THE EFFECT OF MATHEMATICS CONTENT KNOWLEDGE OF CLASSROOM TEACHERS ON TEACHING MATHEMATICS

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ABSTRACT
The purpose of this research is to examine the effects of the content knowledge of the teaching of mathematics on mathematics teaching, factors and self-efficacy perceptions by taking the opinions of primary school teachers about their competencies in teaching mathematics and their competencies in mathematics teaching. For this purpose, the research was carried out with an interview form, one of the qualitative research studies. The data of the study were collected from 30 classroom teachers on a voluntary basis with a semi-structured interview form consisting of four open-ended questions. The obtained data were analyzed by content analysis method. As a result of the research, it was determined that the mathematics content knowledge of the participants in mathematics teaching differs in terms of gender, seniority, and grade level. In the light of the findings, suggestions were made to researchers and classroom teachers.
Keywords: Classroom teacher, Mathematics Content Knowledge, Mathematics Teaching

INTRODUCTION

Mathematics course increases the mental processes of individuals and develops their ability to interpret events/facts occurring around them. It is said that among all programs, mathematics teaching programs are a separate science that includes many concepts and skills (Baykul, 2009). Mathematics course includes many abstract concepts and besides teaching these abstract concepts, students are also provided with the skills of analysis, problem solving and evaluation. (Ministry of National Education (MEB), 2018). For this reason, mathematics course has an important and comprehensive education in each of the primary, secondary and high school education programs (Gürbüz, Erdem, & Gülburnu, 2013). Teachers who undertake the education-teaching task in all educational institutions.

Teacher; Teachers Law 6/2008 made by the Constituent Assembly of the Turkish Republic of Northern Cyprus No. 25/1985 is defined in the article as: It describes the permanent personnel who fulfill the main and permanent duties required by the education and training services that the Ministry and the education and training institutions and organizations affiliated to the Ministry are obliged to carry out. In line with this task, teachers constitute the cornerstone of educational institutions. Teachers are individuals with educational skills who convey the necessary information to the students, make them interested and sensitive to the lesson, renew their knowledge and organize them according to the conditions of the day. In this case, it places teachers at the center of education and training functions (Baloğlu, 2001).

Education and training, on the other hand, consists of teachers, students, environment, applied teaching methods, and effective interaction with each other, including the transfer of subjects suitable for development (Büyükkaragöz and Çivi, 1999).

In the light of the duties undertaken by the teachers, it is accepted that the classroom teachers are active in the ways that they touch the lives of the students and that they will follow today, tomorrow and in the future. The content knowledge that classroom teachers have in all the lessons they teach affects the teaching methods they

use, the materials used, and the extent to which they add technological developments to the education process (Ma,1999).

The fact that the mathematics course contains many abstract concepts in its own structure and that the abstract concepts are clearly transferred to the students depends on the teachers' content knowledge and their ability to transfer it. The fact that primary school teachers' knowledge of mathematics is sufficient is also related to the teacher's own perception of competence in teaching mathematics (Çakmak, 2004).

In cases where classroom teachers' knowledge of mathematics is not sufficient, teachers can make their students realize their own inadequacies with this perception, and even fail to consider learning correctly, causing students to exhibit an anxiety and reluctant attitude towards the mathematics lesson (Alkan, 2010).

It is a fact that at each stage of the education process, the teacher has the greatest responsibility in terms of both setting an example and lecturing and guiding the student (Gitlin, Burbank, Kauchak, & Stevens, 1999). Particularly, primary school teachers, who are the level at which the student adopts the teacher as a model, play a greater role in this process compared to other factors. Therefore, the qualifications of the education programs of primary school teachers gain importance (Halliday, 1998).

Shulman stated the difference between content knowledge and content knowledge education in 1986. According to Shulman, knowledge of field education; It refers to which methods and techniques teachers use their knowledge, which evaluation criteria they will pay attention to, and which materials they will use to convey the subject to their students. At this point, expressed by Shulman, it includes teachers' ability to use the language and way they can understand in explaining their field education knowledge to their students or others. With this statement made by Shulman, it shows that teachers in various research countries perceive mathematics not as a science of concepts but as operations. As a result, it was observed that the mathematics lesson transferred to the students was learned not as comprehension but as analysis by rote (Van de Walle, 2008).

