TRENDS IN TURKISH MATHEMATICS EDUCATION RESEARCH: FROM 1998 TO 2007

TÜRKİYEDEKİ MATEMATİK EĞİTİMİ ARAŞTIRMALARINDAKİ EĞİLİMLER: 1998 İLE 2007 YILLARI ARASI

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ABSTRACT: The aim of the study is to determine trends in Turkish Mathematics Education on the basis of both master and doctoral theses involved. The researchers reviewed the online databases of the Higher Education Council and Proquest as well as the library of each university and examined 284 graduate theses in regard to research topic, research methods, data collection and sample. The document analysis has pointed out that the number of the thesises focusing research problem on *teaching mathematics* is quite high when compared with the other thesis focused different research topics and it is seen an increase in the number of the thesises written around that problem. In addition, it was determined that the most preferable research design by mathematics education researchers *was experimental design* and the most preferable data collection instruments were *questionnaires* and *achievement tests*. Within this process, researchers mostly preferred working on the 6th, 7th and 8th grade students.

Keywords: Mathematics education, research methods, trends in mathematics education, graduate theses.

ÖZET: Bu çalışmanın amacı, Matematik Eğitiminde Türkiye'de tamamlanan yüksek lisans ve doktora çalışmalarındaki eğilimi belirlemektir. Bu amaç doğrultusunda YOK'deki Ulusal Tez Merkezi, Proquest veri tabanı ve Üniversitelerin kütüphaneleri taranarak toplam 284 yüksek lisans ve doktora tezi incelenmiştir. Döküman analizi sonucunda araştırma problemi matematik öğretimi olan tez sayısının diğer araştırma konularına göre oldukça fazla olduğu ortaya çıkmıştır ve bu problem üzerine yapılan tezlerin sayısında artış olduğu görülmektedir. Ayrıca matematik eğitimi araştırmacıları tarafından en çok tercih edilen araştırma tasarımı ise deneysel tasarım ve en çok tercih edilen veri toplama aracının ise anket ve başarı testleri olduğu belirlenmiştir. Araştırmacılar örneklem olarak çoğunlukla 6., 7. ve 8. sınıf öğrencilerini tercih etmişlerdir.

Anahtar Kelimeler: Matematik eğitimi, araştırma metotları, matematik eğitiminde eğilimler, lisansüstü tezler

1. INTRODUCTION

Since mathematics education has been in existence as a field of academic research for roughly a century, over the past 40 years mathematics education has become established world-wide as a major independent area of knowledge and research (Sierpinska & Kilpatrick, 1998). Its growth within the last three decades has been enormous not only in the number of research studies undertaken but also in the number of researchers, places in which scholarly work is being done, and of academic fields represented in that work (Sierpinska & Kilpatrick, 1998). Many countries offer specialist master's and doctoral programs of study in mathematics education, and new researchers often receive their postgraduate education within this academic field. Despite this rapid development in the world, mathematics education was not accepted as a research field in Turkey for a long time. The belief that 'if there is perfect explanation by the teacher, there is also perfect mathematics teaching and if there is careful listening, there is a perfect learning' is very common for the main reason for this delay. In Turkey for the recent 15 years the difference between knowing and teaching, and memorizing and learning in mathematics education has been understood and projects and research studies have been carried out within this framework. As a result of this, according to the records of The Council of Higher Education (YÖK) approximately 500 master's and doctorate thesis have been written for the last 15 years within the field of mathematics education. There has been a great mobility in Turkey at mathematics education

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research area. The belief that every mathematician is at the same time mathematics educator isn't common anymore and the field of mathematics education has aroused as a great research area in Turkey.

Especially in 1970s great discussions started to appear about the quality of mathematics education studies in the USA and some opinions were uttered defending that mathematics education research studies were not enough to meet for the need of real problems. Great changes have been demanded for the scope and the methods used in mathematics education research studies (Lester, 2005). Moreover even in 1990s some researchers have declared that mathematics education research studies performed in the USA neglected some of the fields. (Lubienski & Bowen, 2000). For example, Jacob (1998) claims that the mathematics education research community has tended to focus on "cognition without context or culture", Tate (1997) argues that mathematics education research tends to be narrowly focused, restricted to the disciplines of mathematics and psychology. Scandura, a researcher in U.S. during the 1960S and 1970s has expressed that adoption of statistical approaches in the research studies of mathematics education are generally inadequate in producing solution for educational problems and stated this as "They look at tables of statistical data and they say "So what!". Similarly, after 15 years passed over the start of mathematics education research studies in Turkey, many researchers, although it isn't uttered aloud, have explained that real and significant problems weren't discussed, there was no qualified research studies, using experimental designs and statistical analysis so much caused some vital questions to be unanswered, and the research studies was being carried out without having a strong theoretical substructure.

