. Literature review

Ramirez et al. (2013), who aimed to investigate the effect of mathematics anxiety on mathematics achievement in early primary school, found that mathematics anxiety is associated with low working memory and that mathematics schemas can help reduce mathematics anxiety. Hembree (1990), who discusses the nature, effects and relief of mathematics anxiety, suggests that mathematics schemas can be effective in relieving mathematics anxiety. According to the results obtained by Krinzinger et al. (2009), who investigated the relationship between mathematics anxiety and mathematics achievement, mathematics anxiety affects mathematics achievement through cognitive performance and mathematics schemas can play a role in reducing mathematics anxiety.

Maloney and Beilock (2012), who discuss the causes and development of mathematics anxiety, emphasise that mathematics schemas can be used as a potential strategy to reduce mathematics anxiety. Suárez-Pellicioni et al. (2016) examine the cognitive consequences, psychophysiological relationships and brain basis of mathematics anxiety. As a result, they emphasise the potential of mathematical schemas to reduce mathematics anxiety. Ramirez and Chang (2019) investigated the effect of a schema-based teaching approach to overcome mathematics anxiety. In the study, a schema-based curriculum was applied to students with mathematics anxiety and it was observed that anxiety decreased in students. Ramirez and Suárez (2017) investigated how students' level of mathematics anxiety affects their ability to construct mathematical schemas. The results showed that mathematical schemas reduced mathematics anxiety. Dunn and Seli (2018) investigated the role of mathematical schemas in reducing mathematics anxiety. The researchers showed that the use of schema-based strategies can be useful for individuals with mathematics anxiety to better understand and learn mathematical concepts. Wu et al. (2014) examined the relationships between mathematics anxiety, mathematics achievement, and introverted and extroverted behaviours. In the study, mathematics anxiety was found to be related to mathematics achievement and introverted behaviours. In addition, it is emphasised that mathematics schemas can play an important role in reducing mathematics anxiety.

### 3. Method

#### 3.1 Research model

This research is a qualitative study conducted to examine the effects of mathematical schemas in the mind on the fear of mathematics in line with the views of classroom teachers, prospective elementary mathematics teachers and individuals in society. "*Qualitative research is a preferred research technique in terms of revealing the perceptions and experiences of the people included in the research*" (Yıldırım, 1999). "*The survey model is defined as a research approach that aims to describe an existing situation as it exists*" (Arslan et al., 2017). "*In this research, a semi-structured interview technique was used in order to enable the researcher to influence the flow of the interview with different or sub-questions depending on the course of the interview and to elaborate the responses of the person*" (Türnüklü, 2000).

#### 3.2 Research group

In the second semester of the 2018-2019 academic year, a total of 18 people, including 5 primary school teachers, 5 elementary mathematics teacher candidates and 8 individuals in the community, studying in the fourth grade at Van Yüzüncü Yıl University. "*While selecting the study group, stratified purposive sampling type was selected because it is generally desired to reach universes with multiple and different characteristics*" (Baltacı, 2018). Attention was paid to the fact that the classroom teacher candidates selected in the study group had taken basic mathematics and mathematics education courses.

Table 1. Demographic structure of the participants in the study group

Participant Name	Mission
A	Class Teacher Candidate
B	Class Teacher Candidate
C	Class Teacher Candidate
Ç	Class Teacher Candidate
D	Class Teacher Candidate
E	Elementary Mathematics Teacher Candidate
F	Elementary Mathematics Teacher Candidate
G	Elementary Mathematics Teacher Candidate
Ğ	Elementary Mathematics Teacher Candidate
H	Elementary Mathematics Teacher Candidate

I	Individual in Society (High School Student)
i	Individual in Society (High School Student)
J	Individual in Society (Architect)
K	Individual in Society (Private Company Employee)
L	Individual in Society (Psychologist)
M	Individual in Society (Medical Secretary)
N	Individual in Society (Doctor)
O	Individual in Society (English Teacher)

### 3.3 Data collection

Semi-structured interview technique was used in the research. "*Semi-structured interview was used because it allows quick coding and analysis of the data and helps to compare the similarities and differences between the information given by the participants*" (Topsakal et al., 2013). Four main questions were asked in order to reveal mathematics anxiety in relation to the mathematics schemas of pre-service teachers and society. The answers were sometimes expanded with sub-questions.