In addition, in the research conducted within the scope of self-efficacy beliefs of classroom teachers towards mathematics lesson, it was observed that the higher the self-efficacy beliefs of classroom teachers, the more successful they were in teaching mathematics to their students and enabling their students to develop positive attitudes in this direction (Pul, Aksu, 2020).

Self-efficacy perception and content knowledge are very important in the teaching of mathematics. The formation of self-efficacy awareness in the students who are guided and modeled by the teachers and their ability to develop a positive attitude towards the mathematics lesson depend on the teachers' attitudes and skills in this area (Benzer, 2011).

In this study, the opinions of primary school teachers working in TRNC primary schools on mathematics teaching were sought and answers were sought for the following questions;

a) General opinions of primary school classroom teachers on the effects of mathematics content knowledge on mathematics teaching,

b) Opinions about the content adequacy of the mathematics course,

c) Their views on the important factors in teaching the mathematics course,

d) Opinions and suggestions regarding the elimination of deficiencies in the teaching of the mathematics course,

e) What are the views of primary school classroom teachers depending on the variables of gender and grade level they teach.

In line with this goal, primary school teachers' knowledge of mathematics affects their attitudes and mathematics teaching skills (Thompson, 1984). With this explanation, what does mathematics mean for primary school teachers? It is necessary to determine the meaning of mathematics content knowledge on the effect of mathematics teaching methods and techniques (Raymond & Santos, 1995). The methods and techniques used by classroom teachers can be affected by teachers' field knowledge. In this respect, students' attitudes and skills towards mathematics are also affected.

Classroom teachers have an important place in primary school, which we can count as the beginning of students' school life. In primary school, students reach basic mathematics field awareness under the guidance of their classroom teachers. In this respect, teachers' mathematical content knowledge and methods of transferring their knowledge are of great importance. In addition, the content knowledge that classroom teachers receive is theoretical and far from the classroom environment (Haser, 2006).

Since the subject discussed in this study is "The Effect of Mathematics Content Knowledge of Classroom Teachers on Teaching Mathematics", it has been tried to determine the effect of content knowledge on teaching goals and objectives, to reveal the problems faced by teachers who have experience in this subject, and to reach forward-looking opinions and suggestions about content knowledge. Thanks to the data obtained, it is thought that teachers who teach mathematics in TRNC primary schools can guide the development of their knowledge of mathematics lessons.

Dursun and Dede (2004) revealed in their research that the mathematics lesson is cyclical among the "Teacher Mathematics Student". With the conclusion reached from here, it is seen that the mathematics content knowledge of the teacher who teaches a mathematics lesson is the most basic element of the circular structure on mathematics teaching. Because teachers are the ones who teach and initiate the flow of information and direct the development of attitudes and skills. Insufficient or incomplete content knowledge of a teacher can say that this cycle cannot be completed from the beginning or it may contain deficiencies.

It is known that many national and international studies have been carried out on the teaching of mathematics. As stated before, the mathematics course is an active course in daily life and gives direction to the mindset. For this reason, researchers have given great importance to mathematics teaching. While conducting the researches, they set out from how the mathematics lesson can be taught and how attitudes towards the mathematics lesson can be developed. Realizing that the starting point has many components, they mentioned teachers' mathematics learning, field knowledge, methods and techniques they use, technological knowledge, and their own beliefs about the mathematics lesson.

In the research conducted by Akar in 2009, it emphasized what the teacher who teaches mathematics should know as content knowledge and the importance of content knowledge. In the investigation of the adequacy of mathematics content knowledge, it was tried to reveal the extent of the teachers' mathematical knowledge, the sufficiency of the knowledge in mathematics teaching and its contribution to the mathematics knowledge that the student received throughout his education life. The content knowledge, which is discussed with the basic dimensions of mathematics teaching, was developed into the language of the adequacy or insufficiency of the knowledge of the teachers when the mathematics courses they took at universities became teachers themselves.

Again, in a study examining the proficiency of teachers in mathematics teaching from various perspectives, it was revealed that there were differences between the mathematics education teachers received and the mathematics education they presented in classroom environments. In this study, it was also determined that female teachers' self-beliefs towards mathematics lesson were lower than male teachers. A teacher's low self-belief is among the factors that affect the effective learning of that course. We can say that teachers who know what they know and can transfer it to the environment in the most appropriate way can develop efficient education and training (Akbayır, Akça, 2021).