Given the development of mathematics education as a research field and present debates about mathematics education, it seems timely to pause and examine the state of mathematics education research in Turkey in the past decade, to summaries its achievement, and to ask how this work might inform future practice and policy in mathematics education. It is time to review the state of the field.

1.1. Research Purpose

In recent years a great increase has stood out in postgraduate studies in the field of mathematics education in Turkey and there has been a great mobility. To determine which research studies have been made up till now, what the deficiencies have been, which methods and data gathering instruments have been used is being thought as important because of conducting new research studies, being indicated the deficient points to experienced and new researchers, and giving information about the quality of the mathematics educational research in Turkey. In addition, knowing the trends of recent research studies can help policy makers in related fields to make plans to promote further study in the future. In this context, we think that reviewing master and doctoral thesises will be an important guide for the researchers and policy makers for the mentioned topics. Since there has not been such a study like this one scanning the thesises in the scope of mathematics education before in Turkey, the study has increased its importance and it is thought it will fill in an important gap.

Thereby, the aim of the study is to determine trends in Turkish Mathematics Education on the basis of both master and doctoral thesis involved. The research questions addressed by this study are:
1. Which research problems have been included in master and doctorate thesises within the last 10 years and how often?
2. Which data presentation approaches have been used in master and doctorate thesises within the last 10 years and how often?
3. Which research methods have been used in master and doctorate thesises within the last 10 years?
4. With which samples have been studied in master and doctorate thesises within the last 10 years?

2. METHOD

Firstly the researchers reviewed the online databases of The Council of Higher Education of the Republic of Turkey (YÖK) and Proquest Digital Dissertation as well as the web page of graduate school of each university which presents thesis archive. When enough information about a graduate thesis was not obtained by means of these processes, the researchers sent e-mail to author about their theses. However, there were thesises that couldn't be accessed. Under the scope of this study, totally 284 masters and doctorate thesises were surveyed. Since the dissertations accepted in 2008 have not been published yet, the paper does not incorporate in them. In the reviewing process of thesises we have focused on four main components;

- Research Topic
- Research Methods
- Data Collection
- Sample

2.1. Analysis of Thesis

2.1. 1. Analysis of Research Problem (Research Topic Analysis)

Based on the methodology of content analysis, the research problems were first categorized into five tentative categories: Teaching mathematics, learning mathematics, methodological issues, mathematics teacher education, assessment methods and instruments. For each category, some sub-categories were classified. The framework which Sierpinska (2003) classified the studies in 26th PME has been used for constructing the categories. During the data analysis process, these categories were refined continually by using the constant-comparative method. Categories and subcategories were confirmed until all theses were reviewed. A category and some new categories were added to research topics during the reviewing.

The final analysis framework consisted of the research topic categories and sub-categories are shown at Table 1.

Table 1. Categories and Sub-Categories of Research Topic and Their Descriptions

Research Topic and sub-topics	Description
1. Teaching Mathematics	
1.1. Actual Teaching Practices	Thesises focused on identifying mathematics teachers' teaching practices, for example; • analyzing teacher's practices in attending to and interpreting students' interventions, • Teacher' proficiencies in the management of a whole-class discussion etc.
1.2. Factors that influence teaching practices	Thesises looked at factors that influence teachers' practices, for example; • Teachers' views about nature of mathematics • Teachers' pedagogical efficiencies • Teachers' views about teaching and learning mathematics • Teachers' pedagogical content knowledge • Teachers' knowledge of mathematics • Teachers' professional development • Teachers' views about using technology in mathematics teaching etc.
1.3. Interventions	Thesises focused what happens if the subject is taught differently, for example; • Teaching a mathematical subject different from traditional practices. • Reflections and products from the classroom. • Experimental designs etc.