The participants were 10 students studying in the fourth grade at Van Yüzüncü Yıl University in the 2018-2019 academic year (5 classroom teaching, 5 elementary mathematics teaching) and 8 people were selected from individuals in the society (regardless of any clan). The participants were told that the research was scientific research that their information would be utilised for these purposes and that their identity information would be kept confidential.

### 3.4 Data analysis

In data analysis, firstly, the data obtained through interview techniques were organised. The organised data were subjected to content analysis. "*Content analysis is an analysis technique open to innovations that brings together similar data within the framework of certain concepts and themes, and organises and interprets them in a way that the reader can understand.*" (Ertem-Akbaş, 2018).

## 4. Findings and discussion

In this study, in which we examined the mathematics anxiety developed by primary and elementary mathematics teacher candidates and the society depending on their mathematics schemas, we concluded that the causes of anxiety were shaped around certain concepts. These concepts can be listed as follows:

- Number
- Number
- Formula
- Four Operations
- Maths Teacher

Within the framework of these findings, firstly, the comments received from prospective primary school teachers and my own comments within the framework of the information obtained, then the comments of prospective primary school mathematics teachers and my own comments, and then the comments about the society and my own comments will be discussed. Finally, these will be blended in a general way and suggestions will be expressed.

While mathematical symbols were mostly symbolised as a curiosity for pre-service elementary mathematics teachers, it was found that they had a hesitation about mathematical symbols. This hesitation opens the door that there may be a lack of knowledge about what exactly mathematical symbols are. Another feedback we received predominantly from the candidates was the concepts of four operations. The presence of fear felt with the four operations was expressed. Among these, the most emphasised one was division. While the division process was emphasised as intense stress by the prospective primary school teachers, it was said that situations such as hand sweating, nervousness, etc. occur even when seen. The fact that mathematics education, which is not modelled, that is, mathematics education that is far from concrete mathematics, brings a series of obstacles to us starting from four operations, once again emphasises the importance of mathematics education to be made concrete. In addition, in order not to transfer this anxiety experienced by the classroom teacher candidates to children, they need to make concretisation in the same way. Of course, they should first break their own prejudices about the material they will use and then start working on the activity with the students. Otherwise, it may cause students to show a tendency towards anxiety as a result of the justification of the attachment to the class teachers during the most special period of the students. This situation, which will be developed in the direction of anxiety, will cause students to be indifferent to the lesson, to move away from the lesson, not to perceive the lesson, to see the lesson as a very independent situation from daily life, etc.

Another situation related to concretisation is the effect of mathematics teachers who come to the minds of prospective primary school teachers. It was concluded that the fact that mathematics teachers came to their minds gave them hope for the concretisation of mathematics. An inverse proportion stands out here. The lack of materials used by mathematics teachers encouraged the candidates to use materials and increased the importance given to the use of materials. In this context, the reaction of a candidate to the question about concretisation is as follows: "*We are classroom teacher candidates. Of course, we plan to make the lessons more meaningful by making them concrete.*" There were also classroom teacher candidates who had a hopeless attitude towards mathematics. The reaction of one of those candidates is as follows: "*Maths just makes me tense and nervous.*" The reaction given by the candidate is worrying at one point. Because there is a high possibility that the candidate can transfer this feeling to the students he/she will train. In this context, candidates should either take their anxiety levels under control or get rid of it. A Master's degree can be recommended for classroom teacher candidates to overcome their anxiety. Because the result of a study showed that "*the mathematics anxiety scores of teachers with a master's degree are lower than the mathematics anxiety scores of teachers without a master's degree*" (Gürbüz & Yıldırım, 2017). Another piece of information obtained about the mathematics views of prospective primary school teachers is that they formulate mathematics. There is an orientation that certain concepts that appear in the minds of the candidates are more meaningful and permanent when they are formulated.

The picture that emerged for prospective primary school mathematics teachers is a little more interesting. It was found that anxiety increased and decreased from subject to subject, whereas the peacefulness that symbols sometimes gave was replaced by fear as time passed (as the exam approached). One candidate's opinion on this subject is as follows: "*My maths anxiety changes from subject to subject. In the subjects I have difficulty with, my anxiety increases especially when I see the symbols of that subject.*" It was observed that the symbols and emotions expressed as mathematical symbols, in fact, these concepts could not be fully internalised, that is, the disadvantage of the concepts learned in primary and high school could not be overcome. In this case, prospective primary school mathematics teachers should first overcome their own fears and then start teaching. Because exam anxiety, which is one of the major problems of our country, also causes mathematics anxiety. In this case, especially mathematics teachers who take part in the teaching process in primary education have a great duty. The teaching they will do by concretising will be an opportunity for children to see how much mathematics is actually from life. In international exams such as PISA and TIMSS, the success level of our country is below the general average (Akbaş, 2018; Arslan, Güler, & Gürbüz, 2017). The state of mathematics achievement in these exams gives us a clue that mathematics should be concretised in the same way. Increasing the importance to be given to concretisation in the teaching activities to be carried out