In addition to these, it was determined that the teachers' use of materials helped to conceptualize the mathematics lesson from an abstract language to concrete. In the study conducted by Yazlık (2020), it was observed that more than 80% of the teachers participating in the research expressed the necessity of using concrete materials in the teaching of mathematics. It was stated that concrete materials made a significant difference in the teaching of abstract concepts, contributed to the permanence of learning, and visual materials increased the interest and attitude towards the mathematics lesson. It also emphasizes that the use of materials is at the forefront in concrete materials that teachers choose or create themselves, due to the time consuming use of materials and the wide range of programs. Teachers need to be able to follow information technologies in the developing information age and adapt them to educational environments. Üredi and Ulum (2020), who researched the Technological Pedagogical Content Knowledge of teachers, stated that most classroom teachers have difficulty in using the developments in this field in classroom environments, since they do not have technological content knowledge. However, it is seen that the materials used by the teachers in the classroom environments affect permanent learning and focus the interests and curiosity of the students on the lesson. It will be very easy to concretize a lesson that includes more than one abstract concept such as a mathematics lesson to students with the use of technological materials. It is very important for teachers teaching mathematics lessons to have technological content knowledge as well as mathematical content knowledge.

METHODOLOGY

Research Model

In order to determine the effect of mathematics content knowledge of primary school teachers on mathematics teaching in the TRNC, evaluations will be made by making qualitative observations in the research.

Qualitative research; It was used to determine the vital nature of individuals in different branches of science. If we give examples of these branches of science, we see that they are first used in sciences such as anthropology, psychology and sociology. The qualitative research method, which has various forms, has been named more than once. According to the content of the form, these names are 'natural research', 'interpretive research' and 'field research'. natural research; describing natural works, interpretive research; field research involving individual opinions against a phenomenon; It includes an in-depth examination of any subject in its social environment (Baltacı, 2017).

Qualitative research is a method of questioning and interpretation based on the problem it deals with, as well as explaining the cause and result of the problem in its natural environment (Guba & Lincoln, 1994; Klenke, 2016). It describes an individual-interpretive process that enables the revealing of the previously determined or undetected problematics, and the rational expression of the problematic in its natural environment, with the qualitative research method, in which methods based on qualitative data, including observation, interview form and document analysis, regarding the causes, results and suggestions of the problematic are used (Seale, 1999).

In the research, the interview technique based on qualitative research was used for problem solving. Interview technique; This technique emerged as a technique used by Charles Booth in seminar research in the 1880s. Booth has used this technique, based on a wide range of surveys applied to the masses. This technique, also called structured interview, includes closed-ended questions. Simple random sampling is known as social research in which an empirical and statistical evaluation is made (Lazarsfeld; Wert, 1954).

If a qualitative research method is adopted among the data collection techniques, the interview technique is generally used in accordance with the method. It is the presentation of the participants' interpretations of many events that take place in the social environment, their experiences, opinions or problems with the help of open-ended questions. While analyzing numerical data in quantitative research, the analysis of comments is made with the interview technique (Yüksel, 2020).

Research Universe and Sampling

The universe of this research consists of 1634 primary school teachers working in the TRNC Ministry of National Education Department of Primary Education in the 2020-2021 academic year.

In this study, the sample number was 30 in examining the opinions of the Classroom Teachers depending on the level of the Effect of Mathematics Content Knowledge on Teaching Mathematics. The selected sample consisted of 30 primary school teachers working in the TRNC Ministry of National Education Department of Primary Education in the 2020-2021 academic year as a random sampling.

Research Group

Table 1. Distribution of teachers participating in the research by gender, region, professional seniority and grade level characteristics

Personal Information		Frequency (f)	Percent (%)
Gender	Female	19	%63,3
	Male	11	%36,7
Total		**30**	**100**
Grade level of education given	1.class	4	%13,3
	2.class	8	%26,7
	3.class	6	%20,0
	4.class	6	%20,0
	5.class	6	%20,0
Total		**30**	**100**

63.3% of the teachers participating in the research are female (f19), 36.7% are male (11); 13.3% (f4) of these teachers are 1st grade, 26.7% (f8) 2nd grade, 20.0% (f6) 4th grade, 20.0% (f6) teach at the 5th grade level.

