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Mathematics Teachers' Following Educational Researches and Attitudes towards Educational Research: An Example from Turkey

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Abstract

Raising the quality of education is one of the former aims in our country as in the whole world and with this purpose, several researches are carried out even in a single discipline. Yet, how these researches are applied by the schools is still a controversial topic. And this research was carried out to analyse the role of educational researches (e.g. theses, journal articles) in the professional development process of mathematics teachers, to determine their attitudes towards educational researches and the variables which may be effective in these attitude-construction processes. The study, which a survey used in, was carried out with 315 mathematics teachers who voluntarily participated in. Data were collected with a data collection tool called Education Researches Form from the Perspectives of Mathematics Teachers. This form, which included three parts, was designed to determine the demographic information of the participants with the first part, the sources, which the mathematics teachers used for their professional developments with the second part and the attitudes of mathematics teachers for the educational resources with the third part. During the data analysis process, the descriptive statistics, chi-squared analysis, independent-samples t-tests and one-way ANOVA were applied. In the lights of obtained results, it was concluded that only a small number of mathematics teachers had followed the educational researches and that the internet was the resource commonly used by them for their professional development. It was encountered that a significant relationship between that the teachers' education levels as undergraduate or graduate and their following the educational researches. Furthermore, it was determined that most of the participants' attitudes towards the educational researches were high. It was also found out that the variables of their experience and teacher-training department, where they graduated were effective on their attitudes. It was determined that the participants with high experience levels of 6–10 or 11–15 years have more positive attitudes compared with those with less experience (1–5 years) and the participants who graduated from secondary school mathematics teacher training departments have more positive attitudes than those who graduated from high school mathematics teacher training departments.

Keywords

Educational researches

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Introduction

The scientific research method is defined as collecting data using systematic processes for certain aims, analysing the data, yielding interpretations based on the results and reporting the findings in different formats for relevant people (McMillan & Schumacher, 2006). Educational research is a specific field of scientific research, defined by Kısakürek (1971) as the adaptation of the process, collecting data, organizing the data objectively and systematically, analysing the data and reporting the results for others in the education field. This research field, uniting universities and schools with each other for decades (Yashkina & Levin, 2008), is important for keeping up with the times and modernization of education institutions (Çepni, 2010, p. 12). The declaration of 1970 as International Education Year in the general assembly of UNESCO 1970, (Kısakürek, 1971) compared with our country, can be noticed as the emphasis given on this area a long time ago.

Although it has a crucial importance, what percentage of educational research results can be transmitted to schools is still a controversial topic. On this issue, it is a case stated in the literature that there are several researches stating the gap between study findings and teachers, in other words, the results are not very related to classroom application (Alber & Nelson, 2002; Baş, 2013; Biesta, 2007; Burkhardt & Schoenfeld, 2003; Costa, Marques, & Kempa, 2000; Çepni & Küçük, 2003; De Jong, 2004; Hemsley-Brown & Sharp, 2003; Hiebert, Gallimore, & Stigler, 2002; Papasotiriou & Hannan, 2006; Robinson, 1998; Sarı, 2006; Shkedi, 1998; Wissiak Grm & Savec, 2013; Vanderlindea & Braaka, 2010; Yavuz, 2009). These negative cases can originate from a number of issues, such as teachers not understanding study reports (Anderson, 2007; De Jong, 2004; Ekiz, 2006; Hiebert et al., 2002; Shkedi, 1998; Yıldırım, Sözbilir, İlhan, & Şekerci, 2010), teachers' belief of lack of time for reading (Anderson, 2007; De Jong, 2004; Ekiz, 2006; Shkedi, 1998; Yıldırım et al., 2010), differences in the parties' expectations and their impracticability (Anderson, 2007; De Jong, 2004; Shkedi, 1998; Yıldırım et al., 2010), accessing the resources (Anderson, 2007; Shkedi, 1998; Yıldırım et al., 2010), validity problems of studies (Anderson, 2007; Shkedi, 1998), lacking knowledge and skills to put the results into practice, low level of motivation, resistance against change (Anderson, 2007).

Accordingly, if any kind of collaboration is desired to be created between the applications and educational researches, it is significant to provide the collaboration and interaction between teachers and academicians (Baş, 2013; Biesta, 2007; Costa et al.,, 2000; De Jong, 2004; Ekiz, 2006; Hiebert et al., 2002; Shkedi, 1998; Stenhouse, 1981; Wissiak Grm & Savec, 2013;Vanderlindea & van Braaka, 2010; Yavuz, 2009). Because, if this kind of collaboration is supported between the educational partners, concrete problems can be dealt with and concrete solutions offered with a simplified language. To increase the direct participation of teachers in educational research studies and create collaboration, there are also other external factors such as allocating time for collaboration, supporting necessary guidance and other individual factors such as research skills and interest in the studies are strongly needed (Yashkina & Levin, 2008). Moreover, it is extremely significant that shaping a positive perception among the teachers that the scientific researches is useful for their professional development (Costa et al., 2000). This issue necessitates a clear explanation of teachers' present attitudes towards educational research and a presentation of the factors associated with the attitudes.

There are several researches aimed to put forward teachers' attitudes or perceptions towards scientific research from a general perspective and more specifically educational research. Some of these studies are developmental researches questioning the attitudes (İlhan, Şekerci, Sözbilir, & Yıldırım, 2013; Korkmaz, Şahin, & Yeşil, 2011a; Köklü, 1992; Öztürk, 2011; Papanastasiou, 2005; Walker, 2010) and some of them are about the determining the teachers' perceptions and attitudes (Cousins & Waker, 2000; Ekiz, 2006; Everton, Galton, & Pell, 2000; Günay, Hamurcu, Akmaca, & Şahbaz, 2005; Kayır, Bayar, Eğmir, Bayar, & Ödemiş, 2013; Korkmaz, Şahin, & Yeşil , 2011b). When these studies' findings are reviewed, it is seen that there is a disconnection between the educational researches and classroom applications, and also a contradiction between teachers' attitudes and perceptions towards educational researches. It was found out that though this disconnection was emphasized in the studies, the teachers still believed in the importance of educational research (Ekiz, 2006), cared about the study findings (Kayır et al., 2013) and accepted that educational research was effective (Korkmaz et al., 2011b). In

addition to these findings, it was found that teachers were enthusiastic to take part in the information-sharing process and participate in activities directly related to their in-class practices (Ekiz, 2006; Everton et al., 2000; Kayır et al., 2013) and also they acknowledged the help of academics in this process (Günay et al., 2005; Kayır et al., 2013).

