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MATH ACHIEVEMENT ACCORDING TO THE CLASSROOM TEACHERS WORKING IN THE COUNTRYSIDE

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ABSTRACT

This research aims to examine the factors affecting the mathematics course achievement of students studying in rural primary schools. The study was conducted in the phenomenology design, one of the qualitative research designs. The data was collected through structured interviews with 35 classroom teachers working in rural schools of a district in eastern Turkey in the 2020-2021 academic year. The data obtained were analyzed with the descriptive content analysis method. Six different categories were identified under the theme of "mathematics course success." These categories were mathematics curriculum, teaching environments, teachers, parents, students, and distance education. In line with the opinions of the classroom teachers who participated in the study, it was concluded that the learning objectives were above the level of readiness of the students, and they should be simplified in general, materials were needed in the classrooms and schools, the education received by the teachers was important in concretizing the content, the parents did not show sufficient interest in the students, the students' love of the lesson and the teacher increased the success of the course, and the students had little participation in the lessons due to the lack of internet infrastructure and the limited technological tools to be connected to the lesson in rural areas during the COVID-19 process.

Keywords: *primary school in rural areas, classroom teacher, math achievement*

INTRODUCTION

Mathematics is of great importance at every stage of education starting from primary school. Especially in choosing a profession, mathematics lessons are decisive. For this reason, mathematics education in schools affects not only the present but also the future of students (Volmink, 1994).

The fact that the mathematics course is important has led the researchers to examine the success of the mathematics course. These studies have shown that

curricula, school and classroom opportunities, student-teacher-parent attitudes, and relationships affect the success of mathematics lessons (American Federation of Teachers, 2006; Baker & Bernstein, 2012; Chiu & Xihua, 2008; Clark, 2002; Gezgin & Bal, 2021 Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, & Honorisi, 2015; Levpuscek, Zupancic, & Socan, 2012; Sarı Arıkan & Yıldız, 2017; Tchoshanov, 2011; Turan & Tabak, 2021). In addition, it is clear that the environment variable has an undeniable effect on mathematics achievement. The environment affects students' academic achievement and attitudes toward mathematics and their gaining emotional experiences (Frenzel, Pekrun, & Goetz, 2007). The mathematics achievements of students who study in different regions also differs. The mathematics achievements of students particularly in rural settlements, where the environment is natural, the population is fewer, and people mostly engage in agricultural economic activities (Development Report, 2021), are lower than the mathematics achievements of students in cities (Çiftçi, 2010).

Although mathematics success has started to increase in recent years in the exams held for mathematics courses in our country and in international exams such as PISA and TIMSS, it has still not reached the desired level. In addition to the international exam results that show that the success of mathematics in our country is low, it is a known fact that this success is even lower in rural settlements.

This study aimed to contribute to efforts to increase the quality of education by revealing the factors affecting the mathematics course success of students studying in rural primary schools from the perspectives of classroom teachers who observe and evaluate their success in the best way.

Problem Statement

In this study, conducted with teachers working in primary schools in rural areas, the following problem was studied regarding the factors affecting the mathematics achievement of the students.

According to the classroom teachers working in rural areas, what are the reasons affecting the success of mathematics lessons?

The research problem is based on six subproblems that serve the purpose.

According to the classroom teachers working in the countryside:

1) What are the effects of the primary school mathematics curriculum on mathematics course achievement?

2) What are the effects of the teaching environment on mathematics course achievement?

3) What are the effects of teacher competencies on mathematics course achievement?

4) What are the effects of parental attitudes on mathematics course achievement?

5) What are the effects of student behavior on mathematics course achievement?

6) What are the effects of the distance education process on mathematics course achievement?

Limitations of the Study

The limitation of the research is that it is conducted during the COVID-19 process in the 2020-2021 academic year.

Assumptions of the Research

It was assumed that all teachers gave sincere answers to the interview questions and that all teachers working in rural primary schools were classroom teachers (since paid teachers can be from different branches).

METHOD

Research Model

In this qualitative research, which sought an answer to the question of "According to the classroom teachers working in rural areas, what are the factors affecting success in the mathematics course?" the phenomenological design was preferred to carry out an in-depth analysis. Phenomenology is a qualitative research method that enables people to express their understanding, feelings, perspectives, and perceptions about a certain phenomenon or concept and is used to define how they experience it (Rose, Beeby, & Parker, 1995).

