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Investigation of Mathematics Teachers' Level of Following, Understanding, and Applying Educational Research

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ABSTRACT

Determining teachers' level of following, understanding and applying research in their disciplines and in the education of other disciplines in in-class activities is of great importance for further studies. This study aims to reveal the views of mathematics teachers about following, understanding and applying studies on mathematics education or different disciplines. As a result of the study, it has been determined that the research topics mathematics teachers attach importance are misconceptions, learning difficulty and attitudes towards mathematics. It is seen that teachers follow sources about mathematics education on the internet. Mathematics teachers do not participate in scientific meetings, and do not find in-service training seminars useful. The teachers do not follow scientific studies and do not find the language of scientific findings understandable. It was also revealed that teachers do not follow studies in other fields and that they think using them in their application would take time.

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Keywords:
Mathematics education, educational research, mathematics teachers, research and practice relation

Introduction

For a great many years, educators have been studying to develop qualified education understanding at schools and have reached various results in their studies. These studies are carried out to reach generalization, theories or rules or to improve existing insights into existing understanding (Burkhardt and Schoenfeld, 2003; Gore and Gitlin, 2004; Hargreaves, 1997; Kennedy, 1997; Levin, 2004; Levin and O'Donnell, 1999). Educational research is carried out to solve problems encountered in education, to increase the quality and efficiency of education for practitioners (Ahuja, 2012). Besides, some topics in education are also studied as master and PhD dissertation topics. Such studies are expected to reach noteworthy results with a great source and a large application area. In these studies, implementations in which schools, universities, parents, teachers and administrators are included to ensure a large field of application.

Various investigations are made on research and application studies in education (Bauer and Fisher, 2007; Broekkamp and Van Hout-Wolters, 2007; Chafouleas and Riley-Tillman, 2005; Gore and Gitlin, 2004; Huberman, 1993; Levin, 2004; McIntyre, 2005; Mortimore, 2000; Wagner, 1997; Whitty, 2006). The results of these investigations indicate that there is a gap between research and application studies (Broekkamp and Van Hout-Wolters, 2007; Lagemann, 2000; Levin 2004; Oancea, 2005; Stark and Mandl, 2007). Some researchers maintain that this gap results from the difference in the nature of research and practice (Broekkamp and Van Hout-Wolters, 2007).

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Since researchers in academic fields have started to conduct studies on education, various problems about the relation between research and practice have always been propounded (Biesta, 2007; Harrington, 1991; Hurd, 1991; Kennedy, 1997; Lamm, 1993; Wubbels, 1993). One of the leading problems is to establish a relation between research and practice (Everett, Luera and Otto, 2007). Hallinan (1996) state that there is a lack of communication resulting from the difference between the agendas and interests of researchers and practitioners. It is important to establish connection between research and practice to deal with this deficiency (Broekkamp and Van Hout-Wolters, 2007; Feiman-Nemser, 1998; Randi and Corno, 1997).

William (2002) marked that teachers can work with researchers and obtain information that will help them rather than using information in the studies which they regarded as "far away" from them. Jenkins (2000) states that educational research is generally conducted so extensively that generalization are made and that they fall short in helping specific contexts in classes. Researchers think that research results yield ideal information and should be used by practitioners in practice. The real problem here is that there is no detailed explanation with regard to the use of information in different ways in practice. Therefore, academics and practitioners are to interact and cooperate. It is especially important to focus on research results and the applicability of research results in class. Researchers state that results of educational research can be used in two different cases in practice (Boon et al., 1989; De Vries, 1990; Harbers, 1986): as "technical knowledge", which involves the design of instructional activities and "instrumental knowledge", which affects the quality of instruction (Ahuja, 2012). Therefore, some research should specifically contain instrumental knowledge that will improve practice (Bauer and Fisher, 2007; Mortimore, 2000). Thus, practitioners can be provided with knowledge about using effective strategies and assessment methods that will support the learning environment. Such kinds of studies are of great significance to acknowledge practitioners about up-to-date instructional applications and educational reforms (Everton, Galton and Pell, 2002). Besides, these studies help practitioners to develop different insights into in-class activities (Vanderlinde and Van Braak, 2010).

The reason for the gap between educational research and practice is the incredibility of the research findings for the practitioners (Everett, Luera and Otto, 2007). Some teachers state that studies do not appeal to their needs (Weiss, 1995), some state that studies are far from real teacher, student and classroom settings and in the clouds (Kerlinger, 1991). Therefore, educational researchers are to arrange environments where teachers and faculty members can share ideas and thus develop a more consistent research agenda (Kaestle, 1993). It is stated that researchers and practitioners can come together in seminars, congress and conferences (De Vries and Pieters, 2007).

Yet another reason for the disparity between educational research and application is the low level of access practitioners have to the research studies (Everett, Luera and Otto, 2007). This can be mostly attributed to the scarce physical facilities for teachers to put research findings into practice and their low access to research. Besides, when the beliefs and attitudes are examined, it can be argued that they are inclined to follow research. To provide opportunity for the application of the studies, they are to be published in primary sources like scientific research articles, conference papers, scientific reports, online sources (Education Resources Information Centre (ERIC), Web of Science, Turkish Academic Network and Information Center (ULAKBİM) vb.) and theses, and in secondary sources like compilations, field specific books, encyclopedias and handbooks (Yıldırım et al., 2014). Besides, teachers are also encouraged by National Research Council (NRC, 1996) and National Science Teachers Association (NSTA, 1996) to follow research but there are a few studies related to in-class applications (Everett, Luera and Otto, 2007). Similarly, when the beliefs of teachers with regard to the applicability of studies are examined, it is seen that teachers think that it is difficult to apply the results of the studies (Pajares, 1992; Richardson-Koehler, 1987).

Many justifications for teachers' not following educational research are asserted. One of the leading reasons is that the results of studies are not applicable in the classroom environments (Kennedy, 1997; Kerlinger, 1991). As for the times when the Internet use was not so prevalent as today, some teachers stated that they could not follow articles and publications as they had difficulty to access to them (Biddle and Anderson, 1991; Weiss, 1995). Moreover, research indicates that teachers continued teaching with the methods they are used to employing (Borko and Putnam, 1996; Bryan and Abell, 1999; Loucks-Horsley, et al., 1998; Millar et al., 2002). This trend causes challenges to make a difference in teachers' attitudes towards and beliefs about shifting practices. As teachers are not open to changes and use their experiences only to teach, they do not follow educational research (Costa, Marques and Kempa, 2000; Ratcliffe et al., 2002).

Therefore, as Weiss (1991) states results of educational research are slowly appreciated by practitioners and requires a certain period of time.

There are studies in literature on the views of teachers' with regard to the following, understanding and application of educational research (Ekiz, 2006; Everton, Galton and Pell, 2002; Gitlin et al., 1999; Greenwood and Maheadly, 2001; İlhan et al., 2015; Kennedy, 1997; McIntyre, 2005; Vanderlinde and Van Braak, 2010; Yıldırım et al., 2014) however, there is not a study on the views of mathematics teachers about the research in their fields. However, it is discussed by educational researchers that in general teachers are away from educational research and do not adequately make use of current educational research (Yıldırım et al., 2014). It is considered that it is important for mathematics teachers to follow studies in their fields and understand and use them in-class because new approaches are emphasized in mathematics education for teachers to benefit. Moreover, diverse body of knowledge for the pedagogical development of especially mathematics teachers has been accumulated. Therefore, the aim of this study is to determine mathematics teachers' opinions about research in mathematics education, their tendencies to follow research and their in-class implementations of research findings. It is considered that the results of the study will reflect teachers' beliefs about their level of following and implementing studies in mathematics education. Thus, teachers' expectations can be taken into consideration in studies aimed for in-class application. In this context, answers for the following questions were sought:

1. What are the topics mathematics teachers want to be researched in mathematics education?

2. To what extent do mathematics teachers follow sources about mathematics education?

3. To what extent do mathematics teachers understand research they follow?

4. To what extent do mathematics teachers use the results of mathematics education studies in in-class activities?

5. At what level do mathematics teachers follow studies in educational research in other disciplines and apply their results?