In short, the application process of educational research does not overlap much with the teachers' relevant perceptions. Though it does not directly take place in a classroom setting, there are some positive teacher beliefs about its utility. Another point, the studies in the literature are mostly conducted with teachers from different educational branches or school managers, in other words they present a general perspective for all teachers. Considering these issues in the literature, the present study based on a Turkish sample aimed to analyse the place of educational researches in the professional development process and attitudes towards educational research from the viewpoint of a specific group of teachers (only mathematics teachers) and to determine the variables that influence mathematics teachers' attitudes. From this perspective, the following research questions were asked within the scope of relevant purpose:

1. What resources have mathematics teachers used in their professional-development processes?
2. What percentage of the mathematics teachers following education researches (theses, articles published in scientific journals) in their professional-development process?
3. Is there any relationship between mathematics teachers following educational research reports and the variables: gender, years of experience, education level, graduation department, type of school and location of school?
4. What are the attitude levels of mathematics teachers towards educational research?
5. Are there significant differences in the mathematics teachers' attitudes according to the variables: gender, years of experience, education level, graduation department, and type of school?

Method

This study, which dealt with the place of educational researches in the professional development of mathematics teachers and their attitudes towards these researches, was adopted a survey research design. Survey research is defined as the process of researching the answers of a population group drawn from the whole population to reach and determine general thoughts about a certain topic, thought, attitude, belief or knowledge (Fraenkel & Wallen, 2006; p. 397). The main factor in the adaptation of this method is the aim of presenting the attitudes of mathematics teachers and reaching generalizable findings by observing a huge population that can reflect the thoughts of the whole population.

Participants

The study was conducted with 315 volunteers of mathematics teachers working in Turkey. In the determining process of the study group; first, the structure of the universe of mathematics teachers working in Turkey was investigated and it was found that the population had a very diverse structure, having various variables such as gender, years of experience, education level, graduation department, type of school and the location of the teachers' schools. Then, all these variables were considered in the determining process of the participants. In this process, the maximum variation sampling method, which is mostly used in qualitative studies and gives different viewpoints to the relevant structure by adding various individuals to the group (McMillan and Schumacher, 2006, p. 320), was used in the study. The study group was formed by considering the above variables and created with face-to-face and internet-based meetings. In the face-to-face meetings, the researcher invited the mathematics teachers in his city (Erzincan) to be voluntary participants in the study by visiting each of the teachers in his/her schools. After a short presentation of the study, 110 participants accepted the invitation to participate in the study and many teachers having different years of experience joined the group. In the internet-based meetings, the researcher reached some other teachers and their colleagues based on the criteria of having different characteristics via the internet. Therefore; after discussions with the teachers,

the researcher reached 205 more participants. Totally 315 teachers from various cities in Turkey (mostly from Erzincan city in Turkey) took part in the study. The structure of the study group according to the nominated variables is shown below in Figure 1.

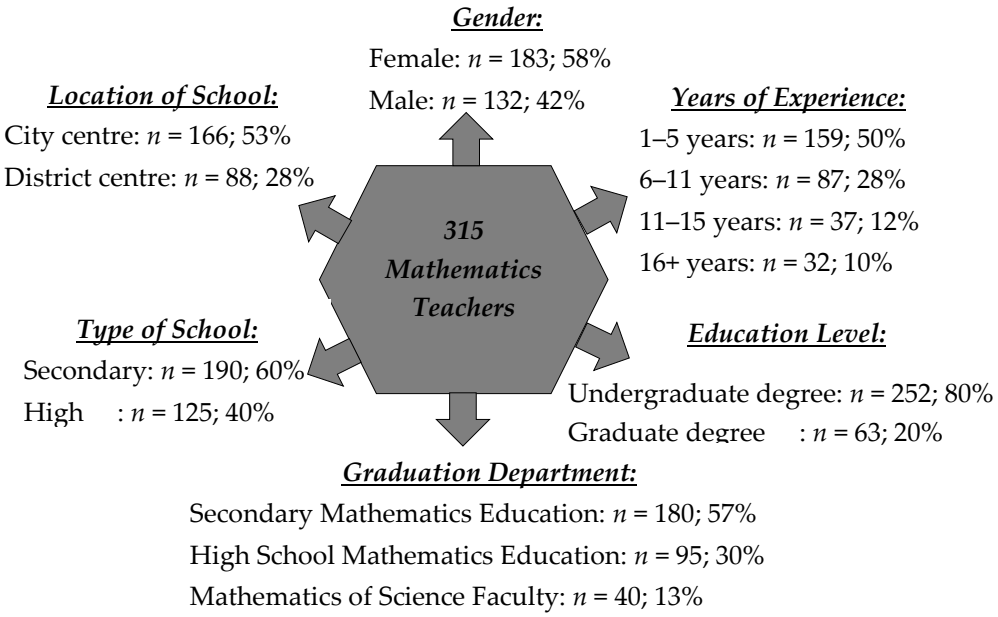

Figure 1. The Distribution of Participants According to the Variables

As it is indicated in Figure 1, though the participants have a homogeneous structure in terms of the variables gender and type of state school, they have a heterogeneous structure in terms of type of graduation department and the location of the school.

In addition to these details, the following details should be given for more clarification, the study group as the group of participants can totally be different in other countries. In the Turkish context, mathematics teachers' experiences with educational research in both pre-service and in-service training periods can be summarised as follows. The course 'scientific research methods' was included in the curricula of mathematics teaching departments in the year 2006 for the first time in Turkey. The Higher Education Council of Turkey (YÖK, 2007) included this course in the curricula of all teacher-training departments in 2006 to train future teachers so they can do scientific research and benefit from the research. The content of this course includes the following topics: science and basic concepts (e.g. phenomena, truth, universal knowledge), fundamental details about science history, the structure of scientific study, scientific methods, research design, participants, data collection methods, data recording, data analysis, data interpretation and reporting findings. Considering the graduation durations of secondary school mathematics teachers (four years) and high school mathematics teachers (five years), teachers who started working life in 2010 and have five years of experience in 2015 had taken the scientific research methods course in their pre-service training period. Therefore, the experience of the teachers was grouped as five years and multiples of five years. In addition, the teachers can also take detailed scientific research methods courses based on enrolment in graduate programs such as masters and PhD.