Data Collection Tool

Data tools related to the problem of the research were formed from the interview form. The interview form consists of two parts. In the first part, there are personal information (gender, grade level of education given) questions of the participants related to the research. In the second part, there are research questions to solve the research problem. The research questions are;

Question 1: How would you explain the effect of mathematics content knowledge on mathematics teaching?

Question 2: What are your views on mathematics teaching proficiency?

Question 3: How would you explain the factors that should be considered in the teaching of mathematics?

Question 4: What are your suggestions on this subject in order to eliminate the inadequacies in the teaching of mathematics?

In the research, the interview form prepared by the researcher was approved and applied by including the expert opinion. The research was based on the principle of volunteerism.

FINDINGS

Table 2. Findings on teacher opinions

Questions	Theme	f	%
How would you explain the effect of mathematics content knowledge on mathematics teaching?	High impact	11	36,7
	Content knowledge is mandatory for teaching.	6	20,0
	It facilitates organizing and transferring information.	5	16,7
	Increases self-efficacy and performance.	3	10,0
	Provides effective teaching	3	10,0
	Content knowledge is more important in the second level of primary school.	2	6,7
What are your views on mathematics teaching proficiency?	Enough for primary school level	11	36,7
	Inadequate for implementation	7	23,3
	It is sufficient in terms of content	5	16,7
	Insufficient teaching materials	4	13,3
	Not suitable for the age and readiness of 2nd level students	2	6,7
	Insufficient in terms of measurement and evaluation	1	3,3
How would you explain the factors that should be considered in the teaching of mathematics?	Student's qualifications (field knowledge, personal characteristics, attitude)	6	20,0
	Methods and techniques used	6	20,0
	Class characteristics (physical, cognitive)	5	16,5
	Teacher's qualifications (age, experience, university from which he graduated)	4	13,3
	Teaching materials (textbook, technology support)	3	10,0
	associating with daily life	3	10,0

	Use of effective communication techniques	2	6,7
	Program qualifications	1	3,3
What are your suggestions on this subject in order to eliminate the inadequacies in the teaching of mathematics?	Increasing teacher qualifications (content knowledge, pedagogy)	8	26,7
	Using different methods and techniques	6	20,0
	Updating training programs	4	13,3
	Reducing the student's anxiety level	3	10,0
	Providing material and technology support	3	10,0
	Renewal of books	2	6,7
	Preparation of teacher's handbook	2	6,7
	Moving away from exam-oriented (e.g. KGS) test studies	2	6,7
Total		**30**	**100**

As seen in Table 1;

1) When the answers given to the question "How do you explain the effect of content knowledge of mathematics on teaching mathematics?" were examined, 11 people said that the effect is high, 6 people said that content knowledge is necessary for teaching, and 5 people answered that it facilitates the organization and transfer of knowledge. Öner (2015) stated in his study that in order to teach any subject, it is necessary to have a certain level of understanding of that subject, but knowing the subject alone is not sufficient to teach it. This result supports the findings of the study. As a result, the classroom teacher needs mathematical content knowledge. Other information is complementary and includes information on how to teach mathematics.
2) When the answers given to the question "What are your views on the adequacy of teaching mathematics teaching?" were examined, 11 people were sufficient for the primary school level, and 5 people expressed their opinion that they were sufficient in terms of content. Primary school mathematics teaching is the basis of the academic success of the student, as it is valid for all other primary school lessons. All subsequent learning is built on this structure created in primary school. The subjects have a continuity and an ever-expanding integrity. As in every field, a content (program) that provides this order is required in mathematics. The content of the Mathematics course given in primary school is sufficient in terms of forming the basis for future classes. 7 people are of the opinion that it is insufficient in terms of implementation. This inadequacy; It was said that it was caused by the lack of time, crowded classes and deficiencies in the textbook.
3) When the answers to the question "How do you explain the factors that need to be considered in the teaching of a mathematics lesson?" are examined, 6 people learn the characteristics of the student (content knowledge, personal characteristics, attitude), 6 people use the methods and techniques, 5 people determine the characteristics of the class (physical, cognitive). and 4 people gave their opinions on the qualifications of the teacher (age, experience, university from which he graduated). At this point, in addition to many factors such as the physical conditions of the classroom and the curriculum, teacher competencies gain importance in order to teach mathematics effectively. (Çakmak, 2004; NCTM, 2000; Romberg and Carpenter, 1986).
4) "What are your suggestions for eliminating the inadequacies in teaching the mathematics course? When the findings related to the question "" were examined, 8 people gave the answer to increase the qualifications of teachers (content knowledge, pedagogy), 6 people gave the answer to use different methods and techniques, and 4 people gave the answer to update the education programs. With the answers they gave, teachers mostly complained about the lack of in-service training. In addition, it has been suggested to make children love mathematics by making it a game and to establish a connection with real life. It was emphasized that the traditional education (rote learning)