Participant Group

This research was carried out with 35 classroom teachers working in rural schools in a district in eastern Turkey. In our study, the convenience sampling method, one of the purposeful sampling methods, was used. The teachers participating in the study were coded as T1, T2, …, and T35. The demographic information of the participants is given in Table 1.

Table 1

Descriptive Statistics of the Demographic Characteristics of Teachers

Variable	Category	Frequency (*f*)	Percentage (%)
Gender	Female	28	80
	Male	7	20

	22-25	11	31.42
	26-29	17	48.57
Age	30-33	6	17.14
	34 +	1	2.85
Years of professional experience	1-3	21	60
	4-6	10	28.57
	7 +	4	11.42

As demonstrated in Table 1, the rate of female teachers was 80%, and the rate of male teachers was 20%. The teachers were mostly in the age range of 26-29 years by 48.57%, and most of them (60%) had a professional experience of 1-3 years.

Data Collection

In the study, the data were obtained by using a structured interview form developed by the researchers. In the process of preparing the structured interview form, first, the literature was reviewed, and the points to be considered were determined. A draft interview form consisting of five questions was prepared, and they were examined by four faculty members and a Turkish teacher who are experts in their fields. As a result of the examination, the interview questions were increased from five to six, and the demographic information part of the classroom teachers to be interviewed was added. The pilot application of the interview form was performed with five classroom teachers, and as a result of the data obtained, it was decided that the structured interview form served the purpose. Then, the necessary ethical permissions were obtained for the implementation, and the data were collected.

Data Analysis

The data collected were analyzed through content analysis. Content analysis can be defined as a systematic, reproducible technique in which some words of a text are summarized with smaller content categories by coding based on certain rules (Büyüköztürk, Kılıç, Çakmak, Akgün, Karadeniz, & Demirel, 2016). Content analysis aims to reveal the existence of certain words and concepts in the content consisting of text or texts. Thus, the themes, categories, and codes are reached by examining the raw data collected through the interviews. Processable information is obtained from the raw data available.

The data gathered through the structured interviews using the Teacher Interview Form were transferred to the computer. For the analysis, the answers given to all questions in the interview form were carefully read, and the themes, categories, and codes were determined. A reliability study was conducted by trying to reach the same themes, categories, and codes for the interviews with a specialist faculty member and

a doctoral student in the field. As a result of their coding, the situations in which there were disagreements were determined. After two weeks, all teacher interview forms were re-examined, a reliability study was conducted, and the themes, categories, and codes created were finalized. The reliability calculated using the formula developed by Miles and Huberman (1994) was calculated as 88% for question 1, 100% for question 2, 85% for question 3, 100% for question 4, 80% for question 5, and 100% for question 6. The reliability calculated by considering all interview questions was 92%. As a result of the content analysis made with the data obtained, the categories and codes were identified under the theme of mathematics course success.

FINDINGS

Results and Discussion on the First Subproblem

The first interview question was "What are your thoughts on the effects of the primary school mathematics curriculum on mathematics course success? Please explain." The findings obtained by analyzing the answers given by the teachers participating in the research are given in Table 2.

Table 2

The Effects of the Primary School Mathematics Curriculum on Mathematics Course Success

Category	Code	Frequency (*f*)	Percentage (%)
Mathematics Curriculum	Program scope	11	22.44
	Learning outcomes	20	40.81
	Subject	2	4.08
	Term	2	4.08
	Relationship to current life	1	2.04
	Implementation	1	2.04
	Source	3	6.12
	Student readiness	9	18.36

As demonstrated in Table 2, the code of "Learning outcomes" (*f*=20) in the mathematics curriculum category has the most opinions of teachers about the effect of primary school mathematics curriculum on mathematics course achievement. This is followed by the codes "Program scope" (*f*=11) and "Student readiness" (*f*=9). The codes "Implementation" (*f*=1) and "Relationship with current life" (*f*=1) were mentioned the least. Some examples for teachers' thoughts are presented below.

T33: "I think the learning outcomes are very dense. The curriculum can be slightly reduced. Some gains can be heavy on children, such as the subject of rounding in the 2nd grade."

T9: "The program is both very intense and heavy on primary school children. Since the student is bored with the intensive program, he/she starts to dislike the lesson."

T3: "During the implementation of the learning outcomes, we teachers can have difficulties. For this reason, I think it is necessary to examine the student's life in preschool education or his/her life in the family. The level of readiness of a student is very important for him/her to perceive the learning outcomes of the course."

T18: "I think the content of the textbooks is very empty. Since it is forbidden to buy additional resources, we can proceed to a limited extent with the insufficient resources we have."