Data Collection Tool and Data Collection

A questionnaire form used in the process of data collection was created benefiting from tools that Yıldırım et al. (2010) used in their projects to follow and understand the science education researches of Science and Technology teachers, and to practise their results. It consisted of three parts; the data collection process can be summarised as below:

Section One: This is about determining the demographic (individual) information and it consists of six factors: gender (male–female), years of experience (1–5 years, 6–11 years, 11–15 years, 16 or more years), education level (undergraduate, graduate), graduation department (secondary school mathematics education, high school mathematics education, faculty of science mathematics), school type in which the teachers work, (secondary school, high school), the location of the school (city centre, district centre, town/village).

Section Two: This is aimed at presenting resources that the teachers used in the progress of their profession and consists of nine options: radios–TVs and newspapers; official correspondence; theses, scientific journal articles, exam materials (KPSS 'an obligatory exam which graduated pre-service teachers can take task in public schools with'), preparation and educational sciences; scientific content magazines; internet; in-service training; conferences, symposia, panels, workshops; and others. This section was formed by revising the open-ended questionnaire form used by Yıldırım et al. (2010). It was concluded that nine options that were determined through literature reviews done in this field and expert opinions were enough for understanding the subject. A draft form was presented to one of the researchers mentioned above (Sözbilir-the second researcher of Yıldırım et al., 2010) and this section was put into its second form according to that researcher's positive feedback. The participants could choose more than one option.

Section Three: This is a five-point Likert scale having 20 items and aimed at attitudes of mathematics teachers towards educational research. This scale was created by İlhan et al. (2013); it consists of three factors: the necessity of education researches, value and applicability of education researches. The factor of the necessity of educational researches includes 7 items (positive), valuing the educational researches 6 items(positive) and the applicability of educational researches 7 items (positive). Orderly, sample one item for each factor is as: educational researches enable useful information that I can use in the lessons- teachers should apply the educational research findings- the researches carried out by the academicians are just for their improvements in their academic successes. The reliability coefficient was calculated by researchers as .881 (Cronbach Alpha). It was calculated in this research as .707, which is acceptable for reporting the analyses (Lance, Butts, & Michels, 2006).

The data collection tool summarised above was formed as three sections and was then presented to three experts who work in the field of mathematics. After they examined it, one of the experts suggested that the explanation parts at the beginning of each section can be shortened and the repeated expressions can be deleted. In addition, two experts stated that the part where the participants give examples in Section 2 was not fully clear, so it would be better to give an example, but it should not bias the participants. In accordance with these suggestions, necessary changes were made and the data collection tool, called The Education Research Form from the Perspective of Mathematics Teachers (ERFPMT) was put into its final form.

After the ERFPMT was prepared, the data-collection process started. The data were collected by two processes: face-to-face and internet based. These processes, the participants of which are shown in Figure 2 below, can be summed up as:

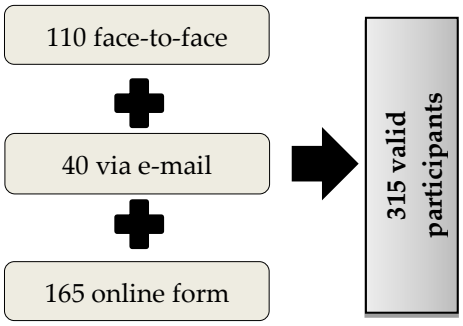

Figure 2. The Data Collection Method

In the face-to-face process, the research was introduced to all of the mathematics teachers in person by visiting them in their schools, which are in the researcher's city, and they were requested to complete the ERFPMT. The form was filled based on volunteering and the answering time was set as five minutes. There were answers from 115 people. The teachers who did not have the opportunity to meet face-to-face and who work in different parts of country, were contacted via the internet. McMillan and Schumacher (2006, p. 238) name this kind of survey an 'internet-based survey'. The data in this process were collected via the e-mail that ERFPMT sent and through use of the online form prepared before. There were 40 answers via e-mail and 165 answers through the online forms from mathematics teachers. At the end of the process of face-to-face and internet-based survey, it was found out that there were 320 mathematics teachers participating. However, five forms were not evaluated because of the views of experts: two participants could not see the back page, two participants did not complete the majority of the questions and one participant gave highly inconsistent answers. There were some missing data in 19 of the remaining 315 forms and the missing data were in the third section of the form. 24 missing data over the 20 items and missing data were prepared for the analysis based on the series mean after consulting an expert from the statistics area.

Data Analysis

Data analysis was done in the sub-problem base orderly as below:

The data collected from the second section of the ERFPMT were analysed to find answers to the first sub-problem that was examined by the sources used by the mathematics teachers in their professional development process. The frequency and percentage values were calculated by taking into consideration the preferences of the participants about the nine categories in accordance with the sources they used in their career-development process. The findings obtained are shown using a histogram.

The frequency and percentage values of ticking the option 'theses–articles published in magazines', which was in the second section of the ERFPMT were calculated with the aim of finding an answer to the second sub-problem, where the rate of mathematics teachers following education researches in their professional-development process was examined. The findings obtained are shown using a pie chart. It was difficult to draw a line for the transmission channel of the education research result to the teachers. It could be prepared by using a webpage, a part of a course book or official letter sent by the ministry of national education. Only the 'theses–articles published in magazines' were evaluated as research reports.

The chi-squared analysis was used with the aim of examining whether there is a relationship between the participants following the education researches. It was one of the nine categories in the form, and the demographic features within the scope of the third sub-problem in which the relationship between the situation of mathematic teachers following educational researches and gender, length of experience, educational background, graduation department, school type and the location of school factors were examined. The data acquired are presented using charts.

