

# Qualifications of an Effective Mathematics Teacher from the Perspectives of 5<sup>th</sup> to 8<sup>th</sup> Grade Secondary School Students

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**Abstract** The present study aimed to examine an effective mathematics teacher's qualifications from the perspectives of secondary school students. The study was a qualitative one carried out with the descriptive model. The study was carried out with 40 students from all the four class grades of a secondary school (10 students from each class grade) in Turkey in the academic year of 2017-2018. The participants were determined using the purposeful sampling method. As the data collection tool, semi-structured interview questions were used, and the interviews were audio-recorded to avoid any data loss. For the analysis of the data, first, the interviews were transcribed and then analysed using the content analysis method. The results revealed that according to the students' views, the qualifications of an effective mathematics teacher were grouped under four categories: "personal traits", "communication skills", "class management and teaching methods" and "measurement-evaluation". It was also seen that regardless of the school type they would choose for their high school education, all the students had an idea about the qualifications of a mathematics teacher and that it was not much easy to become an effective mathematics teacher. In addition, it was found that there were differences between the views of the 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students with respect to their cognitive levels and needs. In line with the qualifications examined, various suggestions were put forward to increase the effectiveness of the mathematics teachers and of the process of mathematics teaching.

**Keywords** Secondary School Students, Teacher Qualifications, Effective Mathematics Teacher, Mathematics Teaching

rapid changes and developments like globalization and restructuring have brought about renovations in the field of education [1]. As a result, various changes have occurred in the understanding of learning and teaching. With these changes, it is now more important to apply our knowledge in our lives. In order to keep up with these changes, individuals who are in their education process are expected to have such effective qualifications as researching, questioning, problem solving, critical thinking, making use of technology, expressing one's thoughts and producing information [2].

It is the educational institutions' duty and responsibility to meet the requirements of this era. In order for educational institutions to carry out these duties, it is necessary to increase the quality within the education system [3]. Studies on increasing the quality of the education system make it compulsory to introduce comprehensive reforms to teacher training programs [4]. In this respect, the teacher and his or her qualifications, which constitute the basis of the education system, become prominent [3-7]. Therefore, the reforms to be introduced to the education system should not only cover the teacher training process but also be involved in the self-development process of teachers. In this process, it is important for teachers to update themselves in line with the current developments and changes and to become an effective teacher. When studies on the qualifications of an effective teacher are examined, it is seen that a teacher should have certain qualifications apart from efficacy in teaching [8-21] and that these qualifications have generally been classified as personality traits, intellectual qualifications and approaches to teaching. This situation shows that the qualifications mentioned in related studies should be taken into account in education systems as well as in teaching training institutions.

Our education system, which has constantly been reformed in line with the changes and developments in recent years, has gone through related innovations in

## 1. Introduction

In the 21<sup>st</sup> century, an era which requires information use,

terms of the curricula applied in elementary, secondary and high schools [22]. In secondary school course curriculum of mathematics, the overall course objective is said to help students acquire the attitudes, knowledge and skills necessary in their lives as well as in their education process [22]. The fact that mathematics is abstract and that students fail to understand it well and that it is mostly regarded as a difficult field for students to learn [23] is one of the causes that lead to this innovation. Altun [24] and Van de Walle [25] point out that dealing with math does not just involve solving numerous mathematical problems on behalf of the teacher but includes mental processes such as developing solutions together with students and evaluating whether the application and its consequence are meaningful or not. To a great extent, it is the mathematics teacher who will develop students' skills like reasoning, relating and problem solving within the scope of mathematics teaching and who will help students acquire the mathematical knowledge, skills and other related positive attitudes. When viewed from this perspective, the qualifications of a mathematics teacher and his or her roles and behaviours are of great importance. Therefore, in renewed mathematics curricula, the reforms especially regarding the qualifications of a teacher have been introduced in line with the points mentioned above. It is reported that as one of the basic qualifications of an effective teacher, he or she should have good professional knowledge as well as good knowledge of mathematics [7,26], yet it is also pointed out that this type of knowledge is not sufficient alone. In their study, Foss and Kleinsasser [27] concluded that a good teacher should not only be patient, flexible and motivating but also create an entertaining class atmosphere that supports learning mathematics. When the related literature is reviewed, it is seen that there are several studies focusing on the qualifications that especially mathematics teachers should have [1,28-30]. All these studies revealed that mathematics teachers were able to use the developing technology in their courses and to create student-centred class environments and that they had effective communication skills. Similarly, other studies reported that as part of their qualifications, teachers were expected to have field knowledge and to know how to teach mathematics [31,32]. Different from these qualifications, some other studies demonstrated that students develop anxiety regarding mathematics due to their negative experiences they had with their mathematics teachers [33-35]. In general, anxiety will lead to failure, which will inevitably cause students to have difficulty in learning mathematics. In this respect, it is seen that teachers' attitudes towards their students are of great importance with respect to shaping their students' viewpoints about mathematics so that they can approach positively to mathematics.

When the success level of our country in international exams like PISA and TIMSS is examined, it is seen that

not enough success has been achieved specifically in mathematics [36]. These results show that we are not successful enough to have our students acquire the intended skills. Therefore, whether this situation is based on the teaching-learning process or on the student-teacher has always constituted the research questions directed in related studies. In this respect, the present study focused on students' views about whether the problem in question is related to mathematics teaching or to the qualifications of the mathematics teacher.

Students' views constitute an important reference to be taken into account while determining efficacies of a teacher. A frequent method to define the characteristics of a qualified teacher is to make use of students' views for the evaluation of teachers [16]. Due to the fact that the student and the teacher are regarded as the main building blocks of education, in the present study, students' views were taken into account while determining the teacher *qualifications*. In addition, considering the importance of mathematics during secondary school education, a period of transition to high school in which students develop their basic mathematical knowledge, it is fairly necessary to evaluate the qualifications of a mathematics teacher. In this respect, examination of especially secondary school students' views about the qualifications of a good mathematics teacher is thought to provide field experts, teachers and the education system with insights into what qualifications an effective mathematics teacher is expected to have. Therefore, the purpose of the present study was to examine the qualifications of an effective mathematics teacher from the perspectives of secondary school 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students. In line with this purpose, the main research problem was the question of "what are qualifications of an effective mathematics teacher from the perspectives of secondary school students (5<sup>th</sup> to 8<sup>th</sup> grade)"

### 1.1. Grades in Turkish Education System and School Type Preference

The education system in Turkey is centrally organized, and the Ministry of Education (known as MEB in Turkey) is the main body for planning, programming, implementing, monitoring, and controlling education and for training services including development of school curricula [37]. The curricula are prepared by commissions made up of teachers, educational experts, academicians and representatives from the relevant departments of MEB. In this way, the development of curricula is ensured by teachers, parents, school administrators and experts from all over the country together with the MEB officials.