and the wave effect that will be created in the student will help the student overcome mathematics anxiety, perceive mathematics more clearly and even learn mathematics. For all these, it is worth mentioning again that, first of all, primary school mathematics teachers and primary school mathematics teacher candidates themselves should overcome their mathematics anxiety. They should think of mathematics as independent from the exam and then make the child forget the exam anxiety in his/her mind and start education and training activities. If these are not realised, they can be beneficial neither for themselves nor for their students. In this case, it is the mathematics teachers who will push the students to prove some mathematical equations. Since children are young, it is equally easy for their minds to take shape. If the teacher encourages the child to prove, question and investigate, the child will progress in this plan. If the teacher directs children to rote logic, the child will achieve what he/she can at this level and leave the rest to the flow. In other words, he/she feels the need to look whenever it is in front of him/her.

*"If the teacher, who is a role model for the student in the first years of primary education, has developed a positive attitude towards mathematics, the student will also develop a positive attitude towards mathematics"* (Keklikci & Yilmazer, 2013). According to a study, *"it was determined that teacher satisfaction was effective in the mathematics anxiety of 4th and 5th-grade primary school students, and the mathematics anxiety of students who stated that they were satisfied with their teachers was statistically significantly lower than that of students who stated that they were not satisfied with their teachers"* (Peker & Şentürk, 2012). Therefore, the effect of the teacher is considerable. When the pre-service elementary mathematics teachers' view of mathematics as a formula was examined, it was found that their anxiety levels were not related to the formula. For the students of pre-service teachers who do not formulate mathematics in their minds, the activities they will carry out will undoubtedly be in a way that will not formulate mathematics. This will open a door for students to question and make connections. Students who question and make connections will constantly acquire new information in line with their research and will do their best to assimilate this information. The student's reaching his/her own formulae without depending on the formula is a situation that can be achieved rather than a utopia. From this point of view, mathematics teachers and prospective teachers, who will open the door to questioning, should develop themselves according to these conditions.

As for the situations in society, it was observed that mathematics anxiety was primarily caused by the teacher and then by the lack of concrete perception of mathematics. The individuals who emphasised that mathematics must be concretised stated that nothing was done to concretise it. They said that this deficiency in this subject is often encountered everywhere in their lives. *"The importance of mathematics for daily life should be discussed in order to get rid of students' known anxieties, fears and prejudices against mathematics course, to gain positive attitudes and to increase their success"* (Eskici & Ilgaz, 2019). This definition of an individual is important: "I have not seen any material used so far except for the abacus, which was already used in primary school." In addition, examples of incorrect concretisation were also presented. As an example of this, it is useful to examine the answer given by an individual. *"When maths concepts are mentioned, wolves and sheep come to my mind. There was an equality in the middle. When we went to the opposite side of the equality, wolves became sheep and sheep became wolves."* When these mind-boggling concepts on opposite sides of equality are explained to a young child, the trauma experienced becomes clearer. No matter how much age advances, some examples continue to stand there in the mind. This situation is actually an indication of the responsibility and burden of teachers.

Teaching is one of the most important professions that leave a mark on society. After individuals reach school age, they spend a lot of time at school and therefore with their teachers. The first idol for most individuals is the teacher. These individuals combine to form the society and play a role in shaping it. Consequently, the teachers who mould them are the first shapers of society. By using these shaping powers, mathematics teachers can overcome a large part of society's concerns with mathematics. The reactions from the society are in this direction. At the same time, there are also individuals who hate mathematics and are now involved in mathematics. The statements of this individual are worth questioning. The statement is as follows: *"I am afraid of maths symbols. I spent a lot of effort to learn, but I did not get very far."* *"Mathematics is the name of the science that rubs me as I run away in my life."* *"Learning*