For the fourth research question aimed at determining mathematics teachers' attitudes towards educational researches, the data gathered from the scale in the third section of the form were analysed. In this part, the scoring procedure of Yıldırım et al. (2010), who are the developers of the scale, was adopted and means were categorized as the means between 1–2.59 indicating low, 2.60–3.39 moderate and 3.40–5 high levels of attitudes. For each participant, attitude scores were calculated and descriptive analyses were conducted of the study group's sub-groups. The distributions are presented in histograms and pie graphics.

In the fifth research question aimed at researching the variables that are effective on mathematics teachers' attitudes towards educational research, demographic details from the first section and the scale from the third section of the form were used. The attitude scores ranged between 26 and 98, low scores meaning a negative attitude, high scores meaning a positive attitude. The distribution of the data showed that skewness is –0.592 and kurtosis is 0.432. Based on these parameters being between +3 and –3, it was accepted that the data had a normal distribution (DeCarlo, 1997). In addition, each group of a variance's homogeneity (Levene's Test for Equality of Variances: gender (0.816), education level (0.227), school type (0.386), the case of following study reports (0.384), years of experience (0.207), graduation department (0.378), location of school (0.093)) a parametric test was used in the study. For the variables having two sub-groups, independent-samples t-test and for the variables having three or more sub-groups one-way ANOVA tests were used. In the ANOVA tests, post hoc tests were used to determine significant differences in the sub-groups of years of experience and type of graduation department. Based on the assumption of homogeneity of variances in post hoc tests and the inequality of group numbers, Scheffe tests were used (Kayri, 2009). As the Scheffe tests did not show a significant difference between the groups, though there are differences between the groups of years of experience, the least significant difference (LSD) test, which has a higher rate of type I error compared with the Scheffe test but presents the relationships in a much more flexible way, was used in the analyses (Kayri, 2009).

Results

After the data analyses, the following findings related to each research question were found.

'What resources have mathematics teachers used in their professional-development processes?'

The resources used by the mathematics teachers in their professional-development processes were categorized under nine groups as follows: radios–TVs and newspapers; official correspondence; theses, scientific journal articles; materials of course and exam preparation about educational sciences; scientific content magazines; internet; in-service training; conferences, symposia, panels, workshops; and others. The findings with frequency and percentage values related to the participants using the resources are shown in Figure 3.

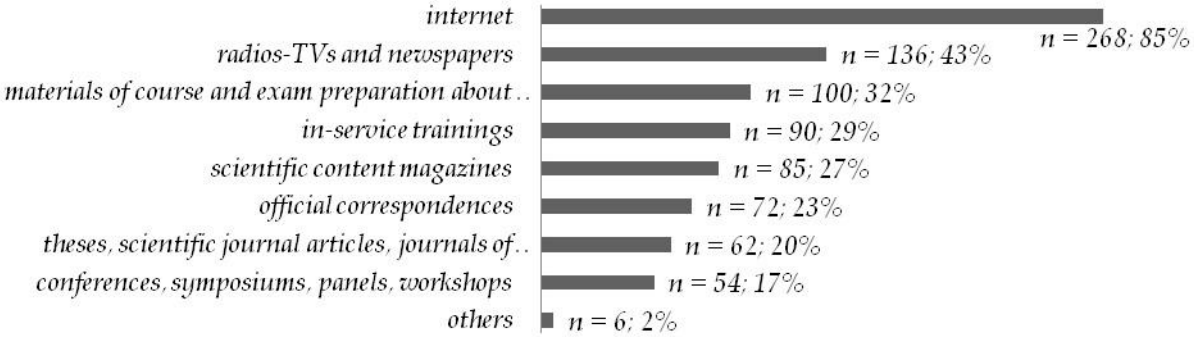

Figure 3. Resources Used by Mathematics Teachers in Their Professional Development

The percentages related to the use of nine resources applied by the teachers in their professional development varied between 2 and 85. The most-preferred resource by the participants is the internet (85%), and on this concept, they reported that the forum-pages about teachers and civil servants, databases formed by private organizations or national ministry of education and social network pages were popular. The second rank is the group radios–TVs and newspapers (43%). In this group, the participants emphasised the daily newspapers and TV programs that assisted mathematics education.

In addition to these resource groups, other resources referenced by the participants were as follows: materials of exam preparation and educational sciences (32%), in-service training (29%), scientific content magazines (27%), official correspondence (23%), theses–scientific journal articles (20%), conferences–symposia–panels–workshops (17%) and others (2%). In the others group, the teachers stated conversations with colleagues. The low rate of marking this choice is about the remaining eight groups giving a high rate reflecting the general points.

'What percentage of the mathematics teachers follows education researches in the professional development process?'

To determine the percentage of the mathematics teachers, the case of selecting the option 'theses–articles published in scientific journals' which is in the second section of the form was investigated and the findings with frequency and percentage values are shown below in Figure 4.

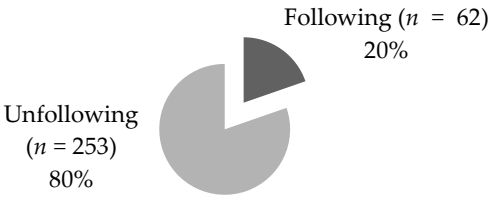

Figure 4. Distribution of the Participants According to the Rate of Following and Not Following Study Reports

Figure 4 indicates that the topic of this study was selected at rank 6 with a percentage of 20. Only one fifth of the participants stated that they used scientific articles and reports for their professional development.

'Are there any relationships between mathematics teachers following educational researches and the variables: gender, years of experience, education level, graduation department, type of school and location of school?'

To determine the relationship between the participants following educational researches and their demographic features, chi-squared analysis was used and the findings are shown in Table 1.