Method

The study was carried out in mixed research design in which quantitative and qualitative data collection tools were used together. In educational research, different classifications are defined for mixed research design (Creswell, 2003; Creswell and Plano Clark, 2007; Tashakkori and Teddlie, 2003). Creswell and Plano Clark (2007) classified mixed research design as: explanatory (confirmatory), exploratory and triangulation. In this study, initially a questionnaire, which aims to determine the level teachers follow, understand and implement research in mathematics education, was administrated. In the second stage, interviews with participants were conducted to obtain in-depth information about quantitative data. Therefore, in this study, explanatory mixed research design has been employed, which is one of the qualitative research designs according to the classification by Creswell and Plano Clark (2007).

Population and Sampling

The study was carried out in the spring term of 2015-2016 academic year with the voluntary participation of 334 mathematics teachers working in elementary schools and high schools in the Central Anatolian region of Turkey. The target population of the study is the elementary school and high school mathematics teachers working in state schools in Turkey. The samples of the study are the mathematics teachers working in the central Anatolia. Therefore, initially necessary permissions were taken from provincial directorate for national education. Later on, the researchers started to administer the questionnaire to the teachers working in different schools. Besides, the digital version of the scale has been developed and a link for the questionnaire was added on the main pages the directorates. The aim was to reach to math teachers working in the provinces in the Central Anatolia. After the questionnaire form link was put on the websites, data was collected for two months and the number of teachers who took part in the study was 334. At the end of two months, the researchers finished data collection process as they saw that the number of questionnaires was fixed and the sample reached represented the population. Demographic information related to the sample of the study is given in Table 1.

Table 1. Demographic information of the teachers

		f	%
Age	20-24 years	69	20,7
	25-34 years	175	52,4
	35-44 years	67	20,1
	45 ears and above	23	6,9
	Total	334	100,0
Gender	Female	162	45,8
	Male	172	51,5
	Total	334	100,0
Educational background	Two-year degree	2	0,6
	Undergraduate	255	76,3
	Post graduate	68	20,4
	Doctorate	9	2,7
	Total	334	100,0
Teaching experience	1-4 years	155	46,4
	5-9 years	77	23,1
	10-19 years	79	23,7
	20 years and above	23	6,9
	Total	334	100,0
School type	Elementary school	152	45,5
	High school	182	54,5
	Total	334	100,0

Data Collection Tool and Analysis

The questionnaire form administrated to determine the level mathematics teachers follow, understand and use research in mathematics education is given in the Apppendix-1. In the preparation of the form, the studies in the literature have been examined (Beycioğlu, Özer and Uğurlu, 2010; Costa, Marques and Kempa, 2000; De Jong, 2004; Everett, Luera, and Otto, 2007; Everton, Galton and Pell, 2000; Everton, Galton and Pell, 2002) and "Questionnaire on Following, Understanding and Applying Science Educational Research Outcomes into Practice" developed by İlhan et. al., (2015) for science teachers was revised to adapt it to math teachers. To determine the topics teachers want to be investigated, the results of studies on the trends in mathematics education research were used Çiltaş, Güler and Sözbilir (2012), Çiltaş (2012) and Güler (2015). The questionnaire form developed for mathematics teachers includes four sections: the topics mathematics teachers want to be investigated, following and understanding sources in mathematics education and applying them. Besides, there is another section to determine mathematics teachers' level of following and applying research in educational research in other disciplines. Before the application of the questionnaire which was revised by the researchers for mathematics teachers was administrated, it was piloted with 60 math teachers. In the pilot study, mathematics teachers were asked to mark the items which they do not understand or which are not suitable for themselves. After the pilot application, the questionnaire form revised according to teacher's views was examined by two faculty members who have previously conducted studies on teachers' level of following, understanding and applying educational research. The final form of the questionnaire was obtained as a result of the corrections made in line with expert views and it was administrated to mathematics teachers. The data obtained with the questionnaire were analyzed using SPSS 20 and Excel software, and the descriptive data are presented in the form of graphics and frequency and percentage tables.

The qualitative data for the study were obtained via semi-structured interviews. Initially, the semi-structured interview form was developed by the researchers based on the studies in the literature (Appendix-2). Later on, the interview form was used to conduct semi-structured interviews with teachers. The interviews were recorded upon teachers' permissions. The participants to take part in the interviews were chosen according to the quantitative data and based on volunteerism. The interviews were 7 elementary school teachers and 8 high school mathematics teachers. Data obtained from interviews were analyzed with descriptive analysis method and they were presented to support the items of the

questionnaire. Each participant were code named by the researchers as P1, P2,….P15 to keep their names confidential.

Results

What Are the Topics Mathematics Teachers Want to be Studied in Mathematics Education?

The outstanding topics that math teachers think further studies in mathematics education should focus include: attitude to mathematics (10,9%), the place of mathematics in Daily life (10,2%) and learning difficulty (9,9%). Besides, it was determined that math teachers stated that in-service training (4,6%),the effects of instruction on cognitive processing skills (3,8%) and comparative studies on PISA and TIMSS (3,7%) are to be studied. In their research topic preferences, teachers tend to choose reasons that prevent students from learning math but it can be argued that they do not prefer students' success in math and math teachers' themselves to be researched.

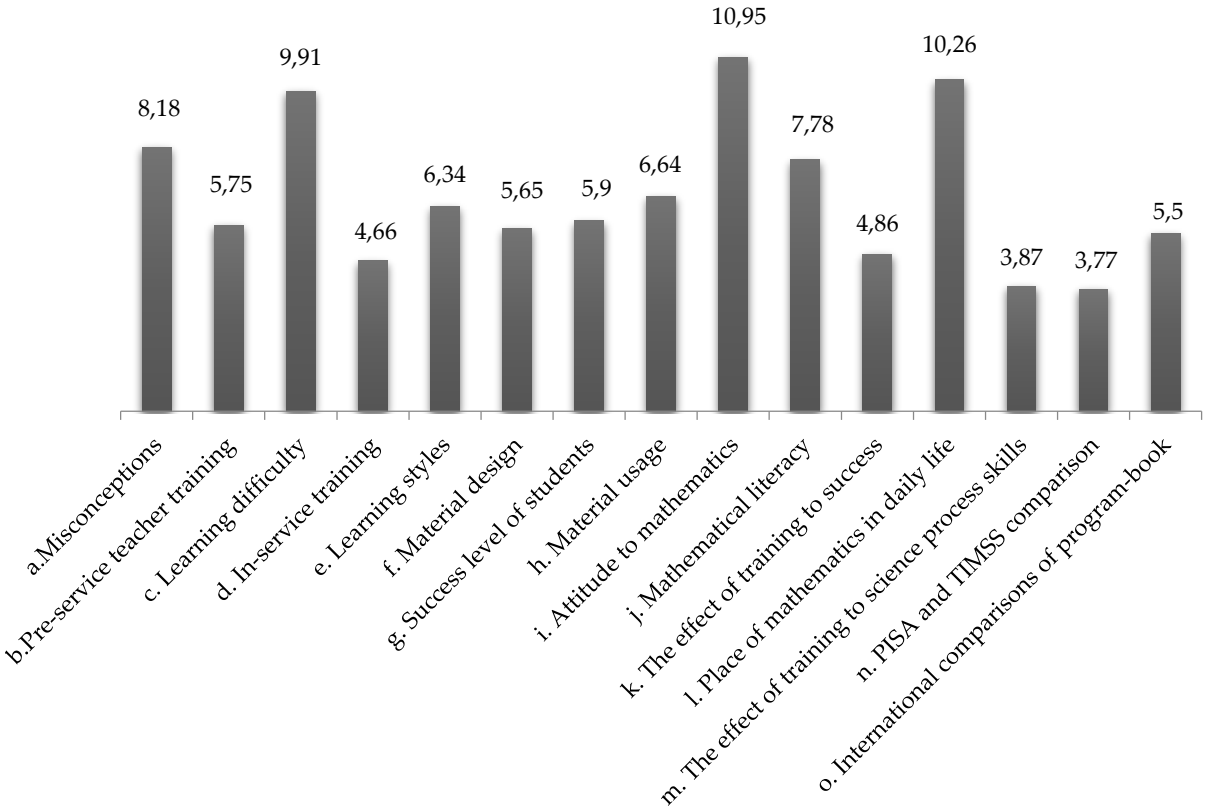


Figure 1. The topics teachers prefer to be studied in mathematics education

The distribution of the topics math teachers want to be studied in terms of three most important topics is given in Table 2. When the table is examined, it is determined that teachers' first choices include misconceptions (22,4%) and learning difficulty (16,99%) topics. The second preferences of teachers include attitude towards math (21,6%) and learning difficulty (15,7%). Their third preferences include the place of math in daily life (18,1%) and attitudes towards mathematics (16,1%). It can be said that the primary topics teachers want to be researched in math education include the determination of the conditions that can prevent students' from learning math. Besides, the distribution of the topics teachers think should be studied with priority can be seen in Graphic 2. When graphic 2 is examined, it can be seen that teachers want the following topics to be studied: attitude towards math (16,6%), learning difficulty (13,5%) and the place of mathematics in daily life (11,1%).