In Turkey, the education system is divided into grades. These grades include preschool education (kindergartens or nursery schools), elementary school 1<sup>st</sup> step (primary schools), elementary school 2<sup>nd</sup> step (secondary schools), high school education (high schools) and higher education (universities). Secondary school students include 5<sup>th</sup>, 6<sup>th</sup>,

7<sup>th</sup> and 8<sup>th</sup> grade students aged between 10 and 13 years old [22]. In addition, the High School Placement Test (known as LGS in Turkey) administered to secondary school 8<sup>th</sup> grade students at the end of the related academic year allows placing students in high schools in accordance with their levels of achievement in this test. Students who do not take LGS are placed in other high schools based on their average academic scores in their secondary school education. According to MEB, high school types can be classified based on the intensity of the course of mathematics as follows: science high schools, Anatolian high schools, vocational and technical Anatolian high schools, social sciences high schools, religious high schools, multi-program Anatolian high schools, fine arts high schools and sports high schools. In this respect, the school type with the most intensive mathematics is the science high school. Therefore, it was thought that the school type could be influential on determining the qualifications of a math teacher based on the views of secondary school students, who constituted the research sample in the present study.

### 1.2. A Mathematics Teacher's Efficacies in Teaching Mathematics

In the process of learning mathematics, there are a number of factors influential on students' viewpoints regarding mathematics. Among these factors, the efficacies of a mathematics teacher in teaching mathematics play an important role in the process. In this respect, MEB gathered the efficacies of teachers who will apply a student-centred curriculum under the headings of "knowing the student, learning and teaching process, monitoring and evaluating students' learning and development, school-family and society relations, program and content information" [22]. When the related international literature is reviewed, it is seen that research conducted previously on a teacher's professional efficacies [38,39] is prominently on the agenda today as well [40]. In this respect, An, Kulm and Wu [41] and Shulman [32] claim that field knowledge is not enough alone for an effective teaching process, and they point out that dimensions such as knowing the nature of mathematics, recognizing students' misunderstandings, developing students' mathematical ideas and increasing students' mathematical thinking are also important for the process of teaching. When these dimensions are considered to be among mathematic teachers' efficacies in teaching

mathematics, it is obvious that we will trigger students' potential in mathematics. In other words, teaching efficacies of teachers are also influential on broadening students' horizons. Therefore, in the present study, it is thought that it is important to evaluate qualifications of a teacher influential on teachers' efficacies from the perspectives of students.

## 2. Materials and Methods

This part presents information about the research model, the study group, data collection tools and about data analysis.

### 2.1. Research Model

The present study aimed to provide a viewpoint regarding what qualifications an effective mathematics teacher should have in line with students' views. In line with this purpose, the study was carried out as a qualitative one with the descriptive model. The qualitative research design is a technique favoured since it allows revealing individuals' understandings, emotions and thoughts as a whole within their own natural and realistic context [42]. According to Özdemir [43], qualitative data analysis is the whole of activities such as organizing the data collected with data collection tools like interviews, categorizing these data, revealing the related themes, and reporting the results obtained.

### 2.2. Participants

While determining the study group, the purposeful sampling method, which allows in-depth examination within the scope of convenient sampling based on the purpose of study, was used [44]. In this respect, the study was carried out with a total of 40 secondary school 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students (10 from each class grade) in the academic year of 2017-2018 (In Turkey, secondary school period covers the class grades ranging between the 5<sup>th</sup> and 8<sup>th</sup> class grades, and students aged between 10 and 13 years old take this education). While determining the students' views about the "qualifications of an effective mathematics teacher", the school type they would prefer in future were specifically identified (see 1.1). In addition, the students took part in the study on voluntary basis, and the Table 1 below presents information about the students.

**Table 1.** Information about the Students Participating in the Study

Class Grade	Code	Gender	School Type to Be Preferred				Number of Students (Total)
			Science High School	Anatolian High School	Vocational and Technical Anatolian High School	Social Sciences High School	
5 <sup>th</sup> Grade Students	S1	Female	X				10
	S2	Female		X			
	S3	Male			X		
	S4	Male				X	
	S5	Male	X				
	S6	Male	X				
	S7	Female		X			
	S8	Female		X			
	S9	Male			X		
	S10	Female	X				
6 <sup>th</sup> Grade Students	S11	Female		X			10
	S12	Female	X				
	S13	Female				X	
	S14	Male		X			
	S15	Male			X		
	S16	Male			X		
	S17	Male	X				
	S18	Female	X				
	S19	Female		X			
	S20	Male				X	
7 <sup>th</sup> Grade Students	S21	Female		X			10
	S22	Female	X				
	S23	Female				X	
	S24	Male			X		
	S25	Male		X			
	S26	Male			X		
	S27	Female	X				
	S28	Female	X				
	S29	Male	X				
	S30	Male				X	
8 <sup>th</sup> Grade Students	S31	Female	X				10
	S32	Female	X				
	S33	Female				X	
	S34	Male		X			
	S35	Male		X			
	S36	Male			X		
	S37	Female	X				
	S38	Female		X			
	S39	Male	X				
	S40	Male			X		

When Table 1 is examined, it is seen that there was an equal distribution of the gender of the students participating in the study with respect to each class grade (Distribution of the students' gender depending on their class grades: 5 male, 5 female; total distribution 20 male; 20 female). In addition, there were four school types that the students preferred to attend in future (science high school, Anatolian high school, vocational and technical Anatolian high school and social sciences high school). According to Table 1, there were 15 students willing to attend science high school, 11 students to attend Anatolian high school, eight students to attend vocational and technical Anatolian high school and six students willing to attend social sciences high school. These school types were general those involving intensive mathematics (See. 1.1.). It is thought that this preferences of the students might have been influenced by the importance of the course of mathematics in their daily lives.

### 2.3. Data Collection Tool

Within the scope of the study, for the purpose of revealing the participants' emotions, thoughts, beliefs and viewpoints regarding the research topic [42], the semi-structured interview method was used it allows changing the order of the questions and explaining the questions in a more detailed manner [45]. In order to find answers to the main research problem, eight open-ended interview questions were determined and presented to three field experts' views. The interview questions arranged in line with the experts' views were directed to the participants at their own schools. For the purpose of avoiding any data loss, the interviews were audio-recorded. In the study, the questions directed to the students were as follows:

- (1) Do you like the course of mathematics? What is the influence of your teacher on this emotion of yours?
- (2) What is your communication with your mathematics teacher like? How do you think this communication should be?
- (3) What should your class environment and the teacher be like for the course of mathematics?
- (4) While teaching the mathematics-related subjects, what type of materials would you you're your teacher to use? Please state your reasons.
- (5) What are your expectations from an effective mathematics teacher? While answering this question, do not consider the school type you would like to choose in future.
- (6) What type of a role model should your dream mathematics teacher be for you?
- (7) What should a mathematics teacher who will meet your expectations from a mathematics teacher do to achieve meaningful learning in the course of mathematics?
- (8) What type of a measurement-evaluation (exam system) should the ideal mathematics teacher you

have defined use to evaluate learning in his or her course?