Table 1. Categories and Sub-Categories of Research Topic and Their Descriptions

1.4. Prescriptive analyses: How to best teach the subject?	Recommendations and ideas for teaching can be based on theoretical arguments only etc.
1.5. Using technology for teaching	Thesises looked at how a teaching environment change if a specific subject taught with technology (Dynamic Geometry Software, Logo, CAS,..), etc.
2. *Learning of Mathematics*	
2.1. How people learn mathematics in general	Thesises were interested in developing theories or models of learning mathematics in general, for example; • Observing the process of constructing mathematical knowledge • Characterizing mathematical thinking • Using multiple representations in learning mathematics • Theories about cognitive development and process of mathematical learning (SOLO, APOS etc.) • Theories of learning specific mathematical concepts or processes etc.
2.2. Theories of learning specific mathematical concepts or processes	Thesises aimed to descript of learning a specific mathematical concept or process, for example; • Analysis of the symbolic thinking involved in understanding and solving word problems using algebraic equations • Misconceptions about different mathematical subjects • Difficulties when learning a new mathematical concept • Problem solving process etc.
2.3. Identification and study of factors influencing, interfering in learning	Thesises aimed at identifying factors, which may influence the learning of mathematics, for example; • The relationship between students' social background and learning mathematics • The effects of out of school life on students' mathematical learning • The effect of attitudes on mathematical learning • The role of cognitive abilities on mathematical learning etc.
2.4. Using technology for learning	Thesises focused on students learning in computer based environment.
3. *Methodological Issues*	Thesises were concerned with research methodologies, for example; • To improve a taxonomy such as Bloom taxonomy or adapting a taxonomic approach into the mathematics • Developing a scale such as attitude and belief questionnaires, etc.
4. *Mathematics Teacher Education*	Thesises about pre-service and in-service teacher education, for example; • Studies about improving mathematics teachers' content knowledge • Studies about improving mathematics teachers' pedagogical content knowledge • Studies examining mathematics teachers' beliefs about using technology in mathematics • Studies aimed to improve pre-service and in-service teaching etc.
5. *Assessment and Evaluations Methods*	Thesises focused to problems related to the development of methods and instruments of assessment of students' mathematical competence, for example; • Bringing new assessment and evaluation methods into the classrooms • Developing new assessment instruments • Examining teachers' actual assessment and evaluation methods etc.
6. *Mathematics Curriculum*	Thesis about evaluation of mathematics teaching programs, for example; • Comparing in Turkey elementary and secondary mathematics curriculum with other countries'. • The developments of Turkish mathematics. • Examining Turkish elementary and secondary school mathematics curriculums in different perspectives etc.

It should be noted that many thesis addressed more than one of the aforementioned topic categories; therefore, one thesis might be coded into two (or more) categories (or sub-categories) in this part of the content analysis. The analysis was processed by three doctoral researchers and resulted in an agreement of 0.87. The discrepancy was resolved upon discussion. The analysis of selected thesis was further validated by a professor.

2.2. Analysis of Research Methods and Data Collection

First of all, the studies were classified as qualitative, quantitative and mixed methods according to the data presentation. We defined *quantitative research* as studies in which the data was analyzed and presented numerically; this included all forms of descriptive and inferential statistics. *Qualitative studies* were those in which there was no quantification of the data; this included narrative studies, case studies and thematic analyses in which common patterns are identified without counting or other quantification. The studies presenting both qualitative and quantitative data were defined as *mixed*.

Since there are so many references in the books and articles published in Turkey to Cohen, Manion and Morrison's book (2000) entitled "Research Methods in Education", Cohen and Manion's book used as main reference while classifying the methods and the means of data gathering used in research studies. Research methods and data gathering strategies used in the classifications have been seen in Table 2.

Table 2: Style of Educational Research and Strategies for Data Collection

STYLES OF EDUCATIONAL RESEARCH	STRATEGIES FOR DATA COLLECTION
Ethnographic Research	Questionnaire or other type of survey
Historical Research	*Interviews*
Survey	*Achievement tests*
Longitudinal, Cross-sectional studies	*Observations*
Case studies	*Journal writings*
Experimental Design	
Actions Research	
Content Analysis	

2.3. Sample Analysis

The sample in the theses were defined as pre-school students, elementary school students (1-5), elementary (6-8) and secondary school students (9-12), pre-service mathematics teachers, mathematics teachers, undergraduate students (else pre-service mathematics teachers), gifted students, students' parents and school administers and the data analyzed in the same direction with that. A sample analysis has not been used for the studies making content analysis.

3. RESULTS

3.1. Research Topic

In this section, the frequencies of research topic were examined. Although many dissertations discussed only one research topic, there were still some dissertations which covered two or more sub-categories. Table 3 shows the final frequency counts for each subcategory.

As it is seen in Table 3 there has been a great increase in the number of the completed thesis beginning from 2005. The number of completed thesis after 2005 is 74,1% of the whole completed ones since 1998. It indicates that there has been a great mobility in the field of mathematics education in recent years. The number of the thesis that includes the research problems focused on teaching involves a great part of all thesises (47,4%).