Table 1. Chi-squared Findings of Following Education Research Reports According to the Demographic Details

Groups	*Sub-groups*	*Following–Not following*		*Total*	χ^2	*sd*	*p*
		Yes	No				
Gender	*Male*	32	151	183	1.332	1	0.248
	Female	30	101	132			
Years of experience	*1–5 years*	37	122	159	3.482	3	0.323
	6–10 years	15	72	87			
	11–15 years	4	33	37			
	16 years or more	6	26	32			
Education level	*Undergraduate deg.*	44	208	252	3.936	1	0.047
	Graduate deg.	18	45	63			
Graduation department	*Secondary sch. Mat.*	47	133	180	7.695	2	0.021
	High school Mat.	17	78	95			
	Science Fac. Mat.	3	37	40			
Type of school	*Secondary School*	44	146	190	3.658	1	0.056
	High school	18	107	125			
Location of school	*City centre*	34	132	166	0.180	2	0.914
	District centre	17	71	88			
	Town/Village	11	50	61			

According to the chi-squared findings in Table 1, there is not a statistically significant relationship between the case of teachers following study reports and the variables: gender ($\chi^2_{(1)} = 1.332$, $p > 0.05$), years of experience ($\chi^2_{(3)} = 3.482$, $p > 0.05$), type of school ($\chi^2_{(1)} = 3.658$, $p > 0.05$) and the location of school ($\chi^2_{(2)} = 0.180$, $p > 0.05$). However, there is a statistically significant relationship between the case of following the reports and teachers' educational level ($\chi^2_{(1)} = 3.936$, $p < 0.05$) and type of graduation department ($\chi^2_{(2)} = 7.695$, $p < 0.05$). The teachers having a graduate degree or getting graduate education follow these resources much more than the teachers who do not. In addition, teachers, who graduated from secondary school mathematics teaching departments, follow these resources more than teachers who graduated from high school mathematics departments.

'What are the attitude levels of mathematics teachers?'

To determine the attitude levels of mathematics teachers towards educational research, the scale in the third section of the form was used and the attitude scores were agreed. Means between 1 and 2.59 indicate low level of attitude, 2.60–3.39 moderate and 3.40–5 high level of attitude were categorized and the findings with frequency and percentage values are presented in Figures 5 and 6.

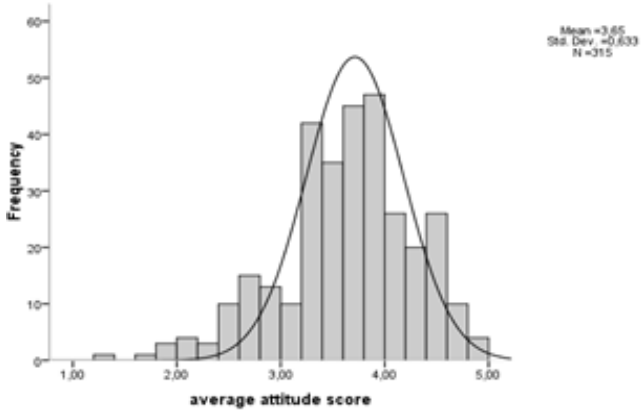

Figure 5. Distribution of Mean Attitude Scores

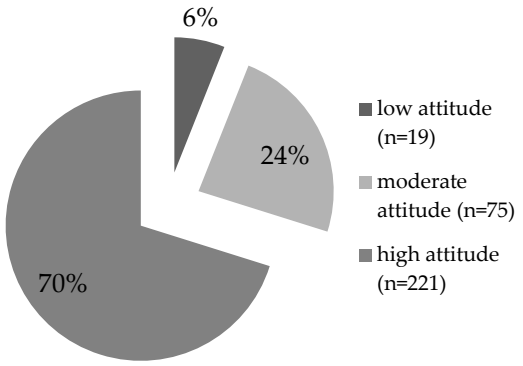

Figure 6. Distribution of the Participants According to Mean Percentages

As seen in Figure 5, the data showed a normal distribution. The mean was found to be $\overline{X} = 3.65$ and standard deviation was ss = 0.63. The figure showed that 70% of the participants had a high rate, 24% had a moderate rate and 6% had a low level of attitude.

'Are there any significant differences in the attitudes of mathematics teachers according to the variables: gender, years of experience, education level, graduation department and type of school?'

To determine the variables that are effective on the participants' attitude scores, the attitude scores of the participants' changing according to the variables: gender, education level, type of school, and the case of following study reports were investigated and independent-samples t-test analyses were conducted. The findings are presented in Table 2.

Table 2. *t*-test Findings of Attitude Scores According to the Variables: Gender, Education Level, Type of School and Following Study Reports

Variable	*Group*	*n*	$\bar{x}$	*ss*	*sd*	*t*	*p*
Gender	*Male*	183	73.962	12.834	313	1.727	0.085
	Female	132	71.473	12.318			
Education level	*Undergraduate*	252	73.348	12.380	313	1.206	0.229
	Graduate	63	71.200	13.694			
Type of school	*Secondary Sch.*	190	74.033	12.165	313	1.934	0.054
	High school	125	71.225	12.818			
The case of following	*Following*	62	72.968	12.896	313	0.138	0.890
	Not following	253	72.719	11.748			

The t-test analyses in Table 2 indicate that there is not a significant difference between the scores of attitude and the variables: gender ($t_{(313)} = 1.727$, $p > 0.05$), education level ($t_{(313)} = 1.206$, $p > 0.05$), school type ($t_{(313)} = 1.934$, $p > 0.05$) and the case of following study reports ($t_{(313)} = 0.138$, $p > 0.05$), in other words, the group scores are equal in terms of attitude scores.

For the variables years of experience, graduation department and location of school, which have three or more sub-groups, the one-way ANOVA test was used. Descriptive findings of groups' scores of attitudes are shown in Table 3.