T4: "I do not think that some of the topics given are suitable for the level of the students. The program contains too many topics."

T15: "The time allocated for the learning outcomes is insufficient. Therefore, it is necessary to allocate additional time to descend to the level of some students."

Findings Related to the Second Subproblem

The second question in the structured interview was "What are your thoughts on the effects of the teaching environment on mathematics course success? Please explain." The findings obtained by analyzing the answers given by the teachers participating in the research are given in Table 3.

Table 3

The Effects of the Teaching Environment on Mathematics Course Success

Category	Code	Frequency (*f*)	Percentage (%)
Instructional Environments	School	19	42.22
	Classroom	25	55.55
	Outside the school	1	2.22

As displayed in Table 3, it was determined that the codes of "Classroom" (*f*=25) and "School" (*f*=19) of the category of teaching environments were frequent in teachers' opinions about mathematics course achievement. In addition, the code "Outside the school" (*f*=1) was also reached. Examples of teachers' thoughts are presented below.

T5: "The size and light of the classroom environment, and the materials in the school and classrooms have a direct effect on student success. There should be stimulating mathematical materials on the walls of the classrooms and schools, and

visual, auditory, and operational activities should be organized with smart boards or projection devices."

T32: "Even if the classroom environment is ideal, school conditions may not be suitable. For example, to play a smart board mathematics game, the electricity should not be cut off, which is one of our biggest problems."

T6: "I think children will be more successful when our children are taught mathematics lessons by living and by doing (for example, going to the village grocery store and shopping together)."

Findings and Comments on the Third Subproblem

The third question asked to teachers in the interview was "What are your thoughts on your own influence on mathematics course achievement? Please explain." The findings obtained by analyzing the answers given by the teachers participating in the research are given in Table 4.

Table 4

The Effects of Teacher Competencies on Mathematics Course Success

Category	Code	Frequency (f)	Percentage (%)
Teacher	Teacher education	15	29.41
	Transferring information	4	7.84
	Motivation	22	43.13
	Teacher love	5	9.80
	Concretization	2	3.92
	Game	3	5.88

In Table 4, it is seen that the codes "Motivation" (*f*=22) and "Teacher education" (*f* =15) are the most common in the teacher category in the opinions of teachers about the effect of their own competencies on mathematics course achievement. In addition, the codes of "Teacher love" (*f*=5), "Transferring information" (*f*=4), "Game" (*f*=3), and "Concretization" (*f*=2) were also determined. Some examples of teachers' opinions are presented below.

T35: "I can say that mathematics is much more than a lesson for me. What other lesson can give us the pleasure of solving a concrete problem by ourselves?"

T3: "The most useful course I took at university was mathematics teaching. I realized this when I first started teaching. The education I received was very useful for me to think about what steps to take in mathematics teaching in the classroom environment."

T23: "There are many reasons for interest in mathematics lessons, but the most important is the student's love for the teacher. Once they love the teacher, the interest to the lessons will be at that level. I have always loved math since elementary school. It was my most successful course. The reason is that I liked my teacher, and I was very curious about this subject."

T1: "Besides thinking that I do not have enough education in mathematics teaching, I sometimes think that I am inadequate in conveying what I know to students because it is my first year in the profession."

T14: "It is a lesson that can be taught fondly when it is made fun with games and activities."

Findings and Comments on the Fourth Subproblem

The fourth subproblem was related to the question of "What are your thoughts on the effects of parental attitudes on mathematics course success? Please explain." The findings obtained by analyzing the answers given by the teachers are demonstrated in Table 5.

Table 5

Effects of Parental Attitudes on Mathematics Course Success

Category	Code	Frequency (*f*)	Percentage (%)
Parent	Perspective on education	4	7.54
	Level of education	3	5.66
	Relationship with the school administration	5	9.43
	Contact with teachers	11	20.75
	Interest in the mathematics course	5	9.43
	Interest in the student	25	47.16

As shown in Table 5, the codes of "Interest in the student" (*f*=25), "Contact with the teachers" (*f*=11), "Relationship with the school administration" (*f*=5), "Interest in the mathematics course" (*f*=5), "Perspective on education" (*f*=4), and "Education level" (*f*=3) were determined in the parent category in the opinions of the teachers about the success of the mathematics course. Examples of teachers' thoughts are given below.

T2: "The fact that the parents are constantly busy in the villages, that their fathers have to work outside the province all the time, that their mothers are dealing with all the remaining jobs and children alone, and that they cannot take care of the schoolchild causes the children not to show sufficient success."