Table 2. The distribution of the topics teachers want to be studied in order of their preference

		1st Choice		2nd Choice		3rd Choice	
		f	%	f	%	f	%
a.	Misconceptions	57	22,4	11	4,3	7	2,7
b.	Pre-service teacher training	35	13,7	11	4,3	9	3,5
c.	Learning difficulty	43	16,9	40	15,7	20	7,8
d.	In-service training	6	2,3	8	3,1	6	2,3
e.	Learning styles	20	7,8	20	7,8	17	6,6
f.	Material design	10	3,9	12	4,7	13	5,1
g.	Success level of students	8	3,1	24	9,4	12	4,7
h.	Material usage	5	1,9	14	5,5	14	5,5
i.	Attitude to mathematics	31	12,2	55	21,6	41	16,1
j.	Mathematical literacy	9	3,5	17	6,6	26	10,2
k.	The effect of training to success	3	1,1	6	2,3	16	6,3
l.	Place of mathematics in daily life	21	8,2	18	7,0	46	18,1
m.	The effect of training to science process skills	2	0,7	4	1,5	6	2,3
n.	PISA and TIMSS comparison	1	0,3	5	1,9	7	2,7
o.	International comparisons of program-book	3	1,1	9	3,5	14	5,5
	Total	**254**	**100**	**254**	**100**	**254**	**100**

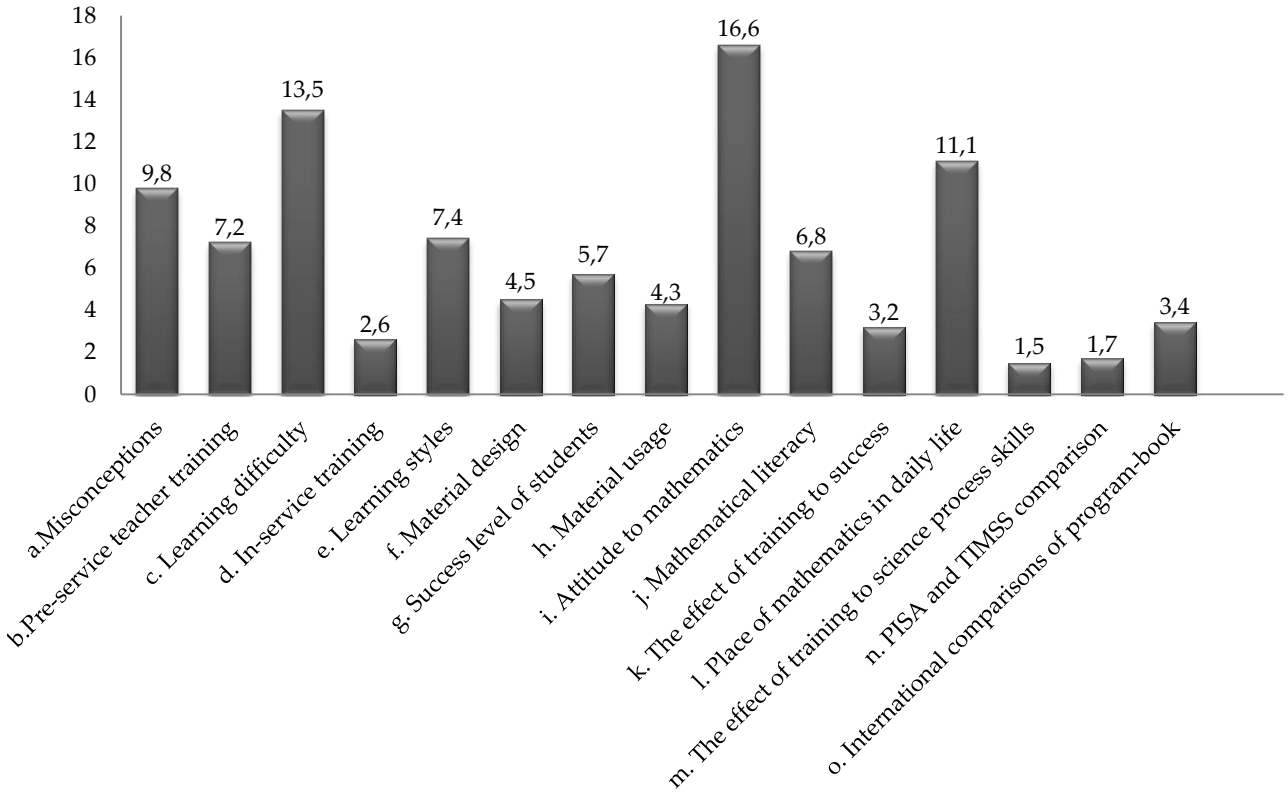


Figure 2. The distribution of the research topics teacher regard important

The distribution of the research topics which mathematics teachers consider important and which are not included in the questionnaire form is given in Table 3. When the Table is examined, it is seen that teachers who responded the relevant question wanted the effect of Curriculum/Syllabus (22,3%), Different methods and strategies (14,9%) and Cognitive level and readiness levels of the students (8,9%) to be studied. Excerpts from the interviews which reflect the views of teachers with regard to the research topics which are not in the questionnaire are as follows:

P5: *…I think the number of studies about education is low. …I have not seen any study on the students preparing university entrance exam.*

P12:… *As they are students studying for TEOG (Transition from Primary to Secondary Education), we need to talk about studies that will be beneficial for them. Studies can be carried out to find out the effects of performance assignment, activity assignments on their development, learning, improvement of knowledge and skills.*

Table 3. Other topics suggested by teachers to be studied

	f	**%**
Effects of the Curriculum	15	22,3
Different Teaching Methods and Techniques	10	14,9
Students cognitive and readiness levels	6	8,9
Relation between technology and math	5	7,5
Classroom management	4	5,9
Mathematics education in vocational high schools	4	5,9
Problem Solving Skills of Students	4	5,9
Fear and Anxiety of Mathematics	4	5,9
Relation of math with other disciplines	4	5,9
Influence of parents	3	4,4
Alternative measurement and assessment	2	2,9
History of Math	2	2,9
Students with Special education needs	2	2,9
Project work	1	1,5
Teacher Education	1	1,5
Total	**67**	**100**

To What Extend Do Mathematics Teachers Follow Sources about Mathematics Education?

The responds to the questions 4 to 10 on the questionnaire form which are about the extend math teachers follow research in their disciplines are presented in this section. In Table 4, the findings with regard to radio and TV programs, newspapers, books, scientific journals, articles and theses, the Internet sources, in-service training seminars and conference, symposium, panel and workshops teachers follow are given. Teachers follow sources about mathematics education online (89,8%), radio, television and newspaper (46,1%), scientific journals (37,7%), books (33,2%), articles and theses (22,5%), in-service seminars (21,3%) and conferences, symposium, panel and workshops (17,1%).