methods should be moved away and the appropriate programs should be prepared with the cooperation of teachers.

Table 3. Examination of teachers' opinions according to the grade level they teach (I.-II. Grade)

Question	I. Grade (1.-2. classes)	f	%	II. Grade (3.-4.-5. classes)	f	%
1	High impact	4	33,3	High impact	7	38,9
	Content knowledge is mandatory for teaching.	4	33,3	Content knowledge is mandatory for teaching.	2	11,1
	Increases self-efficacy and performance.	1	8,3	It facilitates organizing and transferring information.	5	27,8
	Provides effective teaching	3	25,0	Increases self-efficacy and performance.	2	11,1
				Content knowledge is more important in the second level of primary school.	2	11,1
		12	**100**		**18**	**100**
2	Enough for primary school level	5	41,6	Enough for primary school level	6	33,3
	Inadequate for implementation	2	16,7	Inadequate for implementation	5	27,8
	It is sufficient in terms of content	3	25,0	It is sufficient in terms of content	2	11,1
	Insufficient teaching materials	2	16,7	Insufficient teaching materials	2	11,1
				Not suitable for the age and readiness of 2nd level students	2	11,1
				Insufficient in terms of measurement and evaluation	1	5,6
		12	**100**		**18**	**100**
3	Student's qualifications (field knowledge, personal characteristics, attitude)	3	25,0	Student's qualifications (field knowledge, personal characteristics, attitude)	3	16,7
	Methods and techniques used	3	25,0	Methods and techniques used	3	16,7
	Class characteristics (physical, cognitive)	2	16,7	Class characteristics (physical, cognitive)	3	16,7
	Teacher's qualifications (age, experience, university from which he graduated)	1	8,3	Teacher's qualifications (age, experience, university from which he graduated)	3	16,7
	Associating with daily life	3	25,0	Teaching materials (textbook, technology support)	3	16,7
				Use of effective communication techniques	2	11,1
				Program qualifications	1	5,6
		12	**100**		**18**	**100**
4	Increasing teacher qualifications	2	16,7	Increasing teacher qualifications	6	33,3

	(content knowledge, pedagogy)			(content knowledge, pedagogy)		
	Using different methods and techniques	4	33,3	Using different methods and techniques	2	11,1
	Updating training programs	1	8,3	Updating training programs	3	16,7
	Reducing the student's anxiety level	1	8,3	Reducing the student's anxiety level	2	11,1
	Providing material and technology support	2	16,7	Providing material and technology support	1	5,6
	Renewal of books			Renewal of books		
	Preparation of teacher's handbook	1	8,3	Preparation of teacher's handbook	1	5,6
		1	8,3	Moving away from exam-oriented (e.g. KGS) test studies	1	5,6
					2	11,1
		12	**100**		**18**	**100**

As can be seen in Table 3, 12 of the 30 classroom teachers participating in the research are in the I. Grade (1.-2. classes) and 18 of them are in the II. Grade in 3.-4.-5. Classes.

1) 1) When the answers to the 1st question are examined; II. Primary school teachers working at the level II. It has been observed that they think that content knowledge is more important in the first step. They also said that content knowledge facilitates the organization and transfer of knowledge. Classroom teachers working at the I. Level stated that content knowledge provides effective learning.
2) When the answers given to the 2nd question are examined; II. Classroom teachers working at the level II. He did not find the mathematics teaching at the level in accordance with the age and readiness of the students. In addition, they found it insufficient in terms of measurement and evaluation. Teachers working in the I. Level, on the other hand, considered mathematics teaching sufficient for this level.
3) When the answers to the 3rd question are examined; II. The most important factors affecting the teaching of mathematics by the primary school teachers working in this level are the teaching materials (textbook, technology support), the use of effective communication techniques and the qualifications of the program. On the other hand, the teachers working in the I. Level expressed their opinions as the relation of mathematics with daily life.
4) When the answers given to the 4th question are examined; It has been observed that the classroom teachers working in II. Grade have made suggestions to increase teacher qualifications. They also emphasized the necessity of moving away from exam-oriented (KGS) test studies. It was seen that the teachers working in the I. Grade suggested the use of different methods and techniques.