### 2.4. Data Analysis

In the first phase of the analysis of the data collected in the study, first of all, the data collected via the semi-structured interviews were transcribed. Following this, the qualitative data were examined using the content analysis method and the code-definition table was formed. Content analysis is a technique that gathers similar data within the framework of certain concepts and themes and arranges them in a way to allow the reader to understand the data easily [44]. For the analysis of the data, the students participating in the study were coded based on their class grades as S1, S1, ... , S10 for the 5<sup>th</sup> grade; S11, S12, ... , S20 for the 6<sup>th</sup> grade; S21, S22,..., S30 for the 7<sup>th</sup> grade and S31, S32,... , S40 for the 8<sup>th</sup> grade. In the second phase, the qualitative data collected from the students were examined by two faculty members experienced in the field of qualitative research. Of the research data, 20% of them [46] were randomly given to the coders, and they were asked to recode the data according to the code-definition table prepared by the researchers. The reliability of the qualitative analysis was calculated based on the codings done by the researchers and by the two coders with the formula suggested by Miles and Huberman [47] [Reliability = Agreement / Agreement + Disagreement.100]. In the study, when the agreement percentages regarding the codings were examined, it was seen that for all the codings, the overall agreement percentages were 0.84 for the researchers and the first coder and 0.80 for the researchers and the second coder. As for the average agreement for the researchers and the two coders, it was calculated as 0.82. In relation to the coding reliability of the researchers, it is reported that the agreement percentage should be over 70% [47].

Following this, the codings were examined with respect to their fit, and the data were categorized. The data categorized were made meaningful to the reader with the help of the codings and frequencies. In addition, within the scope of the reliability of the study, direct quotations regarding the data were used to help reveal from what perspective the codings were done. For the presentation of the data, the criteria of being impressive (different views), being explanatory (appropriateness to the code) and variety were taken into account while choosing the quotations [48].

### 2.5. Results

As a result of the content analysis conducted on the data, four main categories and the sub-codings for these categories related to the qualifications of a mathematics teacher were revealed. Figure 1 presents the categories obtained via the students' views. When Figure 1 is

examined, it is seen that the students' views about the qualifications of an ideal teacher were gathered under four main categories: "personal traits", "communication skills", "class management and teaching methods" and "measurement and evaluation". Tables 2, 3, 4, 5 and 6 demonstrate the sub-codings regarding the students' views for these categories.

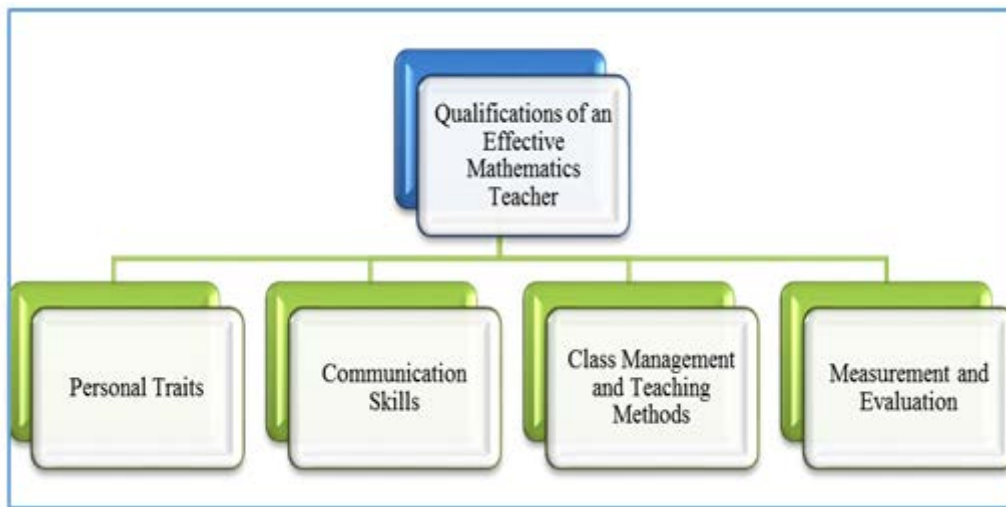
When Table 2 is examined, it is seen that among the qualifications of a mathematics teacher, most of the students mentioned personality traits and communication skills most regardless of the school type they would choose at high school. In addition, the 5<sup>th</sup> and 6<sup>th</sup> grade students reported that personality traits and communication were the most important among the qualifications of a mathematics teacher. It was also found that the 7<sup>th</sup> and 8<sup>th</sup> grade students reported more views about the categories of class management, teaching methods and measurement-evaluation. Below are the related views of some of the students.

*S22: My math teacher should behave equally and avoid discrimination among his or her students. He should always be good-humored, entertaining, tolerant and dependable (Personality Traits).*

*S3: We should be able to talk to our teacher not only in class but in out-of-class environment as well. We should consult him or her when necessary (Communication Skills).*

*S11: He or she should teach mathematics without boring us, and we should enjoy listening to him or her in class. He or she can use the smart board or the computer while teaching because we then learn more easily and participate more in the lesson (Class Management and Teaching Methods).*

*S5: My math teacher should consider my performance during the lesson. I mean not all students are the same. Some are good at multiple-choice tests and some are good at practice. Thus, he or she should evaluate us accordingly (Measurement and Evaluation).*



**Figure 1.** Categorization of the Qualifications of a Mathematics Teacher in Line with the Students' Expectations

**Table 2.** Categorization of the Qualifications of a Mathematics Teacher in Line with the Students' Expectations

Categories	f*	Student Codes
Personal Traits	38	S1, S2, S3, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S33, S34, S25, S36, S37, S38, S39, S40
Communication Skills	37	S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12, S13, S14, S15, S16, S17, S18, S19, S20, S21, S22, S23, S24, S25, S26, S28, S29, S30, S32, S33, S34, S35, S36, S37, S38, S39
Class Management and Teaching Methods	27	S1, S4, S7, S8, S11, S12, S14, S17, S19, S20, S21, S23, S24, S25, S26, S27, S28, S29, S30, S31, S32, S34, S35, S36, S37, S38, S40
Measurement and Evaluation	22	S2, S5, S6, S13, S17, S18, S20, S21, S23, S24, S25, S26, S28, S29, S30, S31, S32, S34, S36, S37, S38, S39

\*Some of the students participating in the study reported more than one view.

**Table 3.** Personal Traits

Personal Traits	f*	Student Codes
Frank/sincere	13	S2, S5, S10, S11, S19, S20, S24, S28, S30, S31, S35, S37, S39
Making the lesson pleasant	11	S1, S5, S6, S8, S13, S17, S18, S25, S33, S32, S38
Easy-going/Good-humored	14	S3, S6, S10, S11, S12, S14, S22, S23, S26, S27, S30, S31, S39, S40
Entertaining/Humorous	9	S21, S22, S25, S28, S31, S33, S34, S36, S38
Egalitarian and Fair	17	S13, S14, S15, S17, S18, S19, S20, S21, S22, S23, S24, S25, S27, S30, S31, S33, S35
Respectful	11	S6, S8, S18, S21, S23, S25, S26, S28, S34, S35, S38
Tolerant/Merciful	16	S1, S2, S7, S9, S12, S14, S18, S19, S20, S22, S28, S30, S31, S34, S35, S40
Hardworking and effective	10	S15, S20, S21, S24, S28, S29, S30, S36, S39, S40
Good-looking	9	S3, S4, S5, S8, S9, S26, S29, S30, S32
Speaking fluently and well	9	S11, S12, S13, S15, S27, S29, S30, S34, S39
Giving confidence	9	S3, S7, S9, S10, S20, S22, S23, S37, S38
Benevolent	9	S12, S16, S17, S24, S25, S33, S34, S37, S38

\*Some of the students participating in the study reported more than one view.