*mathematics takes a lot of time. I thought it was unnecessary to spend so much time, but I encountered so much that I had to learn. I am now an accountant for a private company.*" These holistic answers to separate questions really summarise the perceptions in society. The main point where the symbols become a fearful dream, the compulsion to learn mathematics in relation to the state of necessity, and the situations of escape and pursuit converge is that mathematics is taught as it is rather than being taught as it should be. "*Mathematics is one of the most important courses that students have to learn*" (Yenilmez, 2010). If the first two teachers who hold the end of the rope in mathematics teaching do not hold it firmly, the rope will slip out of their hands and fall to the ground before the third teacher arrives. It should not be forgotten that even if a fallen thing is picked up from the ground, it is different from its first state and has lost its freshness. There is dust on it and that dust penetrates the deepest part of the rope. It is not possible to clean the rope from dust anymore. When we think of the rope as a student, the first ones to teach mathematics to the student are classroom teachers and primary school mathematics teachers. If they do not hold the student tightly, the student will quit mathematics. In this case, before reaching the high school mathematics teacher, the perception in the student's mind is clear: "Mathematics is something to be avoided." While the very idea that a teacher could have given this perception to a student is a chilling situation, to see a teacher doing it himself is truly unthinkable. The comment of an individual is as follows: "*I don't feel anxiety towards maths, but I don't want to solve it.*" The contrast here leads us to the conclusion that the individual can understand but does not make an effort to understand. Because in this case, it is observed that the individual actually develops a formula in his/her favour in order to escape from mathematics. Another participant interpreted an idea arising from this very contrast in this way: "*Mathematics is inequality within equality.*" In fact, this is one of the misconceptions of mathematics. Mathematics cannot be thought without equality. Because the state of equilibrium is the sine qua non of mathematics. A balance and order is sought in every operation, in every thought, and in every planned event. This is actually a requirement of mathematical thinking. Steps taken without calculation and without precaution are contrary to the language of mathematics. In fact, mathematics is a place where equality is for equality. Mathematics is to realise the smallest things. Mathematics is that the values of the items that are transferred to us as small are priceless when the time comes.

The words of the participant who made a metaphor of mathematics based on symbols are as follows: "*The symbols of mathematics make me visualise the sky in my mind. The situation changes according to whether I know and do not know. If I know the subject, I feel the sun in the sky, if I don't, I feel the dark clouds in the sky.*" The words expressed by the individual after his/her approach to these symbols are as follows "*Mathematics is a confusion of meaning for me. Concepts are understandable if the formulae are known. Otherwise, it is not possible to understand.*" When the answers given by the individual are analysed, it will be noticed that the individual has drawn a clear boundary between himself and mathematics. This boundary drawn with the help of the formula, if the formula is known, gives a feeling of relief, comfort and confidence, while if the formula is not known, everything turns the other way round and manifests itself as stress, difficulty in understanding, decrease in self-confidence, etc. This situation, which we observe with the help of this participant, is actually valid for most individuals in society. A formulaic perception of mathematics leads people to a dead end. This is because there are more formulae for only one subject than a human mind can comprehend. When other subjects are added on top of it, it becomes a big pile and the individual says that it is best not to get involved at all and stands aside. Here, an interpretation comes to the fore that individuals actually cannot establish the connection of mathematics with other subjects, cannot establish the connection of mathematics within itself, and likewise cannot establish the connection of other subjects within themselves. Einstein expressed his opinion on this subject with the following words: "*Why should I memorise what I can easily find in a book?*" Rather than memorising formulas, what individuals should do is to make the connection and understand the logic. There is no need to do anything more than that. Another conclusion to be drawn from this situation is the role of prospective classroom teachers in mathematics teaching as a result of the comments of the prospective classroom teachers, which are in parallel. It is realised that the problems of classroom teachers have created a sphere of influence in society in general.



Those who will positively expand this sphere of influence are again classroom teachers. Of course, in this context, they are also prospective classroom teachers.