Table 3. Frequency and Percentages of Research Topics

Category	Sub-Category	1998-2001		2002-2004		2005-2007		Total	
		N	%	N	%	N	%	N	%
Teaching Mathematics	*Actual Teaching Practices*	2	0.6	3	0.8	11	3.1	16	4.5
	Factors that influence teaching practices	3	0.8	1	0.3	19	5.3	23	6.4
	Interventions	1	0.3	4	1.1	61	17.1	66	18.5
	Prescriptive analyses: How to best teach the subject?	1	0.3	2	0.6	29	8.1	32	9.0
	Using Technology for teaching	0	0	13	3.6	19	5.3	32	9.0
Learning Mathematics	*How people learn mathematics in general*	2	0.6	7	2.0	9	2.5	18	5.1
	Theories of learning specific mathematical concepts or processes	5	1.4	14	3.9	21	5.9	40	11.2
	Identification and study of factors influencing/interfering in learning	8	2.2	11	3.1	27	7.6	46	12,9
	Using Technology for learning	0	0	1	0.3	1	0.3	2	0.6
Methodological Issues		0	0	3	0.8	14	3.9	17	4.7
Mathematics Teacher Education		0	0	4	1.1	19	5.3	23	6.4
Assessment Methods and Instruments		1	0.3	4	1.1	3	0.8	8	2.2
Mathematics Curriculum		1	0.3	2	0.6	31	8.7	34	9.6

*Since some of the studies contain more than one research topic, total number of research topic exceed the numbers of studies examined in this study.

The studies focused on learning (29,2%), mathematics curriculum (9,6 %), teacher education (6,4%), methodological issues (4,8%), Assessment methods and instruments (2,2%) followed each other in turn. While the number of the thesis focused on learning (47) was more than the number of the thesis focused on teaching (30) until 2004, a great increase appeared in the number of the thesis focused teaching from 2005 (teaching:139 - learning: 57). It can be understood from the recent studies that it has been focused on teaching rather than learning. Moreover, in recent years, between 2005 and 2007, the total number of the thesis not focused on teaching (126) is less than the the number of thesis focused on teaching (139). In table 3 the increase in the studies about Mathematics Curriculum after 2005 has drawn attention. 31% of the curriculum survey studies carried out totally 34 times was made after 2005. In 2005 the change in mathematics curriculum in Turkey caused an increase in the number of the research problems focused on that issue. On the other hand, the number of research problems focused on methodological issues, mathematics teacher education and assessment methods and instrument is quite less. When the sub-categories have been looked over, the number of thesis surveying a different

way of teaching a subject within the teaching-focused studies (totally 18,5%, in a category 39,1%), and the studies searching the factors affecting learning in the learning-focused studies have a great portion(totally 12,9 %, in a category 44,2%). Notwithstanding, it can be seen within the research studies focused on teaching that the number of the studies observing a real class environment is quite less. (totally 4,5%, in a category 9,5%). One of the other striking points between the sub-categories is that research problems using technology as teaching-focused began to appear after 2002 and there appeared a great increase in the number after 2005. In spite of the increase in the number of the research problems about the usage of technology as teaching-aimed, the number of the research problem that technology used as learning-aimed is considerably inadequate. It indicates that mathematics education researchers in Turkey perceive technology not as a means of learning but a means supporting teaching.

3.2. Research Methods and Data Collection

Table 4 summarizes the types of data presented in the research.

Table 4. Frequency and Percentages of Types of Data Presented

Type of data	Number of Theses (%)			
	1998-2001	2002-2004	2005-2007	Total
Quantitative only	13 (4,6)	24 (8,5)	91 (32,0)	128 (45,1)
Qualitative only	2 (0,7)	9 (3,2)	41 (14,4)	52 (18,3)
Both quantitative and qualitative	6 (2,1)	16 (5,6)	82 (28,9)	104 (36,6)

As it is seen in table 4, only quantitative data compose a great part of the thesis. (45,1%).   Only mixed (36,6%) and qualitative(18,3%) studies follow the former one. Only the ratio of the quantitative studies compose 61,9% of the whole studies between the years 1998 and 2001(13 of the 21 studies), this ratio decreased to 49% between the years 2002 and 2004 (24 of the 49 studies) and to 42,5% between the years 2005 and 2007 (91 of the 214 studies). It can be observed that depending on years there was a decrease in the number of the studies presenting these data only as quantitative .However, an increase stands out depending on years in the number of the thesises presenting the data as both qualitative and quantitative or only as qualitative.(both qualitative and quantitative: 28,6% - 32,7% - 38,3 and: only qualitative 9,5% - 18,4%, 19,2%). The other outstanding point is that the number of the thesises presenting the data as both qualitative and quantitative gradually approaches in the course of time to the number of thesises presenting the data only as quantitative.

Research methods used in the thesises between the years 1998 and 2007 has been presented in the table 5.