Table 3. Descriptive Findings of the Sub-Groups' Scores of Attitude According to the Variables: Years of Experience, Graduation Department and Location of School

Variables	*Sub-groups*	*n*	*Mean*	*Std. Deviation*	*Std. Error*	*95% Confidence Interval for Mean*		*Min.*	*Max.*
						Lower Bound	*Upper Bound*		
Years of experience	*1–5 years*	159	75.197	11.7794	0.9342	73.352	77.043	35	98
	6–10 years	87	71.014	13.0524	1.3994	68.232	73.796	37	93
	11–15 years	37	69.435	14.8769	2.4457	64.475	74.395	26	93
	16–20 years	32	70.803	11.4365	2.0217	66.680	74.926	51	97
	Total	315	72.919	12.6605	0.7133	71.515	74.322	26	98
Graduation department	*Secondary Sch. Mat.*	180	74.289	12.1034	0.9021	72.509	76.070	26	98
	High school Mat.	95	70.232	13.2645	1.3609	67.529	72.934	35	97
	Science Fac. Mat.	40	73.133	12.9530	2.0480	68.990	77.275	50	97
	Total	315	72.919	12.6605	0.7133	71.515	74.322	26	98
Location of school	*City centre*	166	72.086	13.4135	1.0411	70.031	74.142	26	97
	District centre	88	73.353	11.4194	1.2173	70.934	75.773	41	93
	Town/Village	61	74.557	12.2494	1.5684	71.420	77.695	35	98
	Total	315	72.919	12.6605	0.7133	71.515	74.322	26	98

The participants' scores of attitudes varied between 26 and 98. According to the means, there were differences between the groups. For testing if these mean differences are statistically significant or not, one-way ANOVA analyses were conducted and the findings are presented in Table 4.

Table 4. One-way ANOVA Test Findings of the Variables Years of Experience, Graduation Department, the Location of School

Variable	*Resource of variable*	*df*	*SS*	*MS*	*F*	*p*
Years of experience	*Between groups*	3	1733.583	577.861	3.698	0.012
	Within groups	311	48596.736	156.260		
	Total	314	50330.319			
Graduation Department	*Between groups*	2	1025.997	512.998	3.246	0.040
	Within groups	312	49304.323	158.027		
	Total	314	50330.319			
Location of School	*Between groups*	2	295.493	147.747	0.921	0.399
	Within groups	312	50034.826	160.368		
	Total	314	50330.319			

According to Table 4, the scores of attitude had a significant difference in terms of the variables years of experience ($F_{(3, 311)} = 3.698$, $p < 0.05$) and graduation department ($F_{(2, 312)} = 3.246$, $p < 0.05$), and do not have a significant difference according to the variable, the location of school ($F_{(2, 312)} = 0.934$, $p > 0.05$). In other words, though the participants' scores of attitude are equal according to the variable the location of school, they are not equal with the variables: the years of experience and graduation department.

LSD test results related to the in-group differences according to the years of experience variable were indicated in Table 5.

To present the differences in sub-groups, post hoc tests were used. For the variable years of experience, the LSD multiple comparison test was used and shown in Table 6.

Table 5. LSD Test Findings According to the Years of Experience

				95% Confidence Interval	
Years of experience	*Years of experience*	*Mean Diff (I–J)*	*Std. Error*	*Lower Bound*	*Upper Bound*
1–5 years	*6–10 years*	4.1837*	1.6670	0.904	7.464
	11–15 years	5.7623*	2.2817	1.273	10.252
	16 years or more	4.3944	2.4220	–0.371	9.160
6–10 years	*1–5 years*	–4.1837*	1.6670	–7.464	–0.904
	11–15 years	1.5787	2.4534	–3.249	6.406
	16 years or more	0.2107	2.5844	–4.874	5.296
11–15 years	*1–5 years*	–5.7623*	2.2817	–10.252	–1.273
	6–10 years	–1.5787	2.4534	–6.406	3.249
	16 years or more	–1.3680	3.0177	–7.306	4.570
16 years or more	*1–5 years*	–4.3944	2.4220	–9.160	0.371
	6–10 years	–0.2107	2.5844	–5.296	4.874
	11–15 years	1.3680	3.0177	–4.570	7.306

* $p < 0.05$

According to the LSD test findings, there is a significant difference between the scores of teachers having 1–5 years of experience and the teachers having 6–10 years and 11–15 years of experience ($F_{(3, 311)} = 3.698$, $p < 0.05$). The participants having 1–5 years of experience have more positive

attitudes compared with those having 6–10 years and 11–15 years of experience. There is no significant difference between other variables.

The Scheffe test results related to in-group differences according to the differences of the graduation department were indicated in Table 6.

For the presentation of the findings related to in-group differences according to the variable type of graduation department, the multi-comparison Scheffe test was used and results of the Scheffe test are shown in Table 6.

Table 6. Scheffe Test Findings According to the Graduation Department

				95% Confidence Interval	
Graduation Department	***Graduation Department***	***Mean Diff (I–J)***	***Std. Error***	***Lower Bound***	***Upper Bound***
Secondary Sch. Mathematics	*High school Mathematics*	4.0579*	1.5942	0.137	7.979
	Science Faculty Mathematics	1.1569	2.1974	–4.248	6.562
High school Mathematics	*Secondary Sch. Mathematics*	–4.0579*	1.5942	–7.979	–0.137
	Science Faculty Mathematics	–2.9009	2.3694	–8.729	2.927
Science Faculty Mathematics	*Secondary Sch. Mathematics*	–1.1569	2.1974	–6.562	4.248
	Science Faculty Mathematics	2.9009	2.3694	–2.927	8.729

* $p < 0.05$

According to the Scheffe test findings, there is a significant difference between the attitude scores of secondary school mathematics and high school mathematics teachers ($F_{(2, 312)} = 3.246$, $p < 0.05$) and the participants graduated from secondary school mathematics departments have more positive attitudes than those from high school mathematics departments. There is no significant difference between other variables.

Discussion and Conclusion

For the results of this study investigating the place of educational researches (e.g. theses, journal articles) on the professional development process of mathematics teachers based on a Turkish sample, the teachers' attitudes towards educational research and the variables that can be effective on these attitudes, can be summarized as follows.

A small group of mathematics teachers follows educational research in their professional-development process. Yet, it was observed that their attitudes towards educational research are high. It was concluded that experience and source program, as variables, were effective on their attitudes. The results, obtained in detail in terms of sub-problems, can be summarized as follows.