Table 4. Distribution the sources teachers follow research in mathematics

	Yes		No		No response	
	f	**%**	**f**	**%**	**f**	**%**
Radio, television and newspapers	154	46,1	178	53,3	2	0,6
Exam preparation books	111	33,2	219	65,6	4	1,2
Scientific journals	126	37,7	204	61,1	4	1,2
Articles and theses published in scientific journals	75	22,5	255	76,3	4	1,2
The Internet (web pages)	300	89,8	29	8,7	5	1,5
In-service training seminars	71	21,3	253	75,7	10	3,0
Conference, symposium, panel and workshop	57	17,1	271	81,1	6	1,8

When Table 5 is examined, it is seen that the sources teachers frequently follow include Public Personnel Selection Examination (KPSS) books among the various types of books (38,0%), scientific magazines (Matematik Dünyası -The World of Math-, Bilim Teknik- Science and Technique, Genç Bilim-Science for Youth…etc) (95,3%) and scientific studies in educational journals in the category of scientific journals (87,2%). It was also determined that a great majority of the teachers who took part in the study do not follow any source about mathematics education. Therefore, it was determined that the rate math teachers follow sources about their discipline is very low.

Table 5. Teachers' sources to collect data about educational research

	f	**%**
Type of books math teachers follow		
KPSS preparation books	27	38,0
Educational Sciences books used during Bachelor's education	29	40,8
Other Books	15	21,1
Total	**71**	100
What are the scientific magazines that math teachers follow		
Scientific magazines (Matematik Dünyası, Bilim Teknik, Genç Bilim…etc)	82	95,3
Journals about personal development	4	4,6
Total	**86**	100
Scientific journals math teachers follow		
Information about scientific studies on educational research	41	87,2
Topics other than educational research	6	12,7
Total	**47**	100

The views of the participants coded as P1, P4, P7, P10 and P12 about the sources math teachers follow the studies in their field are presented below:

P1:…*I try to follow studies more or less. As a magazine, I follow the Matematik Dünyası magazine and there are magazines about education by Hacettepe Publication; I follow them.*

P4:…*I do not follow studies, I am very tired and busy. If I have time, I watch videos on educational webpages. I watch how topics are taught or I follow textbooks as many textbooks are transformed into digital format online. I look to see what type of problems and solutions there are. I would like to follow journals and articles as well but I do not have time.*

P7:… *I mean I do not follow the hardcopy of the journals; of course books or journals are not delivered to us as hardcopies. Actually as it is easier to access them online, I can follow them all online; I reach books online. As for journals, I use the Internet or follow them on up-dated websites … I follow the websites where students are directly and primarily active.*

P10:… *As I am a math teacher, I follow Matematik Dünyası. Other than that, Tebliğler Dergisi (Journal of Notices) by Ministry of National Education. There you can see rights and the methods developed. Besides, I learn from KPSS, I use them.*

P12:…*I read studies online or also from newspapers. Moreover, there is a journal called Matematik Dünyası; I follow it. It is a habit of me from university years. I examine it.*

When the findings from the interviews are examined, it is seen that the responds math teachers provided are the same as the ones they provided to the questions in the questionnaire. It was determined that teachers could not follow sources about their fields because of a variety of reasons and the sources they follow show similarity.

It was seen that the rate mathematics teachers follow advances and research in their field online is higher compared to other sources. It was determined that the rate teachers follow advances and research online is 89,9%. Findings with regard to the websites teachers follow are presented in Graphic 3. When the graphic is examined, it is seen that teachers generally searched websites for materials that are necessary for their lessons (25,4%). In addition to this, it was determined that the rate of the teachers who responded "I

search for the materials necessary for my lessons on webpages and I also use search engines likes Google, Yahoo etc." is 44,4%. However, it is seen that the rate of those responded: "I follow the webpages of refereed journals" is only %1,6. This case shows that the teachers follow websites related to their field only to find necessary instructional materials by using search engines like Google and Yahoo etc.; however, they do not follow scientific journals.

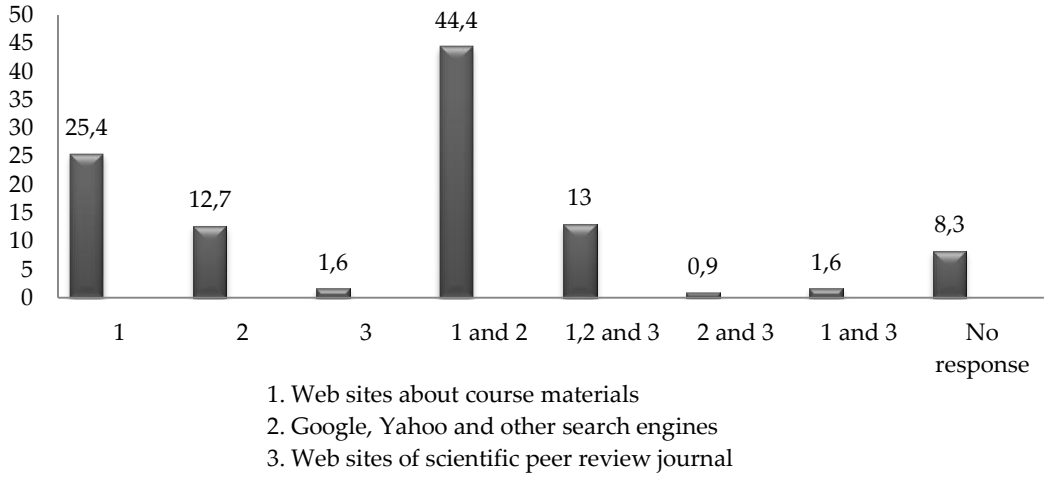


Figure 3. Distribution of the search teachers make online

When mathematics teachers were asked how they made use of websites and online scientific journals, it was seen that their answer were in parallel with the responds they provided for the questionnaire. Math teachers stated that they generally follow online groups of math teachers where instructional materials are shared. The views of teachers coded as P1, P6, P11 and P14 are as follow:

P1:… *There are groups on the Google formed under the name of math teachers meeting; I follow from there. Different solutions of different types of questions are given. Besides, we can reach different materials like textbooks, worksheets online.*

P6:… *I especially make use of videos of lectures and other videos on Eğitim Bilişim Ağı (EBA-Education Informatics Web). When I want different materials I can use in the class, I search on the net.*

P14: … *There is a group on Facebook called math teachers; I am a member of it. Teachers can disseminate studies on math by sharing them. They write on blogs, give examples, and tell how they can be applied. I can benefit from them.*

P11: …*We do not take books or journals in our hands because many things are provided online; we do not need to. EBA, Matematik Köyü (Math Village), Açık Ders (Open Course) are the websites I make use of.*

Findings which indicate whether math teachers follow advances and research in math education in-service training seminars are presented in Graphic 4 and Table 7. When the graphic is examined, it is seen that percentage of math teachers who attend in-service training is 21,3% and the rate of those who do not attend is 75,7% and 3,0% did not answer this question. When the Table is examined, it is seen that 31 (43,6%) math teachers that attend in-service training follow seminars that will contribute to their pedagogical knowledge. In addition, according to the findings obtained from the interviews with teachers who participated in-service training seminars, it was determined that in-service training seminars were regarded as waste of time and not beneficial.