T4: "The *villager does not come to school. He is not interested in his student's situation, so the student's entire educational burden is only on the teacher's shoulders. The children of the uninterested parent often fail."*

T6: "Our *parents are inadequate in this regard. They do not build the necessary communication with the school administration and the teacher. The children seem to have been left to their own fate."*

T29: "Parents care about the mathematics lesson, but since they do not reflect this situation correctly to the children, they cannot be very useful."

T14: "The parent's expectation from their child is limited to four operations. He/she is also expected to be able to count money, but the basic concepts and analysis skills of mathematics represent more than that."

Results and Discussion on the Fifth Subproblem

The fifth question asked to the teachers was "What are your thoughts on the effects of student behavior on mathematics course achievement? Please explain." The findings obtained by analyzing the answers given by the teachers participating in the research are presented in Table 6.

Table 6

The Effects of Student Behavior on Mathematics Course Success

Category	Code	Frequency (*f*)	Percentage (%)
Student	Attitude toward school	2	5
	Attitude toward the teacher	3	7.5
	Attitude toward the course	28	70
	Readiness level	5	12.5
	Reading habits	2	5

When Table 6 is examined, it is seen that the code of "Attitude toward the course" (*f*=28) was the most common code in the student category in teachers' opinions about the effects of students on mathematics achievement. Examples of teachers' thoughts are given below.

T18: "Students who love school, teachers, and lessons–unless they have a special situation–succeed. A student who had a high attitude toward school and the course since the beginning of the year could only show his real performance in the middle of the second semester. Maybe if there was an uninterested student in his place, he would have given up already."

T16: "The student who is active in the mathematics course will be more advanced in terms of success. The readiness of the student who participates in the

lesson, asks where he/she does not understand, and does his/her homework is also high, and his/her interest and desire to learn are also high."

T19: *"There are no students who do not like the course, but since they have problems in reading books, they also have difficulty in solving problems."*

Findings Related to the Sixth Subproblem

The sixth and last subproblem was related to the question of "What are your thoughts on the effects of the distance education process on mathematics course success? Please explain." The findings related to the answers given by the teachers are provided in Table 7.

Table 7

The Effects of the Distance Education Process on Mathematics Course Success

Category	Code	Frequency (*f*)	Percentage (%)
Distance Education	Technological equipment	8	16.66
	Duration	1	2.08
	Participation in the lessons	17	35.41
	Communication with students	8	16.66
	Teaching the lesson	14	29.16

As shown in Table 7, the codes of "Participation in the lessons" (*f*=17), "Teaching the lesson" (*f*=14), "Technological equipment" (*f*=8), "Communication with students" (*f*=8) and "Duration" (*f*=1) are found in the distance education category among the teachers' opinions about the effect of distance education on mathematics course success. Some sample thoughts of the teachers are provided below.

T2: *"The lack of internet infrastructure in the villages and the lack of facilities (phones, tablets, computers) for children to attend the lessons made it impossible for children to participate in distance education. Therefore, distance education has not contributed much to mathematics lessons."*

T31: *"We could not get efficiency in distance education due to our being a village school, lack of infrastructure, and inequality of opportunity. The process with the students who participated was not as productive as face-to-face."*

T22: *"The fact that it was difficult to observe where mistakes in the process and problem steps were made negatively affected the support and corrections to be given to the child."*

DISCUSSION AND CONCLUSION

In this study, opinions were stated about simplifying the learning outcomes and preparing the mathematics curriculum by taking into account student readiness. However, Turan and Tabak (2021) reported that the learning outcomes in the mathematics curriculum were sufficient and appropriate for the students' level. Similarly, Ocak and Tepe (2019) concluded that the gains were appropriate for the students' level and that the students' readiness level was sufficient. It can be said that the reason for the inconsistency between the findings of this study and other studies may be because other studies were conducted in the city, not in the countryside. There are differences in the level of readiness between the student profile in the countryside and the profile in the city (Çiftçi, 2010).

Ersoy (2006) stated that textbooks should be prepared better, as they are often the only source of teachers especially in rural areas where the internet, library, and teachers are limited. Keleş, Haser, and Koç (2012) also argued that textbooks should contain more meaningful activities and examples for rural students. Similarly, in this study, it was concluded that the source books used in the course were insufficient and included a small number of activities.

Another conclusion reached in the study is that the course duration is not sufficient to realize the learning outcomes. In this regard, Gezgin and Bal (2021) also reached similar results. They stated that the time allocated is not sufficient to realize the learning outcomes and those additional activities should be done for students with low readiness levels.