To investigate the place of educational researches in the process of mathematics teachers' professional development, all sources that the teachers used have been determined. In the light of the results, it was observed that the internet was the most common resource that teachers used in their professional development. The websites, the participants reported, are forums for teachers–civil servants, material and resource database websites prepared by the ministry or private institutions and social media websites. When they are investigated in terms of their content, it is difficult to say that these websites provide holistic resources for information for educational research. Radios, TVs and newspapers follow this finding. The others include books on educational sciences and related topics, as well as books for exams (Public Personnel Selection Examination, etc.), in-service training, magazines on scientific issues, official correspondence, theses and scientific journal articles, conferences, symposia, panels and workshops, as one-third of the sample group reported. The other resources are reported by 2% of the participants, this category including communication with teachers and colleagues. In agreement with these results, Yavuz (2009) also stated that the internet is the most common resource the teachers use without any branch distinction. This also overlaps with the results of the research

carried out by Yıldırım et al. (2010) on the teachers of science and technology lesson and stressed on the use of web sites as sources. Considering this, it can be claimed that internet is a significant way of information for teachers without any branch distinction.

Educational researches, which comprise the basis of this study, are followed by one fifth of the participants. In other words, the theses and scientific journal articles, which are the basic ways of publishing the results of educational research, are not followed by most of the mathematics teachers. It can be claimed that this finding is parallel with several studies in the literature (Alber & Nelson, 2002; Baş, 2013; Biesta, 2007; Burkhardt & Schoenfeld, 2003; Costa et al., 2000; Çepni and Küçük, 2003; De Jong, 2004; Hemsley-Brown & Sharp, 2003; Hiebert et al., 2002; Papasotiriou & Hannan, 2006; Robinson, 1998; Sarı, 2006; Shkedi, 1998; Wissiak Grm & Savec, 2013; Vanderlindea & Braaka, 2010; Yavuz, 2009). Within the context of this research, any investigation has not been carried out related to the reasons of this case. But, from the researches stated in the introduction part, it can be claimed that several factors are effective such as: the teachers could not understand the researches (Anderson, 2007; De Jong, 2004; Ekiz, 2006; Hiebert et al., 2002; Shkedi, 1998; Yıldırım et al., 2010), that the teachers do not believe they had enough time (Anderson, 2007; De Jong, 2004; Ekiz, 2006; Shkedi, 1998; Yıldırım et al., 2010), the differences in expectations of those concerned, the thought of research results were not suitable for the application (Anderson, 2007; De Jong, 2004; Shkedi, 1998; Yıldırım et al., 2010), inaccessibility to the publications (Anderson, 2007; Shkedi, 1998; Yıldırım et al., 2010), the validity problems in the researches (Anderson, 2007; Shkedi, 1998), the deficiency in knowledge and skills in applications of the research results, low motivation, resistence to the change (Anderson, 2007).

It was investigated if there is a relationship between the participants' attitudes of following educational research and their demographical features. It was found out that there is no significant relationship between their attitudes of following educational research and their genders, experience, workplace (secondary or high school) and location (working at city centre or rural). A significant relationship between the participants' attitudes of following educational research and their education level (having a graduate or undergraduate degree) was found. It was found that as the level of education increases, the level of following educational research also increases. In addition to the relevant literature, a significant relationship has been found between the graduation department of teachers and the habit of following educational research. According to the results, those having a graduate degree follow educational research more than those not having a graduate degree; those who have graduated from secondary school mathematics teaching departments follow educational research more than those who have graduated from high school mathematics teaching and science faculty mathematics departments.

In contrast to the result of the relationship between gender and following, Yıldırım et al. (2010) have found that gender may cause a difference and female science and technology teachers follow educational research more than male teachers. Having a graduate degree is known to have an effect on following educational researches (Yıldırım et al., 2010) and to have positive attitudes towards following educational research (Hemsley-Brown & Sharp, 2003).

When mathematics teachers' attitudes towards educational research are investigated, it is observed that most of them have high levels of attitude; one fourth of them have moderate attitudes; and only 6% of the participants have low attitudes. In parallel with our results, Yıldırım et al. (2010) also found that science and technology teachers have positive attitudes. However, it can be said that the results of the second and fourth sub-problems contradict each other. This is nearly the same for all existing studies in the relevant literature: in most of them, it is found that though the participants do not follow educational research, they still believe that research is necessary in contributing to the process of education. In addition, the participants state that they would like to help researchers by getting involved in research studies, as stated in the literature (Ekiz, 2006; Everton et al., 2000; Günay et al., 2005; Kayır et al., 2013; Korkmaz et al., 2011b).

As a result of the investigations on possible variables that can be effective on mathematics teachers' attitudes towards educational research, gender, educational background (graduate or undergraduate degree), school level (secondary school or high school) and location of the school in which they work (central or rural) are found to have no significant effect. However, years of experience (1–5, 6–10, 11–15, 16 or more years), and the department from which they graduated (secondary school mathematics teaching, high school mathematics teaching, science faculty mathematics) have an effect on teachers' attitudes to educational research. Compared with those having more experience, teachers with less experience are found to have more positive attitudes; the graduates of secondary school mathematics teaching departments are also found to have more positive attitudes compared with the graduates of high school mathematics teaching departments. Gender is reported to have no effect on the attitudes in Yıldırım et al. (2010). In contrast to the current study, Yıldırım et al. (2010) reported that the department, from which the participants graduated, has no effect on the attitudes.

Discussion

When the results are investigated, it can be said that though the research reports are not commonly referred resources for mathematics teachers during professional development, they have a great potential regarding the teachers' attitudes towards them. Thus, the following suggestions can be stated to enable the use of research reports in teachers' professional development:

- The results of the educational research should be published on the internet, the most common tool the teachers use, with a simple and clear format and style.
- Awareness-raising activities should be carried out for the teachers to direct them to reach the educational researches, for the benefits of these researches and the reflectivity to the applications.
- Having or holding a graduate degree has a positive effect on teachers' attitudes towards following educational research; thus, teachers should be directed to pursue a master's degree under appropriate conditions (time, transportation, the number of courses) .
- Though the participants have positive attitudes towards educational research, they do not follow these studies. This paradox should be dealt with in detail with a focus on mathematics teachers. Thus, there will be more and clearer understanding of the case.
- In addition to these suggestions, if one wants to cover all research problems in practice, they should be dealt with in detail from the mathematics teachers' understanding process of the study reports and the problems that teachers experienced in this process.