Table 3 presents the sub-codings, student codes and frequencies for the category of “personal traits” obtained via the students’ views about the qualifications of a mathematics teacher

When the qualifications mentioned by the students regarding the personality traits of an effective mathematics teacher were examined, it was seen that being egalitarian/fair and being tolerant/merciful were among the most frequent personal traits that an effective mathematics teacher should have. Other important personal traits included being easy-going/good-humoured, frank/sincere, respectful, making the lesson pleasant, hardworking/effective, benevolent, entertaining/humorous, speaking fluently/well, giving confidence and good-looking. In addition, there were students who reported that a mathematics teacher should give importance to discipline and planning. When the students’ responses were examined, it was seen that the 5<sup>th</sup> and 6<sup>th</sup> grade students mostly mentioned such personal traits of an effective mathematics teacher as being frank/intimate, tolerant/merciful, making the lesson pleasant and that the 7<sup>th</sup> and 8<sup>th</sup> grade students mostly mentioned personal traits such as being egalitarian/fair and hardworking/effective. This difference is thought to be due to the fact that students from different age groups have different needs. Some of the students’ views about the personal traits of a mathematics teacher were as follows:

*S15: An ideal mathematics teacher should be honest, hardworking and equal, give equal talking time to everyone in class and speak fluently and well in class (Egalitarian and fair, speaking fluently and well, hardworking and effective).*

*S19: To me, my math teacher should be tolerant, behave everyone fairly and equally. Also, I also take the honest side of my teacher as a role model (Tolerant/merciful, egalitarian and fair, frank/honest).*

*S37: The teacher should be helpful and sensitive to students, and they should be able to talk about their problems. Also, the teacher should earn students’ trust (Giving confidence, benevolent).*

*S26: I think my math teacher should be someone who is respectful to his or her students and who should dress well and have a smiling face (Good-looking, respectful, easy-going/good-humored).*

*S36: To me, the teacher should be entertaining, humorous and hardworking. I mean he or she should not be too serious (Entertaining/humorous, hardworking and effective).*

*S33: I think mathematics is a difficult course, and the teacher is the person who will make the lessons entertaining. Thus, the teacher should draw students’ interest and help them love the course. Also, the teacher should be benevolent (Making the lesson pleasant, benevolent).*

*S40: The teacher should be intelligent, hardworking, and tolerant and have a smiling face and do mathematical calculations quickly in mind (Hardworking and effective, easy-going/good-humored, tolerant/merciful).*

Table 4 presents the sub-codings, student codes and frequencies for the category of “communication skills” obtained via the students’ views about the qualifications of a mathematics teacher.

**Table 4.** Communication Skills

Communication Skills	f*	Student Codes
Out-of-class communication	16	S1, S3, S7, S8, S11, S14, S18, S20, S21, S23, S25, S30, S32, S34, S38, S40
Attitude towards students	26	S1, S2, S6, S9, S10, S12, S14, S16, S17, S18, S19, S20, S21, S22, S24, S25, S26, S29, S30, S33, S35, S36, S37, S38, S39, S40
Caring	11	S21, S22, S23, S24, S25, S29, S32, S33, S34, S36, S38
Good use of tone of voice	11	S1, S8, S13, S15, S16, S19, S30, S35, S37, S38, S40
Effective use of Turkish	8	S4, S11, S12, S15, S23, S26, S28, S34
Calling students by their names	6	S5, S8, S9, S17, S22, S39

\* Some of the students participating in the study reported more than one view.

When Table 4 is examined, it is seen that according to the students' views, the most important communication skill of a mathematics teacher was the math teacher's attitude towards students. The students who reported that a mathematics teacher should demonstrate good and sincere attitudes towards students believed that the teacher should not behave students offensively. The students also pointed out that in a difficult course like mathematics, the teacher's attitudes towards students were fairly influential on students' interests and achievements in the course. According to a great majority of the students, other important communication skills of an effective mathematics teacher included out-of-class communication, caring students and using tone of voice well in class. In addition, there were some other students who believed that an effective teacher should use Turkish effectively and call his or her students by their names. Some of the students' views about the communication skills that a mathematics teacher should have were as follows:

*S25: We have a teacher-student relationship with our math teacher in class and a teacher-friend relationship during break times. Our teacher behaves us sincerely out of class, and we have a very good communication. To me, this relationship must be based on respect. Also, an ideal teacher should not be offensive towards us (Out-of-class communication, attitude towards students, caring).*

*S29: I have a really good communication with my teacher. The teacher is interested when I have a*

*family-related problem, and he cares all students and tries to solve their problems, if any, whether they are hardworking or lazy. He is sincere, and when necessary, serious. I think an ideal math teacher should be like him (Attitude towards students, caring).*

*S14: We have a good and sincere communication. He never shouts at us or gets angry with us. He really understands us. A good teacher should be like him. If not, I will never be interested in math, and if so, I will not be able to learn anything in lessons. Also, a student should have the chance to communicate with the teacher out of class (Out-of-class communication, attitude towards students).*

*S37: The teacher should not talk to students too loudly in class. I mean he should not shout or yell at them. He should pay attention to this while trying to establish communication with us (Attitude towards students, good use of tone of voice).*

*S15: To me, a teacher should not shout while communicating. He should speak well and fluently (Good use of tone of voice, effective use of Turkish).*

*S5: Our teacher should call us by our names while talking to us. He should communicate with us in this way (Calling students by their names).*

Another qualification of a mathematics teacher identified via the students' views was 'class management and teaching methods'. Table 5 presents the sub-codings, student codes and frequencies belonging to the category of 'Class management and teacher methods'.



**Table 5.** Class Management and Teaching Methods

Class Management and Teaching Methods	f*	Student Codes
Class Management	7	S21, S23, S27, S28, S30, S35, S38
Way of teaching the lesson (interesting, appropriate to the level)	20	S1, S4, S7, S11, S14, S17, S19, S21, S23, S25, S27, S28, S29, S30, S32, S34, S35, S36, S37, S38
Use of concrete materials	18	S1, S7, S8, S12, S14, S17, S20, S21, S23, S26, S28, S30, S31, S32, S34, S35, S36, S40
Achieving active participation	13	S1, S11, S12, S14, S20, S21, S23, S27, S28, S31, S37, S38, S40
Giving efficient examples to achieve the target goals	12	S4, S19, S24, S25, S26, S27, S29, S32, S31, S35, S36, S38
Paying attention to individual differences	9	S21, S25, S26, S28, S30, S31, S34, S35, S40
Variety in methods and techniques	9	S20, S21, S24, S27, S28, S31, S32, S34, S38
Use of technology in class	14	S1, S4, S7, S11, S12, S17, S19, S20, S24, S25, S31, S34, S38, S40
Providing up-to-date information about the lesson subject	7	S21, S25, S28, S32, S37, S38, S40

\* Some of the students participating in the study reported more than one view.