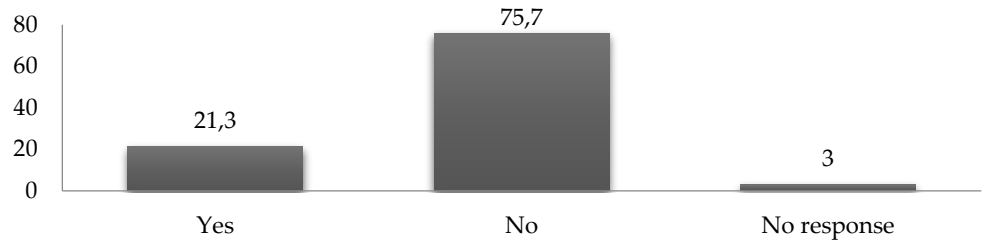


Figure 4. Distribution of the teachers' in-service training attendance

Table 7. The contents of the seminars teachers follow

	f	**%**
Seminars that will contribute to the pedagogical knowledge of teachers	31	43,6
Other seminars (Computer skills, Project development, science and technology development lab)	11	15,4
No response	29	40,8
Total	**71**	**100**

Excerpts from the interviews with math teachers coded as P7 and P13 about in-service training seminars on math education are as follows:

P7:… *After I graduated, in-service training seminars were held to train us as expert educators but in general they were futile meetings where teachers pass the time. That is, I did not see anything that will contribute to me as a teacher … Therefore, I do not have a positive my point of views towards in-service teacher training.*

P13:… *I have attended in-service training a few times. They were seminars held by private institutions. I attended in-service training as a part of teachers' meetings. In these meetings, they tell us that mathematics should not be taught with formulas and not to ask students memorize them. Actually, catchy and effective teaching methods are applied, it will be longer lasting. In this way, they just tell us and expect us to do it but we do not know how this method is put into practice.*

Findings about the rate math teachers follow advances and research in mathematics education in conferences, symposiums, panels workshops are presented in Graphic 5 and Table 8. When the graph is examined, it is seen that the rate of those who attend conferences, symposiums, panels or workshops is 17%, the rate of those who do not attend is 81,1% and 1,7% did not answered this question. When Table 8 is examined, it is seen that 38,5% of the conferences, symposiums, panels or workshops are about mathematics education. In the interviews conducted to better understand the reasons why math teachers do not attend conferences or other scientific events, it was seen that teachers are not up on such scientific meetings, do not believe their benefits or cannot find time.

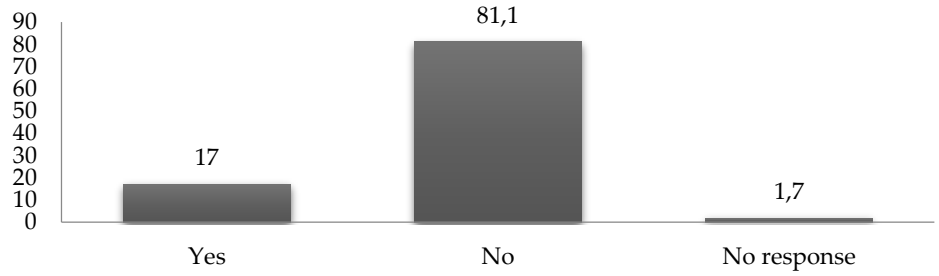


Figure 5. The distribution of the rates teachers attend conferences, symposiums, panels or workshops

Table 8. Academic events teachers attend

	f	%
Conferences, symposiums, panels and workshops on math education	22	38,5
Conference, symposium, panel and workshops in other disciplines in education	8	14,0
No response	27	47,3
Total	**57**	**100**

The view of teachers' coded as P2, P8, P9 and P15 about scientific events like conferences, symposiums, panels and workshops and attending them are as follows:

P2: …*I do not hear about them but there are conference notices that come to our school; they are put up on the notice board. We generally attend them … Even if I do not attend regularly; I attend once or twice a year.*

P8: … *We used to hear about congress, conference or seminars when we were university students. We used to attend seminars but we cannot attend them now because of the heavy workload. Now we do not hear about such events. We do not hear of such events as we are independent of the universities.*

P9: …*That is to say, the research universities conduct are not generally related to elementary school students; they generally seek to answer the question "why", while what we are doing here is to provide solution for (math) problems and teach the solutions. We do not follow their studies but in general we follow their results and focus on them. However, I do not follow more general and more scientific studies that address to scholars because I do not use them for my job.*

P15:…*Generally, the studies which achieved a certain level of success and accepted are of course heard of. Among them we apply the ones that can be applied in schools; however, I cannot attend conferences or similar events; I mean we do not have time.*

To What Extent Do Math Teachers Understand Sources on Math Education They Follow?

The responds teachers gave to the 12th question on the questionnaire which is about the level math teachers understand scientific studies on math education are presented in this section. When Graphic 6 is examined, it is seen that 60,7% of the teachers said no, 19,1% said yes, 17,6% said they had no idea about these studies and 2,3% did not respond. According to the findings of the study, it can be argued that the level math teachers understand scientific studies are very low.

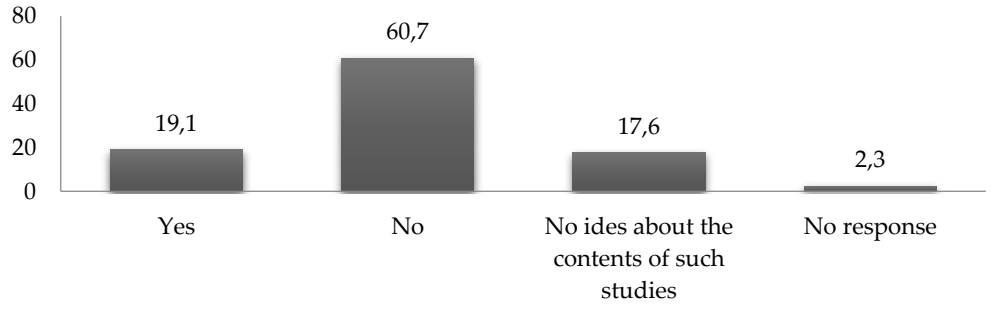


Figure 6. The level teachers understand theses and articles published in scientific

In Table 9, there are findings with regard to teachers who responded "yes" to the 12th question and the scientific studies they read and found understandable. When the Table is examined, it is seen that only 36% of the math teachers who stated that they find scientific studies understandable gave information about scientific research they read and found understandable. It was seen that the studies math teachers read and found understandable included articles and theses on educational research (32,8%) and studies on other disciplines rather than educational research (3,1%).

Table 9. The content of the studies teacher find understandable

	f	%
Teachers who give information about the content of the articles and theses they read	21	32,8
Teachers who information about research on disciplines other than educational research	2	3,1
No response	41	64
Total	**64**	**100**

Excerpts from the interviews with math teachers coded as P15 and P2 who stated that they found the studies they read or the presentations they listened to in scientific events meaningful are as follows:

P15:…*As an example of the articles I came across and read, I remember students' anxiety about math; group works in math instruction.*

P2:…*In the final congress I attended, I tried to attend to presentations of different papers. I have reviewed studies on the application of math in daily life and realistic math education, and other relevant papers.*

The reasons why math teachers do not understand scientific studies they read are presented in Graphic 7. When the graphic is examined, it is seen that the most frequently cited reason for not understanding scientific studies is that their language is not understandable or appropriate (31,5%). Therefore, it can be argued that math teachers think that academic language is not understandable and appropriate. Besides, it was also observed that teachers who find studies understandable state that the results of the study are not regarded as important by teachers and students. Especially, it was emphasized that the suggestions made by the studies are not applicable.

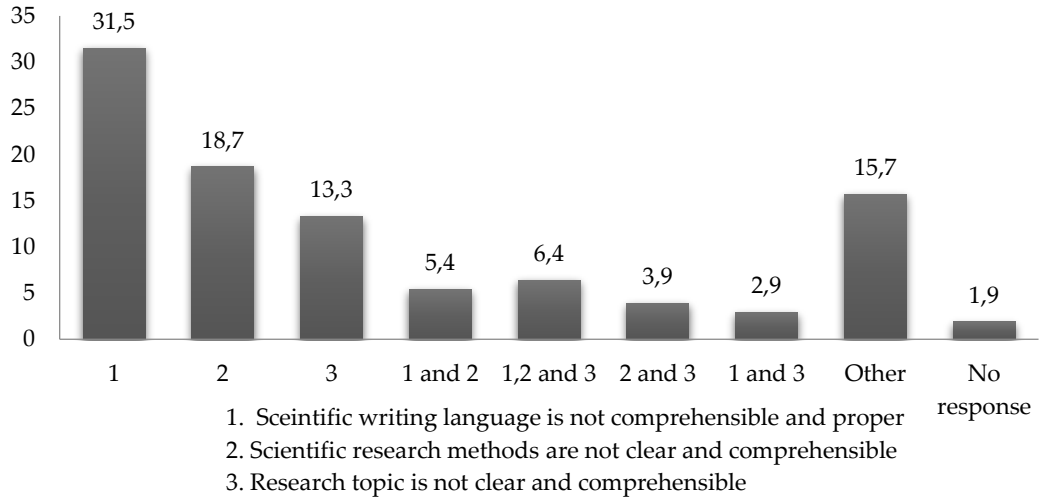


Figure 7. The reasons why teachers do not find articles and theses understandable