Table 5. Frequency and Percentages of Styles of Educational Research

	Number of Theses (%)			
STYLES OF EDUCATIONAL RESEARCH	1998-2001	2002-2004	2005-2007	Total
Ethnographic Research	1 (0,4)	2 (0,7)	16 (5,6)	19 (6,7)
Historical Research	0 (0)	1 (0,4)	4 (1,4)	5 (1,8)
Survey	5 (1,8)	16 (5,6)	59 (20,8)	80 (28,2)
Longitudinal, Cross-sectional studies	2 (0,7)	2 (0,7)	14 (4,9)	18 (6,3)
Case studies	2 (0,7)	7 (2,5)	37 (13,0)	46 (16,2)
Experimental Design	9 (3,2)	18 (6,3)	61 (21,5)	88 (31,0)
Actions Research	1 (0,4)	2 (0,7)	15 (5,3)	18 (6,3),
Content Analysis	1 (0,4)	1 (0,4)	8 (2,8)	10 (3,5)

As it seen in Table 5, survey (28,2%) and experimental designs (31%) are the most preferable methods in this period. The number of the studies these two methods were used composes 59,2% of the whole thesises. These methods in turn have been followed by case study (16,2%), ethnographic research(6,7%), cross sectional studies (6,3%), action research (6,3%), content analysis (3,5%) and historical research (1,8%). Experimental designs compose 42,9% of the thesises written between the years 1998-2001 (9 of the 21 thesises), 36,7% of thesises written between the years 2002-2004 (18 of the 49 thesises) and 28,5% of the thesises written between the years 2005-2007.(61 of the 214 thesises). It indicates that there has been a decrease according to years in the ratio of the research studies in which experimental design is used as a method. However, experimental designs are still the most preferable research method by the researchers. Besides, it has been observed an increase depending on years in the number of the studies in which case study was used (9,5% of the ones between the years 1998-2001, 14,3% of the ones between the years 2002-2004 and 17,3% of the ones between the years 2005-2007). Similarly, between the years 2005-2007 there has been a noteworthy increase in the number of the research in which ethnographic approach was used when compared with previous years.

Data gathering methods used in the thesises has been presented in Table 6.

Table 6. Frequency and Percentages of Data Collection Methods

DATA COLLECTION METHOD	Number of Theses (%)			
	1998-2001	2002-2004	2005-2007	Total
Questionnaire or other type of survey	10 (2,8)	18 (5,2)	72 (20,1)	100 (28,1)
Interviews	6 (1,7)	13 (3,6)	56 (15,6)	75 (20,9)
Achievement tests (Standardized instrument)	16 (4,5)	31 (8,7)	98 (27,4)	145 (40,6)
Observations	3 (0,8)	5 (1,4)	23 (6,4)	31 (8,6)
Journal writings	0 (0)	2 (0,5)	5 (1,4)	7 (1,9)

*Since some of the studies contain more than one data collection method, total number of methods exceeds the numbers of studies examined in this study.

As it is seen in table 6, researchers have mostly preferred achievement tests and public questionnaires (especially likert type) with the aim of gathering data in thesises (40,6% and 28,1%). These are followed in turn by interviews, observations and journals. It is seen as an outstanding point that questionnaires and achievement tests were used in the 68,7% of the whole studies. Notwithstanding, depending on years achievement tests were used by researchers in 45,7% of the thesises written between 1998 and 2001, 44,9% of the thesises written between 2002 and 2004, 38,6% of the thesises written between 2005 and 2007. Although it indicates that there is a decrease in the ratio of the usage of achievement tests, it is still seen as the mostly used data gathering instruments. On the other hand, it stands out an increase in the usage of interview method within the years. (1998-2001: 17,1% , 2002-2004: 19,4 %, 2005-2007: 22,1%).

3.3. Sample

In that part of the research, findings about the sample that researchers used while carrying out their thesises have been presented.

As it seen in table 7, elementary and secondary students compose a great part of the sample (44,4%) used in studies. The students between 6th and 12th year compose 24,4% of that part of the studies. These, in turn, are followed by the thesises using pre-service mathematics teacher (16,1%), and mathematics teachers (13,2%) as a sample. Notwithstanding, the research number that gifted students (0,6%) and university students (0,6%) (Except for mathematic teacher candidates) were used as sample is quite low.

Table 7. Frequency and Percentages of Samples Used in Thesises

Sample	Number of Theses (%)			
	1998-2001	2002-2004	2005-2007	Total
Pre-school students	1(0,3)	1(0,3)	4(1,2)	6 (1,7)
Elementary school students (1-5)	9(2,6)	12(3,4)	52(15,0)	73(20,0)
Elementary (6-8) and secondary school students (9-12)	6 (1,7)	17(4,9)	62(17,8)	85(24,4)
Pre-service mathematics teachers	2(0,6)	7(2,0)	47 (13,5)	56 (16,1)
Mathematics teachers	3(0,8)	7 (2,0)	36 (10,3)	46 (13,2)
Undergraduate students (without pre-service mathematics teachers)	0	0	2 (0,6)	2 (0,6)
Gifted students	0	0	2 (0,6)	2 (0,6)
Students' parents	1 (0,3)	2 (0,6)	9 (2,6)	12 (3,4)
School administers	1 (0,3)	4 (1,1)	11(3,2)	16 (4,6)

*Since some of the studies contain more than one sample, total number of them exceeds the numbers of thesis.