When Table 5 is examined, it is seen that according to the students' views, the most important qualifications of a mathematics teacher regarding class management and teaching methods included way of teaching the lesson and use of concrete materials. This situation was true for most of the students regardless of the school type they would like to choose at high school. The students reported that a mathematics teacher should teach the lesson subjects as appropriate to the students' level and interest. Among the participants, especially the 7<sup>th</sup> and 8<sup>th</sup> grade students thought that a mathematics teacher should use technology actively in class and encourage students to participate actively in lessons. In addition, the students pointed out that mathematics was important to get the opportunity to good-quality schools and that dealing with more mathematical problems would be influential on the development of problem solving skills. Also, it was reported that the teacher should solve a sufficient number of mathematical problems via related games and activities in class to achieve the target outcomes of the course. Some of the students stated that a mathematics teacher should use a wide variety of methods and techniques in class, provide up-to-date information about the lesson subjects, have a good class management and take students' individual differences into consideration. Some of the students' views about class management and teaching methods to be adopted by a mathematics teacher were as follows:

*S17: The teacher should teach the lesson subject well. He or she can also bring related materials in class, use the smart board and videos as well. I learn better in this way (Way of teaching the lesson, use of concrete materials, use of technology in class).*

*S23: First of all, the math teacher should teach the lesson subject very well. Also, he or she should use related materials while teaching. In this way, I participate more in class. Also, he or she should control the whole class during the lesson. This is quite important (Class management, way of teaching the lesson, use of*

*concrete materials, achieving active participation).*  
*S27: First of all, the student should enthusiastically say "I will solve this math problem on the blackboard", and the teacher should encourage students to solve as many math problems as possible until they understand the subject because this is absolutely necessary for students to get the right to attend a good high school. Also, the teacher should not always use the same method of teaching in class. I mean he or she should use games and activities to increase our participation in class. There shouldn't be anything in class like noise, which will distract our attention (Class management, way of teaching the lesson, achieving active participation, giving efficient examples to achieve the target goals, variety in methods and techniques).*

*S40: Our teacher should bring related materials into class while teaching. I am an 8th grade student, and many math subjects require visuality. I understand math subjects better via such materials. I mean the teacher should teach the lesson in the way students learn easily. In this way, we will participate more in class. Also, math is very important to have the opportunity to attend a good high school. For this reason, students have to solve numerous math problems. We always see that everything is changing rapidly, and our teacher should share these changes with us (Use of concrete materials, achieving active participation, paying attention to individual differences, use of technology in class, providing up-to-date information about the lesson subject).*

Another factor related to the qualifications of a mathematics teacher was reported by the students to be "measurement and evaluation". It was seen that measurement and evaluation constituted an important factor for a teacher to be effective. Table 6 presents the sub-codings, student codes and frequencies regarding the students' views about the category of "measurement and evaluation".

**Table 6.** Measurement and Evaluation

Measurement and Evaluation	f*	Student Codes
Considering in-class performance (personal success, feedback)	18	S2, S5, S6, S13, S18, S20, S23, S24, S25, S26, S28, S29, S31, S32, S34, S36, S37, S38
Considering cognitive level	14	S6, S17, S18, S20, S21, S23, S24, S25, S29, S30, S31, S32, S38, S39
Considering individual differences	13	S2, S5, S13, S17, S20, S21, S25, S26, S31, S32, S36, S37, S39
Variety in measurement and evaluation (traditional, multiple-choice test, theoretical, practice, high mark)	9	S20, S21, S23, S24, S29, S30, S32, S34, S37

\* Some of the students participating in the study reported more than one view.

When Table 6 is examined, it is seen that according to the students' views, a mathematics teacher should mostly consider students' in-class performance by giving feedback. This situation was true for most of the students regardless of the school type they would choose for their high school education. Within the scope of in-class performance, it was pointed out that students' personal success, participation in class, fulfilling the given tasks, problem-solving skills and their responses to the feedback given and to the questions directed. Also, most of the students believed that a teacher should consider students' cognitive levels and individual differences in the process of measurement and evaluation. In addition, the 8<sup>th</sup> grade students pointed out that a high mark to be given in the course of mathematics was necessary to have the chance to attend a good high school in future, and they also believed that math exams should be conducted in line with the university placement exam and that the teacher should not assign low scores for the exams. In addition, a mathematics teacher should use various exam techniques in the process of measurement and evaluation (traditional, multiple-choice and so on), conduct practical exams and direct questions in the way everyone can understand easily. Some of the students' views about the measurement-evaluation process for a mathematics teacher were as follows:

*S23: First, the teacher should consider whether I participate in lessons or not and should prepare exams appropriate to my level. I mean the exams should not be too difficult but include all types of questions like multiple-choice questions or traditional questions. Also, if the teacher provides feedback, I will be able to see good and bad sides of my performance (Considering in-class performance, considering cognitive level, variety in measurement-evaluation).*

*S25: To me, my math teacher should not just consider my written exam score because not all students are the same. The teacher should consider how that child was in the 5th grade or 6th grade class, and he or she should think about how that student is now. Thus, the teacher should ask questions in exams according to my level and provide feedback. Also, he or she should consider my participation in lessons while evaluating me (Considering in-class performance, considering cognitive level, considering individual differences).*

*S32: While evaluating us, the teacher should give an*

*exam as appropriate to our level. The exam could be practical even including games. It could also be traditional. I mean the exam should be varied. Our math exams should include questions like those directed in the university placement exam. Also, our marks should not be low; that's, the teacher should not give low marks because our average mark in math is very important for us to attend a good high school in future (Considering cognitive level, variety in measurement-evaluation).*

### 3. Discussion, Conclusions and Recommendations

Mathematics is a basic universal communication tool which constitutes the basis of analytical thinking and which allows understanding the world. Besides the importance of mathematics in students' education lives and the importance of the teacher to teach this course, it also plays an important role for students while determining their future professions. Therefore, determining the qualifications of teachers of this course from students' perspectives will not only allow mathematics teachers to become more effective teachers but also contribute to the development of students' understanding mathematics. This development will have positive influence on the development of students' carriers in their future lives as well. No one has claimed or can claim that it is easy to become an effective and good teacher of especially mathematics. In addition, all the interviews revealed that there were more than one way of becoming an effective mathematics teacher. In this respect, the present study tried to determine the qualifications of an effective mathematics teacher from the perspectives of secondary school 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students, who had the chance to observe their teachers directly.

When the findings obtained in the study were examined, it was seen that the qualifications of a mathematics teacher were gathered under four main categories: personal traits, communication skills, class management and teaching methods, and measurement and evaluation. When the qualifications of a mathematics teacher were examined in line with the students' views, it was seen that in the categories of personal traits and communication skills, all the students mentioned the qualifications a teacher is

expected to have in general, and it was seen that in the categories of class management-teaching methods and measurement-evaluation, all the students mentioned the qualifications they expected a mathematics teacher to have. This situation was true for most of the students regardless of the school type they would prefer at high school. In addition, it was found that the 5<sup>th</sup> and 6<sup>th</sup> grade students mostly mentioned such qualifications of a mathematics teacher as personal traits and communication; that the 7<sup>th</sup> and 8<sup>th</sup> grade students mostly reported views regarding the categories of class management, teaching methods and measurement-evaluation. This situation shows that there is not a single way of describing a mathematics teacher. As reported in other studies, there are various descriptions of an effective mathematics teacher at various other education levels (for example, elementary school, high school and so on) [49-51]. Parallel to this finding, in the present study, when the students' views regarding the categories of personal traits, class management-teaching methods, and measurement-evaluation were examined, it was seen that there were differences between the views of the 5<sup>th</sup>, 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grade students with respect to their cognitive levels and needs.