Regarding the teaching environments, it was concluded in the present study that there was a lack of materials in primary schools in rural areas. In addition, the internet infrastructure and technological tools were insufficient, and in this case, it had a negative effect on the mathematics success of primary school students in the concrete procedures period. Koşar and Çiğdem (2003) also stated that the lack of materials in rural schools reduces the success of education. Since primary school students are in a period of more concrete operations, the materialization of mathematics containing abstract concepts increases mathematical success. Gezgin and Bal (2021) maintained that materials should be available in classrooms and schools; it is important to use them effectively by teachers, but unfortunately, teachers think that the course materials are insufficient and that the course tools should be enriched. Temli Durmuş (2016) also reported that teachers need classes enriched with smart boards and mathematical materials.

Concerning the teachers, it was concluded that the motivation of the teachers, the education they received, and the love for the teacher affected the mathematics success of the student. It can be said that the students who love their teacher also like the course over time, and the likelihood of success in the lesson increases. Studies showing that the teacher's attitude toward the mathematics course affects student success (Brown & Baird, 1993; Bulmahn & Young, 1982; Kelly & Tomhave, 1985) support the findings of this research. The competence, field knowledge, and experience of classroom teachers affect the entire educational life of the student starting from primary school. The most important factor affecting the mathematics success of students is teacher competence (Davis & Simmt, 2006; NCTM, 2000; Romberg & Carpenter, 1986). Some of the teachers interviewed explained that they did not consider themselves sufficient in mathematics teaching because they were not classroom teachers, and this situation was effective in the mathematics success of the students. On the other hand, the education received at university is important in mathematics proficiency (Hill, Rowan, & Ball, 2005). Seminars and courses are organized by the Ministry of National Education (MoNE) through the Education Information Network and the Teacher Information Network to increase teacher competence. According to the MoNE Report (2022), 8,715 activities were carried out between August 2021 and February 2022, and 1,755,473 teachers participated in these activities and received certificates. It is also seen that teachers participate in seminars and courses to increase their own competencies.

With respect to the parents, it was concluded that they did not pay enough attention to the students, did not communicate with the teacher and the school healthily, and the education level of the parents was low; accordingly, their expectations from education were also low. Parents' support, guidance, appropriate working conditions, and expectations from the student are important factors for success (Kiwanuka et al., 2015). Levpuscek, Zupancic, and Socan (2012) stated that the education level of the family is an important predictor of children's mathematical success because parents can provide appropriate environmental conditions for education. However, there are also studies that concluded that there is no relationship between parents' education level and students' mathematics achievement. Ural and Çınar (2014) examined the TIMMS and PISA reports and stated that the education level predicted mathematics success as culturally different. In this regard, Liu, Wu, and Zumbo (2006) stated that the education level of Singaporean, Korean, and Hong Kong students' parents did not predict mathematics achievement. Similarly, Wang (2008) determined that there was no statistically significant relationship between the

education level of the Singaporean families and mathematics course achievement, but the relationship was significant in Russia, South Africa, and America.

As regards the students, it was concluded that the students' attitude toward the lesson, their attitude toward the teacher, their level of readiness, and their reading habits affected their mathematics achievement. If the student's attitude toward the lesson is positive, mathematics success is expected. Yavuz, Demirtaşlı, Yalçın, and Dibek (2017) also concluded that students who love the course and have a positive attitude have higher mathematics achievement than students who do not have a positive attitude. A negative attitude toward mathematics is effective on the student's low mathematics achievement (Baykul, 2009; Chaman, 2014; Sarı, Arıkan, & Yıldız, 2017).

In relation to distance education, it was concluded that participation in the course with distance education, the teaching of the course, communication with students, and technological equipment affect mathematics success. Kızıltaş and Özdemir (2021) stated that students living in rural areas could not connect to live lessons due to the lack of technological infrastructure and insufficient internet packages. In cases where there are no technological facilities at home, the internet is not available or sufficient, and students cannot benefit from distance lessons (Bergdahl & Nouri, 2020; Zhou & Li, 2020). MoNE has contributed to eliminating the disadvantage by providing free 8 GB internet access to all students (Özer, 2020). It has also been concluded that distance education is not very effective for the mathematics course, and it is not sufficient to ensure the expected success in mathematics teaching due to situations such as not being able to effectively control what the students who participate in the lessons do, not knowing whether they understand the subject, not being able to give feedback instantly, and not being able to communicate with the student in a healthy way.

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