The views of math teachers coded as P1, P3, P7 and P9 with regard to understanding studies and applying them in their classless are given below:

P1: *I think that assessing what individuals are inclined to do rather than molding them into stereotypes is more correct. In other words, studies that draw generalizations are not good. I think that education should be given by analyzing how students will express themselves.*

P3: …*In some studies are suggestions that will force the limits of learners. For example, when we look at the examples related to project, performance assignment, they include questions that can only be answered with support from an educational institution or parents. I do not think they will contribute to students' development to a great extent.*

P7: … *I think that we lie heavy on primary school students; under the name of studies to improve students' success scholars are conducting many applications which students cannot do. If the aim is to develop students, studies aiming at students (success) should be done.*

P9:… *There are results which can be applied but teachers are to be willing to apply them. I tried to apply them in the first year of my teaching after I graduated but the conditions were not favorable. Following scientific research do not provide me a lot of guidance. I tried to reflect on education I received. I do not think that the number of teachers who follow scientific is very high. The number of teachers at state school who participate in the studies in universities is very low. Thus the findings and results do not reflect our schools very much.*

To What Extent Math Teachers Use the Results of Studies in Their in-Class Application?

The responds math teachers provided for the questions 13, 14 and 15 on the questionnaire form which are about the extent they use the results of scientific studies on math education are presented in this section. The findings with regard to the level math teachers apply knowledge they learn about recent advances from scientific studies they follow, in-service training seminars and conferences, symposiums, panels and workshops they attend are presented in Graphic 8. When the graphic is examined, it is seen that math teachers state that they "frequently use the findings in scientific studies (thesis, articles..etc.) by arranging them to be suitable to in-class application" (37%=144 teachers). Besides, it was determined that some teachers stated that such studies do not contain information (19%=63 teachers) and 15% (41teachers) did not respond to this question.

With regard to using the recent advances, research and useful information that math teachers learn in in-service training seminars they follow in their in-class application, math teacher most frequently stated they did not attend any in-service training (46%=160 teachers). Besides, 24% of the teachers (98 teachers) indicated "I apply the information I learn during in-service training seminars by combining them with my own experiences" and 13% (33 teachers) left the question unanswered. Similarly, as for the question with regard to using the information they acquire in the conferences, symposium, panel and workshops in-class frequently math teachers (57%=196 teachers) responded that they did not attend any conference, symposium, panel or workshops on this issue. As in the previous question, teachers stated they use the information they acquired in conferences, symposiums, panels and workshops by combining them with their own experiences (22%=80 teachers) and 13% (33 teachers) left this question unanswered.

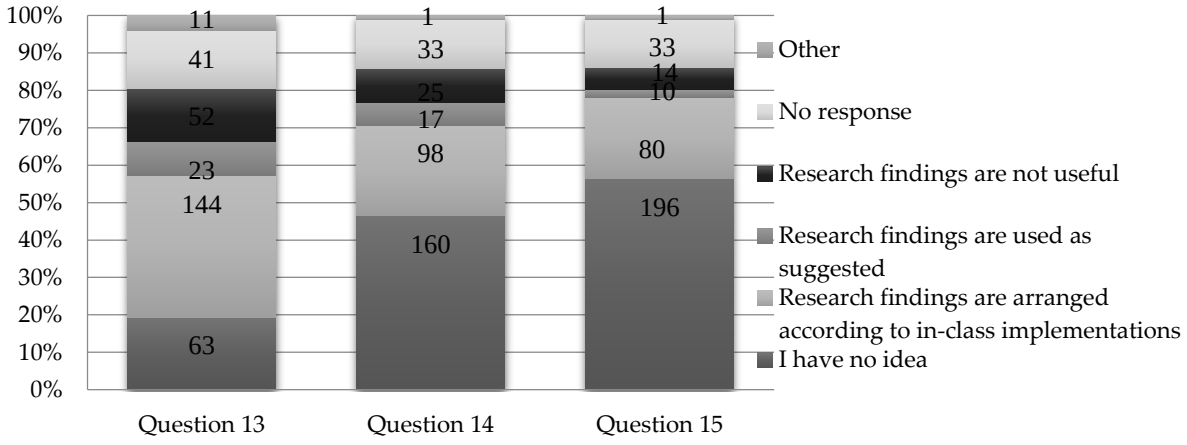


Figure 8. The level of teachers use research on mathematics education in their applications

The views of participants coded as P4, P6, P10 and P13 with regard to using the results, suggestions or treatment procedures of the studies in-class are presented below:

P4: …*Of course, if they are more robust than what we apply or than previous studies, we apply them, and we keep on doing it if it works. After all, we prefer the methods that make the best contribution to learners.*

P6: … *The first thing I do before teaching a class is to get familiar with the class; that is to say, I consider the overall level of the students in the class and find applications in line with this. They are shaped according to the class.*

P10: … *I think many research cannot go beyond providing bookish information. In other words, to what extend are they applicable to real life? For example, the technique of giving breaks. When we give a break, the pupil perceives it as a reward. When you give a break and send the child outside the class to another room, the pupil regards it as a reward, he does not even understand that it is punishment … Or how should I know, you can apply some techniques*

but cannot apply some of them. According to a student-centered approach, you try to help the learner discover the topic himself/herself but it is very difficult in math to make learners discover…No matter how much you try, you should have taught the pupils fundamentals of some topics. Pupils do not have the opportunity to find on their own. You cannot do this in math education very much or you cannot teach them by living, it is very difficult for children because what you ask them experience is something abstract.

P13: … *I apply them, I follow them, I try to apply them as much as I can. That is, it is shaped according to students' development and as they want or desire.*

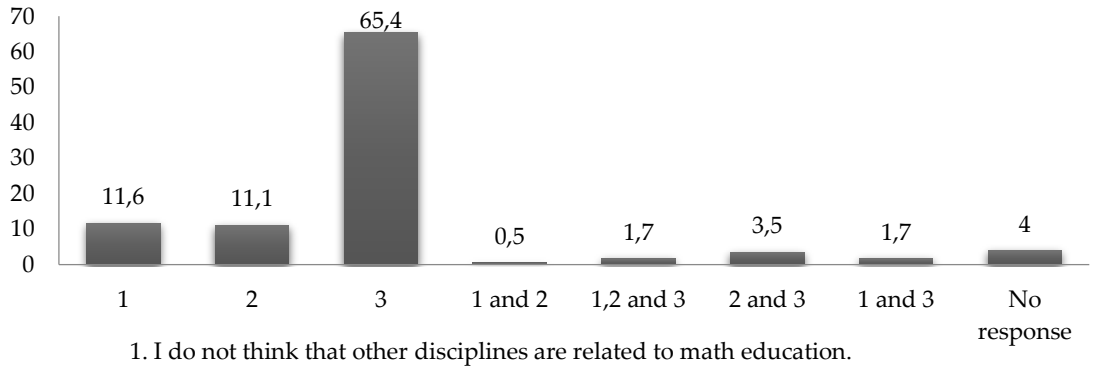
To What Extend Do Mathematic Teachers Follow and Apply the Results of Studies on the Education of Other Disciplines?

The responds math teachers provided for the question number 11 on the questionnaire form which is related to the extend they follow studies in other disciplines in education are presented in this section. When Table 10 is examined, 256 teachers (76,6%) do not follow studies in other fields of education, 74 (22,1%) follow. In line with the result of this study, it can be said that mathematics teachers do not follow studies on the education of other disciplines. Besides, the responds math teachers provided for the question 16 related to the level teachers apply the results of scientific studies on the education of other disciplines in their classes are presented here. When Table 10 is examined, it is seen that the rate teachers who do not give place the results of studies in other disciplines of education in their in-class applications is 51,2%, 43,4% give place to them and 5,4% did not answer. According to this result, mathematics teachers do not frequently apply the results of the studies on the education of other disciplines.