In relation to personal traits, the 5<sup>th</sup> and 6<sup>th</sup> grade students mostly focused on entertainment and appearance, while the 7<sup>th</sup> and 8<sup>th</sup> grade students mostly mentioned such qualifications as being egalitarian/fair and hardworking/effective. In addition, according to the 5<sup>th</sup> and 6<sup>th</sup> grade students, if a mathematics teacher has good-looking appearance and courtesy (dressing well, speaking well) and if he or she is easy-going, sincere/frank, entertaining, enthusiastic and friendly, then students' interest and achievement in the course of mathematics will increase. Similarly, other studies demonstrated that a student's achievement in a course has a relationship with the teacher's being entertaining, friendly and enthusiastic [18,52-55]. On the other hand, Gillett and Gall [56] reported that a friendly and enthusiastic teacher does not guarantee students' achievement in a course though such a teacher will increase students' interest and enthusiasm. In the present study, the views of the 7<sup>th</sup> and 8<sup>th</sup> grade students, who were preparing for the high school placement exam, revealed that a mathematics teacher who was egalitarian/fair and hardworking/effective had positive influence on the students' achievement in the course of mathematics. Similarly, some other studies showed that the personal traits of an effective teacher with fair, objective and democratic behaviours had influence on students' love for the teacher and on their achievement in the course [7,52,57].

According to the views of the students participating in the present study, the most frequent and important communication skills of an effective mathematics teacher included attitudes towards students. A teacher with good and sincere attitudes towards students had influence on their interest and achievement in the course of mathematics.

According to the students' views, the teacher's offensive attitudes, prejudiced behaviours and fixed ideas about students cause the teacher to behave differently to students depending on their levels of achievement in the course. This situation saddens less successful students [19,57,58], decreases their interest especially in the course of mathematics, causes them to fear from mathematics and leads to negative influence on their achievement in mathematics [59-64]. According to the students' views, other important communication skills included out-of-class communication, caring students, good use of tone of voice in class, effective use of Turkish and calling students by their names. This result is similar to those reported by Iossi [31], Shulman [32] and Vinson [65], who, in their studies, pointed to the importance of the teacher's field knowledge and his or her transfer of this knowledge to students. In this respect, considering the fact that mathematics teachers' communication with students has a relationship with students' interests and achievements in the course of mathematics, mathematics teachers' patient and self-sacrificing attitudes towards students could help overcome students' negative perceptions regarding mathematics. In addition, it is thought that positive perceptions regarding mathematics could allow increasing the average success rate especially in the course of mathematics to the desired level in Turkey as well as in international exams (like PISA, TIMSS and so on).

In relation to another category, it was found that the qualifications of a mathematics teacher regarding class management and teaching methods had a relationship with being an effective mathematics teacher. In the study, it was found that the 5<sup>th</sup> and 6<sup>th</sup> grade students focused more on the teacher's way of teaching, while the 7<sup>th</sup> and 8<sup>th</sup> grade students mostly mentioned use of technology, active participation, variety in methods and solving more mathematical problems to be able to attend a better high school (In Turkey, students are allowed to attend better-quality high schools in accordance with their results in the High School Placement Exam, which is conducted at the end of the secondary school 8<sup>th</sup> grade class. Students who do not take this exam are placed in other high schools in line with their average grades at secondary school. See 1.1). Based on this situation, it could be stated that students at different levels have different needs. This result is consistent with the results of other studies which reported that an effective teacher is described differently at different education levels (for example, elementary school, secondary school and high school) [49-51]. In addition, the students generally believed that a mathematics teacher should have such qualifications as 'good class management, considering individual differences, teaching lessons as appropriate to students' levels and interests, use of technology, providing up-to-date information about the lesson subject, being clear'. It is in related literature that other researchers [53,66-71] reported similar results in their studies. When the views of the students participating

in the present study were examined, it was seen that due to the abstract nature of mathematics, a mathematics teacher can achieve effective and permanent learning in students by working in a disciplined manner, using concrete materials appropriate to the lesson subject, addressing more than one sense organ via games and activities and using various other methods and techniques. Similarly, some other studies demonstrated that an effective teacher does not leave anything to chance and is aware of his or her responsibilities [72,73] and that various teaching methods and techniques will increase students' achievement in mathematics via effective learning [74].

When the students' views regarding the measurement-evaluation process were examined, it was seen that it was important for a mathematics teacher to give priority to students' in-class performance especially in the evaluation process and to provide them with guidance and feedback. Similarly, studies revealed that giving feedback is an important part of effective teaching [57] and that feedback allows students to understand and correct their mistakes [75,76]. Butler and Nisan [77], in their study, found that feedback especially given to students individually is more effective. In the present study, it was seen via the students' views that a teacher should pay attention to students' individual differences and cognitive levels in the process of measurement and evaluation. In this respect, an effective mathematics teacher could vary the measurement and evaluation process, apply various exam techniques considering students' individual differences and provide them with positive feedback to help them correct their mistakes. In the present study, the fact that some of the 8<sup>th</sup> grade students reported views focusing on getting high marks in exams is thought to be due to the high school placement exam conducted in Turkey. Therefore, teachers could be suggested to consider students' cognitive levels regarding mathematical reasoning skills.

Consequently no student participating in the present study stated that it is easy to become an effective teacher, especially an effective mathematics teacher. In addition, all the secondary school students reported a view about the qualifications of an effective mathematics teacher regardless of the school type they would prefer at high school. Based on the fact that mathematics, which has an important place in students' achievements in their education lives, is an abstract and difficult course to understand, it could be stated that teachers of this course should not only be hardworking, self-sacrificing and knowledgeable about the field but also use appropriate teaching methods and techniques and demonstrate attitudes and behaviours by consider students' cognitive levels and individual differences so that students can be successful at school. In this respect, in order for mathematics teachers to become effective teachers, they should research current related studies and become aware of the attitudes and behaviours that will lead to success in class. In addition, they could also support current studies by putting forward

related suggestions and make the mathematics teaching process more effective.