In addition, from the table 7, depending on the years there has been observed an increase in the number of the thesises using pre-service mathematics teachers as sample.(7,4% of the samples between the years 1998-2001, 11,5% of the samples between the years 2002-2005 and 18,1% of the samples between the years 2005-2007). However, there has been observed a great decrease from 1998 to 2008 in the research number that elementary school (1-5) students were used as sample. (33,3% of the samples between 1998-2001 and 20% of the samples between 2005 and 2007).

4. DISCUSSION

Although there have been research studies in the field of mathematics education in Turkey since 1990, especially after 2005 the great increase in the number of the produced thesises has stood out. (Table 3). It indicates that there has been a serious mobility in the field of mathematics education after 2005 and the influence of the mobility can be noticed in the number of the thesises. It can be pointed out that mathematics education began to be entrenched as a research field in Turkey and, there has been an increase in the number of the mathematics education researchers and institute educating in the postgraduate level in the field of mathematics education. It can be said that mathematics education in Turkey as a research field got ahead of the early stage of development.

The number of the thesises focusing research problem on teaching is quite high when compared with the other thesises in other fields (Table 3) and it is seen an increase in the number of the thesises written around that problem. It points out that there is a trend having a tendency to teaching instead of learning in mathematics education research. Consequently, it can be inferred that mathematics education thesis in Turkey tend to conceptualization to take the importance on defining the factors influencing teaching, and on developing, at first, the new teaching approaches and means for students to learn mathematics well. Actually, when it is considered that mathematics education research in Turkey have a recent past, it can be seen as normal that researchers in order to develop the present teaching practices tend to focus on research problems laying stress on teaching. In recent years, it can be said that the reason of the increase in the number of the thesises written about mathematics curriculum is new developed mathematics curriculum of the elementary and secondary schools in 2005. In addition, researchers' preference of choosing technology in the teaching-focused studies indicates that they perceive technology not as a means of learning but as means of supporting teaching. Baki (2006) expresses that Turkish mathematics teachers also share the same belief. Notwithstanding, there are still blanks in terms of research in some fields such as Assessment Methods and Instruments, Methodological Issues and Using Technology for learning.

The most used research methodology has been *experimental design*. This may result from statistical evidences where readers can compare new attempt with old one. In fact, it is clear that experimental group or design performs better than traditional one since each material such as teaching, measurement and assessment instruments is devised and implemented for their features. After

mathematics education began to be common in Turkey as a research field, Researchers whose study perceptions configured as quantitative, tend to use experimental design and survey methods in their studies by generally focusing on quantitative approaches. Therefore, experimental design has been preferred in great part of the thesises especially written between the years 1998-2001. However, with the beginning of the development in the belief that the process of mathematics learning and teaching can not be expressed with only numbers and symbols, at first case study and then the methods focused on qualitative approaches have started to be preferred. However, experimental design and survey are still the most dominant and preferable research methods. Ulutaş & Ubuz (2008) have determined that experimental design is the most preferable method used in articles and studies about mathematics education research published in educational journals in Turkey. In addition, Çalık at all (2008) have designated at the result of their study that the same trend is also seen in science education. The same findings have been acquired in the USA in 1960 and 1970s when mathematics education fairly new found acceptance as an independent academic field. (Scandura, 1967). In parallel with the change in the methods used in research studies, the way of presentation of data changed. It can be seen a great increase in the number of the thesises presenting the data as both quantitative and qualitative.

Questionnaires and achievement tests are the most preferable data gathering tools used in thesises. Actually, this occasion results from the influence of the experimental and survey method among the methods used in thesises. The use of achievement tests especially in experimental design studies and the preference of the researchers in using mostly this method in their thesises make the most preferable data gathering means, an achievement test. Especially while applying the questionnaires and the facilities in analyzing data might oriente researchers to use questionnaires in their studies. Since the tradition of mathematics education research in Turkey does not have a long past, the number of the experienced researchers in that field is low. As a consequence of that, we think that new researchers' not getting an active counseling service (because of the deficiency in the number of experienced researchers) causes them to focus on easier methods in presentation and analysis of their studies. Ulutaş & Ubuz (2008) have determined with their study that researchers mostly use questionnaires and achievement tests in articles published in Turkish educational journals. Nevertheless, in recent years it is observed that especially data gathering approach by using interview method have been increasing gradually in written thesises. Especially in recent years qualitative approaches are intensively used in mathematics education around the world and there is an important paradigm change. The increase in the number of the thesises in which interview used as data gathering method indicates that there is a tendency in Turkey as in the world, and it can not be still said that the tendency to qualitative approach is enough.