Table 10. The level math teachers follow and use the results of studies on the education of other disciplines

	Yes		No		No response	
	f	%	f	%	f	%
The level mathematics teachers follow the studies on the education of other disciplines	74	22,1	256	76,6	4	1,2
The level mathematics teachers give place to results in the studies on the education of other disciplines in their in-class applications	145	43,4	171	51,2	18	5,4

The findings with regard to the reasons why math teachers do not use the results of the studies on the education of other disciplines are shown in Graphic 9. When the graphic is examined, it is seen that the number of the teachers who do not use the results of studies on the education of other disciplines is 171 (51,2%). 65,4% of the teachers stated that they did not frequently use these studies in their applications as relating the results with practice takes time.



1. I do not think that other disciplines are related to math education.
2. On the education program, math is not related with other disciplines.…

Figure 9. The reasons why teachers do not use the results of studies in other disciplines in their in-class applications

Conclusion and Discussion

The results of the study which was undertaken to determine the levels math teachers follow, understand, and apply the studies in educational sciences and their views are discussed here. The topics math teachers want to be studied math education include students' attitudes towards math, the place of math in daily life and the difficulties in learning mathematics. When the order of importance teachers attach to the topics studied or to be studied, it is seen that misconceptions and learning difficulties stand out. Therefore, it was revealed that the topics teachers want to be studied in the field of education are research topics that will contribute to more meaningful and effective teaching of mathematics to learners. Besides, another important result found is that teachers do not prefer studies in which they will be the participants. This can be interpreted to mean that teachers do not like their applications and teaching to be researched. This result obtained from the study supports the results of the studies which indicate that teachers are not open to innovations and therefore, tend to continue with the methods they are used to employing (Borko and Putnam, 1996; Bryan and Abell, 1999; Loucks-Horsley et al., 1998; Millar et al., 2002).

The topics that are not included in the questionnaire form but teachers especially want to be studied include the effects of curriculum and program on learning. At the same time, teachers suggest different methods and strategies that will make mathematics education more effective and meaningful. It can be argued that teachers want particularly these topics to be studied because they want to help learners having learning difficulty and also those who have negative attitudes towards mathematics. As a matter of fact, with regard to research topics teachers' responds focus on attitude, learning difficulty and curriculum. In a study by Everton, Galton and Pell (2002), it was found that teachers want to carry out studies and make suggestions for topics to be studied. Therefore, it was revealed in the interviews conducted in this study that math teachers are inclined to follow studies on the topics they are interested; however, they could not do so because of lack of time and opportunities. Hence, this result supports the findings of the studies in the literature which indicate that teachers want to carry out studies but cannot do so because of the high number of classes they teach and limited access to research opportunities (Rossouw, 2009).

It was seen that mathematics teachers follow sources about mathematics teachers at very low level. It was determined that math teachers frequently follow studies on mathematics education on the internet. In a similar way, in a study by İlhan et al., (2015), it was found that teachers generally follow studies on education on the Internet. With widespread use of computers today, teachers' making use of technology is requirement of the age of technology. However, teachers' use of the internet to reach sources is generally limited to the materials they will use in their classes. Besides, the rate teachers follow articles and theses in online scientific journals are rather low. It was found out that although full texts almost all articles in scientific journals and studies by Higher Education Board (YÖK) are accessible in our country, teachers do not follow these studies. This finding of the study is supported by another study which found that online research skills of science teachers is low (İlhan et al., 2015). Similarly, another study emphasized that the teachers did not have idea about online scientific journals or cannot reach such journals by using search engines effectively (Vanderlinde and Van Braak, 2010). The interviews revealed that teachers generally reach materials, lessons, testing and assessment sources online. Often interactive information sharing sites established by mathematics teachers and search engines are preferred. Vanderlinde and Van Braak (2010) stated that a great number of research articles are published in many journals, but teachers are not as much successful as researchers in search and research. Therefore, teachers tend to reach to sources which are shared by math teachers and which they can access more easily. Therefore, as Yıldırım et al., (2014) put it, at least some research should be aimed for developing materials that will solve the problems teachers face in practice and their results are to be reported in a language understandable to teachers. This, they argue, will cause teachers to follow and value educational research more.

It was also seen that teachers use radio, television and newspapers, scientific magazines and KPPS preparation books. Teachers who state that they follow scientific magazines frequently read "Matematik Dünyası" and "Bilim Teknik" magazines. Teachers who stated that they followed mathematics education sources on TV marked that they watched lessons given by the Open Education Faculty (AÖF) and had ideas from them. Besides, it was seen that mathematics teachers also stated that follow up-to-date advances in

mathematics education and the education of other disciplines from the newspaper supplements which include educational topics. However, it can be argued that as lectures, various educational materials are now available online, teachers do not follow hardcopies of journals, books or newspapers. It was seen that teachers reach to almost all the sources in mathematics education they need on the internet rather than using printed materials.

It was found that the rate teachers attend in-service training seminars which were held to improve their content knowledge and increase the effectiveness of their teaching is low. It was seen that teachers were not aware of in-service training seminars, the seminars given are not generally focused on education and do not provide benefits for teachers and students. It is seen that teachers who attend in-service training seminars use knowledge they learn in their classes by combining them with their teaching experience. The Ministry of National Education (MEB) should encourage teachers' attendance to such seminars in which teachers and faculty members will work together as the Ministry can easily access to schools and teachers. Eilks and Markic (2011) suggest that teachers can be encouraged to attend in-service training seminars by providing program information, methods and strategies, and by asking teachers design learning using recent research findings related to teachers and students. Besides, introduction and presentations particularly addressing to issues in a specific field, giving place to activities that which facilitate teacher-academician and teacher-student interactions will encourage teachers to follow such seminars and using information they gain from them in-class applications.

It was seen that the level mathematics teachers follow studies on math education by attending such scientific events like conferences, symposiums, panels or workshops is very low. According to De Vries and Pieters (2007), scientific events include studies which give teachers chances to follow studies in their filed and therefore, teachers are to be encouraged to attend such events. Appropriate environments are to be created to encourage researchers to attend scientific events on various themes where they can share ideas with schools and teachers. The teachers state that they are not informed about conferences, symposiums, panels or workshops and thus they do not hear of such activities. It can be said that this stems from the lack of communication between schools and universities. Therefore, teachers and academicians are to be encouraged to prepare joint project will increase coordination between MEB and universities because steps made to increase cooperation between education faculties and schools can help in solving this problem. It is seen that to achieve this cooperation, the number of action research studies (Shkedi, 1998; Zeichner, 1993) in which researchers and teachers cooperate and qualitative studies (Anderson, 1997; Clandinin and Connelly, 1996; Clarke and Fournillier, 2012; Groth and Bergner, 2007; Shkedi, 1998) which aim to depict teachers' experiences. Similarly, it is stated that studies to increase pedagogical knowledge of teachers have an important place in the literature (Shulman, 1990). In studies which emphasize that teachers and researchers are to work together, it is stated that this cooperation will have many positive contributions (Broekkamp and Van Hout-Wolters, 2007; Everton, Galton and Pell, 2002; Hemsley-Brown and Sharp, 2003; Vanderlinde and Van Braak, 2010). Therefore, with such cooperation, studies which teachers see difficult to apply and on the clouds can be made more realistic and meaningful. Thus, both researchers will be able to see the benefits of their studies in practice and teachers will have chances to apply different methods, strategies, materials or assessment approaches they believe to be meaningful. On the other hand, teachers who attend scientific events like conferences, symposiums, panels or workshops use knowledge they gain by combining it with their own experiences. This can be attributed to the fact that teachers do not believe the applicability of scientific studies and researchers make suggestions without coming to the application fields; in other words schools. In a study by Everton, Galton and Pell (2002), it was concluded that teachers generally attribute the reason why they do not adopt innovations in their practices to external reasons like physical inadequacy of the schools and inapplicability of studies' results.