## REFERENCES

- [1] Arslan, S., & Özpınar, İ. (2008). Öğretmen nitelikleri: ilköğretim programlarının beklentileri ve eğitim fakültelerinin kazandırdıkları. *Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi*, 2(1), 38-63.
- [2] Akkoyunlu, B., & Kurbanoğlu, S. (2003). Öğretmen adaylarının bilgi okuryazarlığı ve bilgisayar öz-yeterlik algıları üzerine bir çalışma. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 24, 1-10.
- [3] Çalışkan, M., Işık, A. N., & Saygın, Y. (2013). Öğretmen adaylarının ideal öğretmen algıları. *İlköğretim Online*, 12(2), 575-584.
- [4] Sağlam, M., ve Kürüm, D. (2005). Türkiye ve Avrupa Birliği ülkelerinde öğretmen eğitiminde yapısal düzenlemeler ve öğretmen adaylarının seçimi. *Milli Eğitim*, 167, 53-70.
- [5] Adıgüzel, A. (2005). Avrupa Birliğine uyum sürecinde öğretmen niteliklerinde yeni bir boyut: bilgi okuryazarlığı. *Milli Eğitim*, 167, 355-364.
- [6] Bıkmaz, F. H., & Güler, D. S. (2002). Velilerin sınıf öğretmenlerinden beklentileri ve sınıf öğretmenlerinin bu beklentilere uygunluğu. *Kuram ve Uygulamada Eğitim Bilimleri*, 2(2), 445-472.
- [7] Çakmak, M. (2009). Prospective teachers' thoughts on characteristics of an "effective teacher". *Education and Science*, 34(153), 74-82.
- [8] Arnon, S., & Reichel, N. (2007). Who is the ideal teacher? Am I? Similarity and difference in perception of students of education regarding the qualities of a good teacher and of their own qualities as teachers. *Teachers And Teaching: Theory And Practice*, 13(5), 441-464.
- [9] Aydoğdu, M. (2003). *Ergenlerin öğretmen ve ideal öğretmen algılarının incelenmesi*. (Yayınlanmamış yüksek lisans tezi). Ankara Üniversitesi, Eğitim Bilimleri Enstitüsü, Ankara.
- [10] Çetin, Ş. (2001). İdeal öğretmen üzerine bir araştırma. *Milli Eğitim Dergisi*. Sayı.149. Retrieved from <http://oyegm.meb.gov.tr> [14.04.2016]
- [11] Das, M., El-Sabban, F., & Bener, A. (1996). Student and faculty perceptions of the characteristics of an ideal teacher in a classroom setting. *Medical Teacher*, 18(2), 141-146.
- [12] Genç, S. Z. (2007). Öğrenci algılarına göre ideal bir öğretim elemanında bulunması gereken özellikler. *Milli Eğitim*, 173, 210-218.
- [13] Kızıltepe, Z. (2002). İyi ve etkili öğretmen. *Eğitim ve Bilim*, 126, 10-14.
- [14] McDonald, F. (1975) Research on teaching and its implications for policy making: Report on phase II of the beginning teacher evaluation study. Princeton, NJ: Educational Testing Service.
- [15] Oktar, İ., & Yazçayır, N. (2008). Öğrencilere göre etkili

- öğretmen özellikleri. *Milli Eğitim*, 80, 8-23.
- [16] Pozo-Munoz, C., Reboloso-Pacheco, E., & Fernandez-Ramirez, B. (2000). The "ideal teacher" implications for student evaluation of teacher effectiveness. *Assessment & Evaluation in Higher Education*, 25(3), 253-263.
- [17] Senemoğlu, N. (2001). *Öğrenci görüşlerine göre öğretmen yeterlikleri*. Eğitimde yansımalar: Altıncı 2000'li yıllarda Türk Milli eğitim Örgütü ve yönetimi. 11-13 Ocak 2001. Ankara: Öğretmen H. Hüseyin Tekişik Eğitim Araştırma ve Geliştirme Vakfı.
- [18] Sherman, B. R., & Blaackman, R. T. (1975). Personal characteristics and teaching effectiveness of college faculty. *Journal of Educational Psychology*, 67, 124-131.
- [19] Telli, S., Brok, P., & Çakıroğlu, J. (2008). Teachers' and students' perceptions of the ideal teacher. *Education and Science*, 33(149), 118-129.
- [20] Tezer, F. (1998). *İdeal öğretmenin kişilik özellikleri*. (Yayınlanmamış yüksek lisans tezi). Marmara Üniversitesi, Sosyal Bilimler Enstitüsü, İstanbul.
- [21] Wilson, S., & Cameron, R. (1996). Student teacher perceptions of effective teaching: A developmental perspective. *Journal of Education for Teaching*, 22(2), 181-195.
- [22] MEB, (2017). Ortaokul matematik dersi (5, 6, 7 ve 8. Sınıflar) öğretim programı. Ankara.
- [23] Beurk, D. (1982). An experience with some able women who avoid mathematics. *For The Learning of Mathematics*, 3, 19-24.
- [24] Altun, M. (2008). İlköğretim ikinci kademe (6, 7 ve 8. Sınıflarda) matematik öğretimi, 5. Baskı, Bursa: Aktüel Yayınları.
- [25] Van de Walle, J. A. (2010). Elementary and middle school mathematics: teaching developmentally (7 b.). Boston, MA: Pearson Education.
- [26] Pang, J. (2003). Numbers always make sense: Janie's experience of learning to teach elementary mathematics. *Journal of the Korea Society of Mathematical Education Series D: Research in Mathematical Education*, 7(1), 25-40.
- [27] Foss, D. H., & Kleinsasser, R. C. (1996). Preservice elementary teachers' views of pedagogical and mathematical content knowledge. *Teaching and teacher Education*, 12(4), 429-442.
- [28] Alkan, H., Köroğlu, H., & Başer, N. (1999). Ülkemizde matematik öğretmenin yetiştirilmesi ve matematik öğretiminin amaçları. *Dokuz Eylül Üniversitesi, Buca Eğitim Fakültesi Dergisi*, 10, 5-22.
- [29] Baki, A., & Gökçek, T. (2007). Matematik öğretmeni adaylarının benimsedikleri öğretmen modeline ilişkin bazı ipuçları. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 32, 22-31.
- [30] Kyriacou, C., & Coulthard, M. (2000). Undergraduates' views of teaching as a career choice. *Journal of Education for Teaching*, 26, 117-126.
- [31] Iossi, L. (2007). Strategies for reducing math anxiety in post-secondary students. In S. M. Nielsen & M. S. Plakhotnik (Eds.), Proceedings of The Sixth Annual College of Education Research Conference: Urban and International Education Section (pp. 30-35). Miami, USA: Florida International University.
- [32] Shulman, L. S. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review*, 57, 1-22.
- [33] Başar, M., Ünal, M., & Yalçın, M. (2002). İlköğretim kademesiyle başlayan matematik korkusunun nedenleri. *V. Fen Bilimleri ve Matematik Eğitim Kongresi*, 16-18. Retrieved from [http://www.fedu.metu.edu.tr/ufbmek5/b\\_kit\\_abi/PDF/Matematik/Bildirir/t212d](http://www.fedu.metu.edu.tr/ufbmek5/b_kit_abi/PDF/Matematik/Bildirir/t212d) [18.03.2017]
- [34] Bekdemir, M., Işık, A., & Cıklı, Y. (2004). Matematik kaygısını oluşturan ve arttıran öğretmen davranışları ve çözüm yolları. *Eğitim Araştırmaları Dergisi*, 4(16), 88-94.
- [35] Frank, M. L. (1990). What myths about mathematics are held and conveyed by teachers?. *Arithmetic teacher*, 37(5), 10-12.
- [36] Aydın, S., & Çelik, D. (2018). İlköğretim matematik öğretmeni adaylarının öğretmen eğitimi programının etkinliği hakkındaki inanışları: ölçek, geçerlik ve güvenilirlik çalışması. *Kastamonu Üniversitesi Eğitim Dergisi*, 99(99), 1-18.
- [37] Binbaşıoğlu, C. (1995). Türkiye'de eğitim bilimleri tarihi (History of Turkish educational sciences). The series of research and examination. Ankara, Turkey: MEB.
- [38] Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- [39] Grossman, P. L. (1991). Overcoming the apprenticeship of observation in teacher education coursework. *Teaching and Teacher Education*, 7(4), 345-357.
- [40] Loewenberg Ball, D., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special?. *Journal of Teacher Education*, 59(5), 389-407.
- [41] An, S., Kulm, G., & Wu, Z. (2004). The pedagogical content knowledge of middle school, mathematics teachers in China and the US. *Journal of Mathematics Teacher Education*, 7(2), 145-172.
- [42] Yıldırım, A., & Şimşek, H. (2013). Sosyal bilimlerde nitel araştırma yöntemleri. (Genişletilmiş 9. Baskı). Ankara: Seçkin Yayıncılık.
- [43] Özdemir, M. (2010). Nitel veri analizi: Sosyal bilimlerde yöntem bilim sorunsalı üzerine bir çalışma. *Eskişehir Osmangazi Üniversitesi Sosyal Bilimler Dergisi*, 11(1), 323-343.
- [44] Büyüköztürk, Ş., Çakmak Kılıç, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2008). *Bilimsel araştırma yöntemleri*. (2. Baskı). Ankara: Pegem Akademi.
- [45] Çepni, S. (2010). Araştırma ve proje çalışmalarına giriş (5. Baskı). Trabzon.
- [46] Forbes, C. T. (2011). Preservice elementary teachers' adaptation of science curriculum materials for inquiry-based elementary science. *Science Education*, 95(5), 927-955.
- [47] Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis*. (Second Edition). London New Delhi: Sage Publication.