Table 4: Examination of teachers' opinions by gender

Soru	KADIN	f	%	ERKEK	f	%
1	High impact	11	57,9	Content knowledge is mandatory for teaching.	6	54,5
	Increases self-efficacy and performance.	3	15,8	It facilitates the organization and transfer of information.	3	27,3
	Provides effective teaching	3	15,8	Content knowledge is more important in the second level of primary school.	2	18,2
	It facilitates organizing and transferring information.	2	10,5			
		19	**100**		**11**	**100**

2	Enough for primary school level	9	47,4	Enough for primary school level	2	18,2
	Inadequate for implementation	5	26,3	Inadequate for implementation	2	18,2
	It is sufficient in terms of content	3	15,8	It is sufficient in terms of content	2	18,2
	Insufficient teaching materials	2	10,5	Insufficient teaching materials	2	18,2
				Not suitable for the age and readiness of 2nd level students	2	18,2
				Insufficient in terms of measurement and evaluation	1	9,0
		19	**100**		**11**	**100**
3	Student's qualifications (field knowledge, personal characteristics, attitude)	4	21,1	Student's qualifications (field knowledge, personal characteristics, attitude)	2	18,2
	Methods and techniques used	5	26,3	Methods and techniques used	1	9,0
	Class characteristics (physical, cognitive)	4	21,1	Characteristics of the class (physical, cognitive)	1	9,0
	Teacher's qualifications (age, experience, university from which he graduated)	1	5,3	Teacher's qualifications (age, experience, university from which he graduated)	3	27,3
	associating with daily life			Teaching materials (textbook, technology support)	3	27,3
	Use of effective communication techniques	3	15,8	Program qualifications	1	9,0
		2	10,5			
		19	**100**		**11**	**100**
4	Increasing teacher qualifications (content knowledge, pedagogy)	6	31,6	Increasing teacher qualifications (content knowledge, pedagogy)	2	18,2
	Using different methods and techniques	5	26,3	Using different methods and techniques	1	9,0
	Updating training programs	1	5,3	Updating training programs	3	27,3
	student anxiety reducing the level of	2	10,5	student anxiety reducing the level of	1	9,0
	Providing material and technology support	2	10,5	Providing material and technology support	1	9,0
	Renewal of books	1	5,3	Renewal of books	1	9,0
	Preparation of teacher's handbook	2	10,5	Moving away from exam-oriented (e.g. kgs) test studies	2	18,2
		19	**100**		**11**	**100**

As seen in Table 3, 63.3% (19) of the 30 classroom teachers participating in the research were female and 36.7% (11) were male.

1) When the answers to the 1st question are examined; While female teachers generally think that the effect of mathematics content knowledge on mathematics education is high, male teachers think that mathematics content knowledge is compulsory for mathematics education. In addition, female teachers mentioned that content knowledge increases self-efficacy and performance and provides effective teaching. Male teachers also stated that they think that content knowledge is more important in the second level of primary school.
2) When the answers given to the 2nd question are examined; female teachers generally found mathematics teaching sufficient for primary school level. Male teachers, on the other hand, said that mathematics education is not suitable for the age and readiness of primary school 2nd level students and that it is insufficient in terms of measurement and evaluation.
3) When the answers to the 3rd question are examined; female teachers generally consider the methods and techniques used as the most important factor affecting mathematics teaching. Men, on the other hand, consider teacher qualifications and teaching materials as important factors. In addition, while female teachers talked about factors such as associating with daily life and using effective communication techniques, male teachers talked about the characteristics of the program.
4) When the answers to the 4th question are examined; female teachers generally suggested the use of different methods and techniques by increasing teacher qualifications. Men, on the other hand, suggested that education programs should be updated and that they should stay away from exam-oriented studies. In addition, female teachers suggested preparing a teacher's handbook.