We found it necessary to analyse the most common of today's problems separately. In general terms (12 out of 18 candidates), the first thing that came to mind when mathematics was mentioned in the minds of prospective primary and elementary mathematics teachers and individuals in the society were numbers, digits and other concepts including these. The fact that 66.7% associated an abstract concept such as number with mathematics is an indication that mathematics actually remains within an abstract framework and cannot go beyond it. This opinion stems from the explanations made only for procedural knowledge about the concept of number. In addition to this, it is also a striking result for us that the concepts of number and digit are not fully established in the mind. It is useful to share a sentence. *"...a number like 15,000,000 is mentioned..."* As it can be understood from the sentence, 15.000.000 is a number, but it is described as a number. This frequently expressed mistake gives us information about how mathematics is incorrectly transferred to daily life. If analysed in a systematic order, numbers emerge and numbers emerge as a result of their combination. This anxiety caused by not knowing what numbers and digits are is in the nature of an explanation of the prejudiced approach to mathematics caused by misconceptions. These misconceptions seem to be small at first, but when we go deeper, we see that every data actually starts with numbers and then is replaced by numbers. Therefore, classroom teachers, who have a large share in the teaching of numbers, should concretise and teach the numbers in depth and then move on to the teaching of numbers. After teaching the teaching of numbers by concretising them, they will have solved the problem that the student will encounter throughout his/her mathematics life and will allow the student to breathe a sigh of relief. In this case, it will be useful for prospective classroom teachers to realise the magnitude of their responsibilities in advance. If the mathematics teacher, after the classroom teacher, transfers the theoretical knowledge to the student after transferring it to practice, the mathematics anxiety of most of the students will end. This will give us the good news that mathematics anxiety, which has now turned into a phobia in society, will decrease. Because mathematics is the road we walk, the breath we take, the pen we hold, the book we read. It would not be fair to evoke any other situation in our minds and reach the conclusion that mathematics is difficult.

As can be understood from the common issues mentioned by prospective primary and elementary mathematics teachers and individuals in the society, it was determined that there was a general problem in the placement and assimilation of mathematical concepts, that they thought of mathematics independently from daily life, that they were surrounded by certain boundaries in their minds and that individuals could not go beyond these boundaries. While understanding, interpreting and solving the problem does not cause a great deal of anxiety in primary school mathematics teacher candidates who are more interested in mathematics, problems and their interpretation cause a little more anxiety in primary school teacher candidates. In society, there is a certain anxiety about not being able to solve the problem. It was observed that society has a prejudice against these problem concepts, even though this situation, which is thought to be caused by exams, is a daily life problem. Parallel thoughts among themselves also show how much mathematics is related to each other. Therefore, the information presented to the student during a teaching activity should be in a way to leave a question mark in the student's mind. Research in terms of the student's readiness will be useful for him/her. When the student hears the information again with the teacher, his sense of curiosity will increase and he will be more interested in the lesson. This will help the student to place the information and will continue the wave effect at the point of influencing the environment. As the interaction between teacher-student-society can never be considered independent of each other, the interaction and diffusion in the ideas of these three are also considerable.

## 5. Conclusion

Mathematics is the concretisation of the abstract world. With the help of discoveries and inventions, this science, which has managed to make itself known everywhere in daily life, manifests itself as anxiety at all levels of society. In this study, it was observed that mathematics could not be provided with a schema belonging to the mind due to wrong

conceptualisations and prejudices. The use of more abstract concepts in mathematics teaching has caused students to show an opposite reaction against mathematics. By overcoming these fears, the hidden world of mathematics and its unique dance that amazes us will open its doors to every individual (Launay, 2018). Özkubat, Karabulut and Akçayır (2020) found that schema-based mathematics problem-solving interventions increased the problem-solving performance of students with learning disabilities and proved to be an effective intervention. This shows that schema-based learning can overcome many barriers to learning.

As can be understood from all these, prospective primary school teachers and prospective elementary mathematics teachers are the carriers of the mathematics consciousness integrated into society. In this respect, they should be aware that every concept they will teach will find itself in a schema and will not be forgotten for a long time. Since the concepts of mathematics will be encountered everywhere in life, these concepts should be made meaningful at a young age. The most important tool for this will undoubtedly be concretisation. If primary and elementary mathematics teacher candidates have sufficient knowledge about concretisation, if they master the use of teaching techniques and discussion techniques to be used, and if they establish a relationship with students to visualise the concepts in their minds instead of being exam-oriented in their communication with students, it is thought that the perception in the society can be prevented after a certain period with the help of these students who seem to be just a class at first but feed the society. In this context, concretisation is essential for every individual. It is thought that identifying the concepts associated with the problem with the situations that students encounter in daily life at first and then moving on to higher level concept teaching will improve students' interpretation skills. It is thought that every teacher who strives for interpretation should definitely benefit from updating activities.

## 6. Acknowledgements

This research was approved by decision number 2023/22-07 by the Social and Human Sciences Publication Ethics Committee of Van Yuzuncu Yil University on 23/08/2023.

## 7. Disclosure of Conflict

The authors declare that they have no conflicts of interest.

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