Why elementary school students are the most important for mathematics education in Turkey can be explained with different reasons. The main reason can be explained the fact that students first time met formal mathematical structures in these grades. They begin to use algebraic expressions and solve mathematical problems by using variables. Students begin to use basic mathematical reasoning principles in both geometry and algebra. These aspects are important for mathematics education researchers. The same tendency is seen in science education thesises (Çalık at all, 2008) and from the mathematics education research studies published in journals (Ulutaş & Ubuz, 2008). In addition, in studies it is observed a great increase depending on years in the number of the thesises choosing pre-service teachers as samples. It indicates that in Turkey the analysis about educating teachers have increased, and there are still new ways of searching, and it is started to study on teacher education professionally. Notwithstanding, focusing on elementary and secondary school students according to university students shows that there is a great gap in mathematics education research at the university level. So, we think that it will be useful if the researchers focus on that part.

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Genişletilmiş Özet

Türkiye'de uzun süre matematik eğitimi bir araştırma alanı olarak kabul edilmemiş ve bu alanda araştırma yapılmamıştır. Bu gecikmenin temelinde "iyi matematik öğretimi iyi bir anlatımla, iyi öğrenme de dikkatli dinleme ile gerçekleşir" inancı yaygındı. Türkiye'de son 20 yıldır matematik öğretiminde bilmekle-öğretmek, ezberlemek ile öğrenmek arasındaki fark anlaşılmakta ve bu eğilim çerçevesinde projeler ve araştırmalar yürütülmektedir. Bunun sonucu olarak, son 20 yıldır yüksek öğretim kurumunun kayıtlarına göre matematik eğitimi alanında 500'den fazla yüksek lisans ve doktora tezi yapılmıştır. Matematik eğitimi araştırmalarında Türkiye'de önemli bir hareketlilik yaşanmaktadır. "Her matematikçi aynı zamanda matematik eğitimcisidir" inancı yok olmakta ve matematik eğitimi alanı önemli bir araştırma alanı olarak karşımıza çıkmaktadır. Özellikle 70'li yıllarda Amerika'da üretilen matematik eğitimi çalışmalarının niteliği noktasında önemli tartışmalar yaşanmaya başlamış ve matematik eğitimi araştırmalarının gerçek problemlere cevap vermekte yetersiz kaldığı yönünde düşünceler dile getirilmiştir. Matematik eğitimi araştırmalarında hem kapsam olarak hem de kullanılan yöntemler bağlamında önemli değişimler talep edilmiştir. Hatta 90'lı yıllarda bile bazı araştırmacılar, Amerika'da matematik eğitiminde yapılan araştırmaların bazı alanları ihmal ettiğini belirtmişlerdir

Son yıllarda matematik eğitimi alanında Türkiye'de yapılan lisansüstü çalışmalarda önemli bir artış göze çarpmakta ve bir hareketlilik yaşanmaktadır. Bu çalışmanın bugüne kadar hangi araştırmaların yapıldığını, nelerin eksik kaldığını, hangi yöntem ve veri toplama araçlarının kullanıldığını tespit etmek; yeni araştırmalara yön vermesi, deneyimli ve yeni araştırmacılara bu alandaki eksik yönlerin gösterilmesi ve Türkiye'deki matematik eğitimi araştırmalarının niteliği hakkında bilgi vermesi bakımından önemli olduğu düşünülmektedir. Bu kapsamda lisansüstü tezlerinin taranmasının bahsedilen konularda araştırmacı ve politika yapıcılara önemli bir yol haritası sunacağını düşünmekteyiz. Daha önce Türkiye'de matematik eğitimi alanında üretilen tezleri tarayan benzer bir çalışmanın yapılmamış olması çalışmanın önemini artırmakta ve çalışma ile önemli bir boşluğu doldurulacağı düşünülmektedir.

Bu çalışmanın amacı, Matematik Eğitiminde Türkiye'de tamamlanan yüksek lisans ve doktora çalışmalarındaki eğilimi belirlemektir. Bu amaç doğrultusunda YÖK'deki Ulusal Tez Merkezi, Proquest veri tabanı ve Üniversitelerin kütüphaneleri taranarak toplam 284 yüksek lisans ve doktora tezi incelenmiştir. İncelenen tezler, Anna Sierpinska'nın (2003) 26. Psychology of Mathematics Education (PME)'deki çalışmaları sınıflandırdığı yapıdan yararlanarak kategorilere ayrılmış ve analiz edilmiştir. Yapılan tezler, *araştırma problemi, araştırma metodu, veri toplama araçları ve örneklem* açısından kategorilere ayrılarak analiz edilmiştir. Her bir kategori ise alt kategorilere ayrılarak konular özelleştirilmiştir.