- [48] Bümen, N. T., Ünver, G., & Başbay, M. (2010). Öğrenci görüşlerine göre ortaöğretim alan öğretmenliği tezsiz yüksek lisans programı derslerinin incelenmesi: Ege Üniversitesi örneği. *Eğitim Bilimleri ve Uygulama*, 9(17), 41-62.
- [49] Evertson, C., Anderson, L., & Brophy, J. (1978). Texas junior high-school study: final report of process outcome relationship, Vol. 1. Report No. 4061, *Research and Development Center for Teacher Education, University of Texas*.
- [50] Soar, R. S., & Soar, R. M. (1978). Setting variables, classroom interaction, and multiple outcomes. Final Report for National Institute of Education, Project No. 6-0432. Gainesville, University of Florida.
- [51] Stallings, J., & Hentzell, S. (1978). Effective teaching and learning in urban schools. *Paper presented at the National Conference on Urban Schools, St. Louis, Missouri*.
- [52] Murray, H.G. (1983). Low inference classroom teaching behavior and student ratings of college teaching effectiveness. *Journal of Educational Psychology*, 75, 138-149.
- [53] Rosenshine, B., & Furst, N. (1973). The use of direct observation to study teaching. In R. Travers (Ed.), *Second handbook of research on teaching*. Chicago: Rand McNally.
- [54] Ryans, D. G. (1960). Characteristics of effective teachers, their descriptions, comparisons and appraisal: A research study. Washington DC: American Council on Education.
- [55] Soar, R. S., & Soar, R. M. (1979). Emotional climate and management. In P. Peterson and H. Walberg (Eds.), *Research on teaching concepts, findings, and implications*. Berkeley, CA: McCutcheon.
- [56] Gillett, M., & Gall, M. (1982). The effects of teacher enthusiasm on the at-task behavior of students in the elementary grades. *Paper presented at the annual meeting of the American Educational Research Association, New York*.
- [57] Good, T., & Brophy, J. (1997). *Looking in classrooms*. New York: Harper Collins.
- [58] Brattesani, K. A., Weinstein, R. S. & Marshall, H. H. (1984). Student perceptions of differential teacher treatment as moderators of teacher expectation effects. *Journal of Educational Psychology*, 76, 234-247.
- [59] Ertem Akbaş, E. (2018). Öğretmenlerin bakış açısıyla ilkokulla başlayan matematik korkusunun nedenlerinin ve çözüm önerilerinin incelenmesi. *International e-Journal of Educational Studies (IEJES)*, 2(3), 12-25. DOI: 10.31458/iej.405144
- [60] Keklikçi, H., & Yılmaz, Z. (2013). İlköğretim öğrencilerinin matematik korku düzeyleriyle matematik öğretmenlerine yönelik görüşleri arasındaki ilişkinin belirlenmesi. *Eğitim ve Öğretim Araştırmaları Dergisi*, 2 (3), 198-204.
- [61] Kükey, E., & Aslaner, R. (2017). Matematik öğretmen adaylarının, iyi bir matematik öğretmenin nasıl olması gerektiğine yönelik görüşlerinin incelenmesi. *International e-Journal of Educational Studies (IEJES)*, 1(1), 1-11.
- [62] Peker, M., & Şentürk, B. (2012). İlköğretim 5. sınıf öğrencilerinin matematik kaygılarının bazı değişkenler açısından incelenmesi. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, 34, 21-32.
- [63] Şahin, F. Y. (2008). Mathematics anxiety among 4th and 5th grade Turkish elementary school students. *International Electronic Journal of Mathematics Education*, 3(3), 179-192.
- [64] Şenol, A., DüNDAR, S., Kaya, İ., Gündüz, N., & Temel, H. (2015). Investigation of secondary school mathematics teachers' opinions on mathematics fear. *Journal of Theory & Practice in Education (JTPE)*, 11(2), 653-672.
- [65] Vinson, B. M. (2001). A Comparison of preservice teachers' mathematics anxiety before and after a methods class emphasizing manipulatives. *Early Childhood Education Journal*, 29(2), 89-94.
- [66] DeRoche, E. F. (1981). An administrator's guide for evaluating programs and personnel. Boston: Allyn and Bacon, Inc.
- [67] Hines, C. V., Cruickshank, D. R., & Kennedy, J. J. (1982). Measures of teacher clarity and their relationships to student achievement and satisfaction. *Paper Presented at the annual meeting of the American Educational Research Association, New York*.
- [68] Hines, C. V., Cruickshank, D. R., & Kennedy, J. J. (1985). Teacher clarity and its relation to student achievement and satisfaction. *American Educational Research Journal*, 22, 87-99.
- [69] Huang, T. H., Liu, Y. C., & Chang, H. C. (2012). Learning achievement in solving word based mathematical questions through a computer-assisted learning system. *Journal of Educational Technology & Society*, 15(1), 248-259.
- [70] Land, M. L. (1987). Vagueness and clarity. In M. Dunkin (Ed.), *The International Encyclopedia of Teaching and Teacher Education* (392-97). New York: Pergamon.
- [71] Margaret, M. B. (2000). Instructional materials development: a review of the IMD program. *Past, Present, and Future*. National Science Foundation, Arlington VA Directorate for Education and Human Resources.
- [72] Davis, G. A., & Thomas, M. A. (1989). *Effective schools and effective teachers*. Boston: Allyn and Bacon.
- [73] Wright, C. J., & Nuthall, G. (1970). Relationships between teacher behaviors and pupil achievement in three experimental elementary science lessons. *American Educational Research Journal*, 7, 477-491.
- [74] Ural, A., Umay, A., & Argün, Z. (2008). Öğrenci takımları başarı bölümleri tekniği temelli eğitimin matematikte akademik başarı ve özyeterliğe etkisi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 35, 307-318.
- [75] Bangart-Drowns, R. L., Kulik, C. C., Kulik, J. A., & Morgan, M. (1991). The instructional effect of feedback in test-like events. *Review of Educational Research*, 61, 213-238.
- [76] Elawar, M. C., & Corno, L. (1985). A factorial experiment in teachers' written feedback on student homework: changing teacher behavior a little rather than a lot. *Journal of Educational Psychology*, 77, 162-173.
- [77] Butler, R., & Nisan, M. (1986). Effects of no feedback, task-related comments, and grade on intrinsic motivation and performance. *Journal of Educational Psychology*, 78, 210-224.