In the study, it was seen that teachers did not understand scientific publications like articles and theses as they do not find their language comprehensible. This results complies with the results of many studies in the literature (Broekkamp and Van Hout-Wolters, 2007; Hemsley-Brown and Sharp, 2003; İlhan et al., 2015; Vanderlinde and Van Braak, 2010; Yıldırım et al., 2014). Sydoriak and Fields (1997) state that results of studies are to be reported in a comprehensible language for teachers. For teachers to develop their skills to conduct, read and interpret research, such topics are to be covered in in-service training seminars and vocational trainings (Arends, 1990). It was seen that teachers who follow scientific publications and find

them meaningful apply the results of studies by combining them with their own experiences. In a study by Boardman et al., (2005) it was pointed out that teachers prefer practices that are applicable rather than project-based. Davies (1999) underscores that studies are to be applicable in-class so that research can be meaningful for teachers. To this end, researchers are to work in cooperation with teachers in schools and carry out studies aimed for practice as well (Lather, 2004; Oancea, 2005). Jenkins and Healey (2005) state that besides general research studies it is necessary to conduct specific case studies that will support teachers' practices.

Students are to learn mathematics by establishing relations between real life situations and different disciplines and meaningfully (National Council of Teacher of Mathematics ([NCTM], 2000; MEB, 2013). It was seen that few mathematics teachers follow studies on the education of other disciplines. Similarly, it is seen that teachers think that applying the results of studies on the education of other disciplines will take time. However, integration of different disciplines in mathematics education program is called as skill of establishing relations in process (MEB, 2013). Besides, in education programs based on their learners' age groups, mathematics teachers are recommended to ask them to establish relations between the functions of the mathematical concepts students learn with their functions in other disciplines. Therefore, mathematics teachers are to follow studies in other disciplines, establish their relations with mathematics and use their results in their in-class applications.

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Appendix-1

Personal Information

1. Age
a. (between 20 and 24) b. (between 25 and 34) c. (between 35 and 44 age) d.(45 and over)
2. Gender:
a. Female b. Male
3. 3.Education level:
a. Associate degree b. Undergraduate c. Masters d. PhD
4. 4.Length of Service:
a. (1to 4 years) b. (5 to 9 years) c. (10 to 19 years) d. (20 years and over)
5. The School you work:
a. Elementary School b. High School

Ideas about Research on Mathematics Education

1. Below are some research topics about mathematics education. Please circle the topic(s) that you think should be studied.
Research topics;

a. Misconceptions
b. Training prospective teachers
c. Learning difficulty.
d. In-service education
e. Learning style
f. Material design
g. Students level of success
h. Using Materials
i. Attitudes towards math
j. Mathematical literacy
k. Effects of instruction on success
l. The place of math in real life
m. Effects of instruction on scientific process skills
n. PISA and TIMSS comparisons
o. Comparisons of international programs and books

2. Please write other topics you want to be researched.
p. ……..
q. ……..
r.…….
3. Please write three most important topics you circled or written above.
a. ……. **b**……. **c**……
4. I follow advances and research in mathematics education from radio, television and newspaper.
☐ Yes ☐ No

If yes, provide detailed information about these means and their contents.

5. I follow advances and research in mathematics education from books written for educational sciences courses and exams (educational sciences books used in undergraduate education, Public Personnel Selection Examination, etc…)

☐ Yes ☐ No

If yes, please write the names and provide detailed information about the content of these books.

6. I follow advances and research in mathematics education from scientific magazines (*Matematik Dünyası, Bilim Teknik, Genç Bilim*, etc…).

☐ Yes ☐ No

If yes, write the names and contents of these magazines in detail.

7. I follow advances and research in mathematics education from articles and theses published in scientific journals (MEB Journal of Education and Social Sciences, Faculty journals, etc…)

☐ Yes ☐ No

If yes, give detailed information about the topics of the last thesis or article you read.

8. I follow advances and research in mathematics education from the Internet (web pages)

☐ Yes ☐ No

If yes, mark the appropriate choice to indicate the aim of the search you make.

☐ I search materials for my lessons on webpages.
☐ I use search engines like Google, Yahoo etc.
☐ I follow the webpages of refereed scientific journals published online.
☐ Indicate if you have other reasons.

9. I follow advances and research in math education by attending in-service training seminars.

☐ Yes ☐ No

If yes, give detail information about the topic and content.

10. I follow advances and research in mathematics education by attending conferences, symposiums, panels and workshops.

☐ Yes ☐ No

If yes, give details about their topics and content.

11. I follow advances in mathematics education by following scientific studies on.

☐ Yes ☐ No

If yes, explain why you follow these studies.

12. When I read theses and articles published in scientific journals to acquire knowledge about advances and research in mathematics education, I find them qualified and comprehensible.

☐ Yes ☐ No ☐ I have no idea about these studies and research.

a. If yes, give detailed information about the last theses or article you read and found comprehensible and qualified.

b. If no, mark the appropriate choice to indicate the reason why you do not find studies qualified and comprehensible.

☐ Scientific language is not intelligible and appropriate.
☐ Scientific research methods are not clear and understandable.
☐ The research topic is not clear and understandable.
☐ If you have other reasons, please indicate.

13. Indicate the statement appropriate in your case with regard to the in-class implementations of the articles and theses published in scientific journals you read and research on new advances in mathematics education.

☐ Such research and studies do not involve any knowledge.
☐ I arrange and use findings of scientific studies (theses, articles, etc.…) in a way that will be appropriate for my own in-class implementations.
☐ I use the findings of scientific studies (theses, article, etc…) as it is suggested in the study.
☐ I do not find the findings of scientific studies (theses, articles, etc…) applicable in class.

Explain your experiences about the application of the findings of scientific studies in class:

14. Indicate the appropriate choice with regard to how you use knowledge about advances, research and useful knowledge (about methods of instruction, classroom management, constructivist approach, active learning, etc….) you acquire in in-service education seminars.

☐ I did not attend any in-service training about it.

☐ I apply the knowledge I acquire in in-service training seminars by combining them with my own experiences.
☐ I use the knowledge I acquire in in-service training as it is indicated in the seminars.
☐ I do not benefit from the information I obtained in the in-service training seminars, in teaching practices.
If you have experiences other than the expressions given above, explain your experiences of applying knowledge you acquired during in-service education seminars in-class.

15. Indicate the appropriate choice with regard to knowledge you acquire and use in conferences, symposiums, panels and workshops you attended to follow advances and research in application math education.
☐ I did not attend any conference, symposium, panel or workshop on these topics.
☐ I use the knowledge I acquire in conferences, symposiums, panel and workshops by combining them.
☐ I apply knowledge I acquire from conferences, symposium, panel and workshops as they are indicated.
☐ I do not think that conferences, symposium, panel and workshops include beneficial information about instructional applications.
If you have different experiences other than listed above with regard to the application of knowledge you acquire from conferences, symposiums, panels and workshops in class.

16. I follow scientific studies on the education of other disciplines other than mathematics education and give place to their findings in class applications.

☐ Yes ☐ No

If yes, explain how you apply these findings.

If no, choose the reason why you do not use these findings in class applications.
☐ I do not think that other disciplines are related to math education.
☐ On the education program, math is not related with other disciplines.
☐ It takes time to relate mathematics with other disciplines in class applications.

Appendix-2

Personal Information:

The institution you work (state-private):
The institutions you worked at before:
Experience:
Educational Background:
The university-department and faculty you graduated (faculty of education or science):
Date of Graduation:
Do you hold M.A. degree?
Where did you get your degree? :
Which university/department:
Which discipline:
Date of graduation:
Are you planning to do master's degree?
Do you hold a PhD degree?
Where did you get it?:
Which university/department:
Which discipline:
Date of graduation:
Are you planning to do PhD degree?
Do you have access to computers and the Internet?

Questions about Research in Mathematics Education

1. What does the word educational research remind you?
2. What do you think about educational research?
3. Do you follow educational research?

If Yes;

1. Do you follow journals published in the field of education?
2. Are you a member of educational research journals or websites? What are they?
3. Do you follow research conducted in universities on education?
4. Do you think that the studies conducted are beneficial?
5. How do you make use of the findings of educational research?
6. In which field of education are the studies you make use of? (assessment and evaluation, classroom management …)
7. How do you apply the findings and suggestions of the studies in your classes?

If No;

1. What do you think about educational research?
2. Why do not you apply the results of the studies?
3. Would you follow studies if they were on other topics? What are these topics?
4. What are your ideas and suggestions about educational studies?