Elde edilen veriler sonucunda 1990'lardan beri matematik eğitimi alanında Türkiye'de araştırmalar yapılıyor olmasına rağmen, özellikle 2005 yılından sonra üretilen tez sayısında önemli bir artış olduğu göze çarpmaktadır. Bu ise 2005 yılından sonra matematik eğitimi alanında ciddi bir hareketlenme olduğunu ve bunun da yapılan tez sayısına yansıdığını göstermektedir. Bu durum, matematik eğitiminin bir araştırma alanı olarak Türkiye'de yerleşmeye başladığını, matematik eğitimi araştırmacı sayısında ve matematik eğitimi alanında lisansüstü düzeyde eğitim veren enstitü sayısındaki artışı da işaret etmektedir. Artık Türkiye'de matematik eğitiminin bir araştırma alanı olarak emekleme devresini geride bıraktığı söylenebilir.

Bununla birlikte araştırma problemini öğretme üzerine şekillendiren tezlerin sayısı diğer tüm alanlardaki tezlerin sayısına göre çok daha fazladır ve bu problem etrafında üretilen tez sayısı giderek artış göstermektedir. Bu durum matematik eğitimi araştırmalarının "öğrenme" yerine "öğretme" eğilimli olduğunu göstermektedir. Dolayısıyla Türkiye'deki matematik eğitimi araştırmacılarının öğrencilerin daha iyi matematik öğrenebilmeleri için öncelikle yeni öğretme yaklaşımlarının ve araçlarının geliştirilmesine, öğretimi etkileyen faktörlerin tespit edilmesine ağırlık verilmesi gerektiği yönünde bir kavramsallaştırmaya yöneldikleri sonucuna varılabilir. Aslında, Türkiye'de matematik eğitimi araştırmalarının yakın bir geçmişe sahip olduğu göz önüne alındığında araştırmacıların mevcut öğretme pratiklerini geliştirmek için öğretime vurgu yapan araştırma problemlerine yönelmeleri normal olarak karşılanabilir. Son yıllarda matematik müfredatı üzerine yapılan tez sayısındaki artışın 2005 yılında ilk ve ortaöğretim matematik müfredatlarında yapılan değişiklikten kaynaklandığı söylenebilir. Ayrıca araştırmacıların teknolojiyi öğretme odaklı çalışmalarda tercih etmeleri, teknolojiyi bir öğrenme aracı olarak değil öğretimi destekleyen bir araç olarak görme eğiliminde olduklarını ortaya koymaktadır.

Türkiye'de matematik eğitiminin bir araştırma alanı olarak yaygınlaşmaya başlamasından sonra araştırmacılar, çalışmalarında daha çok nicel yaklaşımlara odaklanarak deneysel tasarım ve anket yöntemlerine yönelmişlerdir. Özellikle 1998-2001 yılları arasında yapılan tezlerin önemli bir bölümünde deneysel tasarımı tercih edilmiştir. Ancak matematik öğrenme ve öğretme sürecinin sadece sayı ve sembollerle ifade edilemeyeceği inancının gelişmeye başlamasıyla başta özel durum çalışması olmak üzere nitel yaklaşımlara dayalı yöntemler tercih edilmeye başlanmıştır. Ancak hala, deneysel ve anket çalışmaları baskın olarak tercih edilen araştırma yöntemleridir.

Anketler ve başarı testleri tezlerde en çok kullanılan veri toplama araçları olarak dikkat çekmektedirler. Aslında bu durum tezlerde kullanılan yöntemler arasında deneysel ve anket yönteminin etkisinden kaynaklanmaktadır. Özellikle deneysel çalışmalarında başarı testleri kullanılması ve araştırmacıların tezlerinde çoğunlukla bu yöntemi tercih etmeleri, en çok kullanılan veri toplama aracının da başarı testi olması sonucunu beraberinde getirmiştir. Özellikle anketlerin uygulanmasında ve verilerin analizindeki kolaylık araştırmacıları çalışmalarında anket kullanmaya yöneltmiş olabilir.

Çalışmalarda örneklem olarak öğretmen adaylarını seçen tezlerin sayısında da yıllara bağlı olarak önemli bir artış gözlemlenmiştir. Bu Türkiye'de öğretmen yetiştirmeye yönelik analizlerin arttığını, yeni arayışlar olduğunu ve öğretmen eğitiminin profesyonel olarak çalışılmaya başlandığını göstermektedir. Bununla birlikte tezlerde ilköğretim ve ortaöğretim öğrencilerine odaklanılması buna karşın üniversite düzeyindeki öğrencilerle çok az çalışılması, üniversite düzeyinde matematik eğitimi araştırmalarında önemli bir boşluk olduğunu göstermektedir. Bu anlamda araştırmacıların bu alana yönelmelerinin faydalı olabileceği düşünülmektedir.