CONCLUSION AND DISCUSSION

In this study, it was aimed to examine the effect of primary school classroom teachers' mathematics content knowledge on mathematics teaching. The opinions of the teachers were taken with semi-structured forms and various findings were obtained by examining the data obtained. The most important of these findings is that mathematics content knowledge is necessary, even compulsory, for mathematics teaching.

A teacher who does not have sufficient knowledge in the field cannot be expected to perform an effective teaching. On the other hand, if a teacher with sufficient field knowledge has difficulties in using and transferring his/her knowledge and skills for teaching, he/she cannot perform an effective learning (Gürbüz & Gülburnu, 2013).

In addition, this research has shown that field knowledge alone is not enough. Supporting factors are also needed for teaching to take place. These factors are; student's qualifications (field knowledge, personal characteristics, attitude), methods and techniques used, class characteristics (physical, cognitive), teacher qualifications (age, experience, university from which he graduated), teaching materials (textbook, technology support), associating with daily life are determined as the use of effective communication techniques and the qualifications of the program.

In this research, at the beginning of the factors that should be considered in order for the teaching to take place effectively; student qualifications, the methods and techniques used, the characteristics of the class and the qualifications of the teacher. By the qualities of the student, it is meant his mathematical intelligence, readiness, and interest or concern for the lesson. In this context, it has been seen that these qualities greatly affect learning. Dursun and Dede (2004) in their research; revealed that teachers see students' mathematical intelligence, readiness, and attitudes towards the lesson as an important factor in their success in mathematics. This supports the opinions of the teachers identified. Again in this study, methods and techniques were shown as another important factor. Demirel (2004) states that the methods and techniques used in the teaching of mathematics are an important element in the realization of learning. Therefore, it is necessary for teachers to have various teaching method and technical knowledge and to choose suitable methods and techniques for the students. In addition, the physical characteristics of the classroom as a factor affecting learning are also emphasized. These views of the teachers are also consistent with the results of the research conducted by Papanastasiou (2002). Papanastasiou investigated the effect of school environment on mathematics achievement and determined that the physical facilities of the school are an effective factor on students' mathematics achievement. In addition, it was mentioned that teacher qualifications also affect teaching. Gürbüz, Erdem and Gülburnu (2013) also obtained results that support these views with the data they determined in their research.

In the study, most of the classroom teachers suggested increasing in-service training in order to overcome the deficiencies in mathematics education. Primary school is the first and most important stage in which the student

develops personally and socially. Educational institutions fulfill their functions through teachers. Particularly, classroom teaching is not an ordinary job that anyone can do, it is a profession that requires expertise. In order for teachers to have this specialization, they must receive vocational training before the service and be trained during the service. Technological and social changes, the development of knowledge, and the change in student expectations and needs have led to the differentiation of teaching methods in educational institutions. Especially in the teaching profession, the education given at the university was insufficient. The ability of teachers to catch up with these changes and developments depends on qualified in-service training.

As a result, in this study, it was determined that the mathematics content knowledge of the classroom teachers had a high effect on mathematics teaching. In addition, supporting factors were also observed.

RECOMMENDATIONS

Primary education is the cornerstone of education. Teaching mathematics is also seen as one of the most important and difficult areas of education. Especially since it includes abstract concepts, it is difficult for students in younger age groups to learn mathematics. The most important role in concretizing and giving meaning to these abstract concepts again falls to the classroom teachers. For this reason, some suggestions can be put forward in the light of the information obtained in this research aimed at improving the content knowledge in order to make mathematics teaching effective:

- It should be ensured that in-service training activities are effectively planned, arranged according to needs and accessible every year.
- The biggest task falls to the teachers in order to prevent the students from developing negative attitudes towards the lesson and to make them love mathematics. Teachers should provide knowledge and skills by making mathematics education fun.
- The methods and techniques used in the mathematics lesson are very effective in the students' understanding and success of the lesson. For this reason, new student-centered teaching techniques should be applied by moving away from traditional methods (based on rote). Educational programs should also be open to development in all aspects and should be suitable for using new teaching techniques.
- The high number of students in the classrooms in our country and the lack of material and technical support are the most important obstacles to teaching. In this direction, classroom environments that are suitable for modern education, equipped and with fewer students should be created.

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