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Appendix. 1. Used Data Collection Tool (Turkish)

<table>
<tr><td colspan="2">Saygıdeğer Meslektaşımız,
Bu araştırmada siz değerli öğretmenlerin eğitim araştırmalarını takip etme, anlama ve sonuçlarını uygulamaya yansıtma durumlarının incelenmesi amaçlanmaktadır. Elde edilecek bilgiler araştırma amaçlı olarak kullanılacak olan hiçbir şekilde başka kimselerle paylaşılmayacak ve araştırma raporlarında sizlerin tanınmasına yol açacak hiçbir bilgiye yer verilmeyecektir.
Araştırmanın güvenilirliği vereceğiniz cevaplarla doğrudan ilgilidir. Bu konuda göstereceğiniz ilgi ve katkılarınız için teşekkür ederiz.

Adres: Araştırmacı</td></tr>
<tr><td colspan="2">1. BÖLÜM: DEMOGRAFİK (KİŞİSEL) BİLGİLER</td></tr>
<tr><td colspan="2">Aşağıda sizlere ait demografik (kişisel) bilgiler sunulmaktadır. Bu bilgiler araştırma amaçlı olarak kullanılacak olan hiçbir şekilde başka kimselerle paylaşılmayacak ve araştırma raporlarında sizlerin tanınmasına yol açacak hiçbir bilgiye yer verilmeyecektir.</td></tr>
<tr><td colspan="2">Cinsiyetiniz: (❑) Bayan (❑) Bay</td></tr>
<tr><td colspan="2">Deneyim Yılınız: (❑)1-5 yıl (❑)6-11 yıl (❑)11-15 yıl (❑)16-20 yıl (❑)21-25 yıl (❑) 26 yıl ve üzeri</td></tr>
<tr><td colspan="2">Öğrenim Durumunuz: (❑)Ön lisans (❑)Lisans (❑)Yüksek Lisans (❑)Doktora</td></tr>
<tr><td colspan="2">Mezun Olduğunuz Lisans Programı:</td></tr>
<tr><td colspan="2">Şuan Öğretmenlik Yaptığınız Alan:</td></tr>
<tr><td colspan="2">Şuan Görev Yaptığınız Okulun Bulunduğu Yer: (❑) İl Merkezi (❑) ilçe Merkezi (❑)Belde/Kasaba (❑) Köy</td></tr>
<tr><td colspan="2">2. BÖLÜM: ANKET SORUSU</td></tr>
<tr><td colspan="2">Eğitim bilimleriyle ilgili yenilikleri, gelişmeleri ve araştırmaları takip etmek için aşağıdaki araçlardan hangisi ya da hangilerini kullandığınızı işaretleyiniz. Açıklama bölümünde mümkün olduğunca ilgili seçeneğe ilişkin kullandığınız kaynakları örneklendiriniz. Örneğin internet ortamında yaptığım gezintiler seçeneğini işaretleyen bir katılımcı açıklama bölümüne eğer o amaçla kullanıyorsa üyesi olduğu sosyal paylaşım sitesini yazabilir. gazete ismini yazabilir.</td></tr>
<tr><td>(❑) radyo, televizyon, gazete</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) resmi yazışmalar</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) Tezler, bilimsek dergilerde yayınlanan makaleler (Eğitim ve sosyal bilimler dergileri, fakülte dergileri</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) eğitim bilimleri ile ilgili ders ve sınavlara hazırlık kitapları (lisanstaki eğitim kitapları, KPSS hazırlık kitapları)</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) Bilimsel içerikli magazin dergileri (Genç bilim, Bilim Teknik)</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) İnternet ortamında yaptığım gezintiler (web sayfaları)</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑)katıldığım hizmet içi eğitimler</td><td>Açıklama /Örnek:</td></tr>
<tr><td>(❑) katıldığım konferans, sempozyum, panel ve çalıştaylar</td><td>Açıklama /Örnek:</td></tr>
<tr><td>Diğer;</td><td></td></tr>
<tr><td colspan="2">3. BÖLÜM: EĞİTİM ARAŞTIRMALARI TUTUM ÖLÇEĞİ</td></tr>
</table>

Aşağıda verilen ilgili ifadelere katılma derecenizi ***"Hiç Katılmıyorum" (1)*** dan ***"Tamamen Katılıyorum" (5)*** a doğru derecelendirerek işaretleyiniz. **LÜTFEN SADECE BİR SEÇENEĞE İŞARETLEYİNİZ.**	***(1) Hiç Katılmıyorum***	<---------->			***(5) Tamamen Katılıyorum***
	1	**2**	**3**	**4**	**5**
1. Eğitim araştırmaları derslerde kullanabileceğim yararlı bilgiler sağlar.	☐	☐	☐	☐	☐
2. Eğitim ile ilgili bilimsel yayınlar (tez, makale, kitap vb.) eğitimin kalitesinin artmasına katkı sağlar.	☐	☐	☐	☐	☐
3. Eğitim araştırma sonuçlarına göre sınıfta ders işlemek bana zevk verir.	☐	☐	☐	☐	☐
4. Akademisyenlerin yaptığı eğitim araştırmaları sadece kendi kariyerlerini yükseltmek amacıyla yapılan araştırmalardır.	☐	☐	☐	☐	☐
5. Eğitim araştırmalarından elde edilen verilere göre ders işlediğimde konular yetişmez.	☐	☐	☐	☐	☐
6. Öğretmenler eğitim araştırmaları sonuçlarından yararlanmalıdırlar.	☐	☐	☐	☐	☐
7. Eğitim araştırmaları ile ilgili seminerlerden hoşlanırım.	☐	☐	☐	☐	☐
8. Eğitim ile ilgili bilimsel yayınların (tez, makale, kitap vb.) yüzeysel olduğu kanısındayım.	☐	☐	☐	☐	☐
9. Nitelikli bir öğretmen olmak için eğitim araştırmalarından yararlanmak gerekir.	☐	☐	☐	☐	☐
10. Yapılan eğitim araştırmaları öğretim programlarının geliştirilmesi ve yenilenmesine katkı sağlar.	☐	☐	☐	☐	☐
11.Eğitim ile ilgili bilimsel araştırmaların yapılması gereklidir.	☐	☐	☐	☐	☐
12. Eğitim araştırmalarından haberdar olmak önemlidir.	☐	☐	☐	☐	☐
13. Eğitimde yapılan çalışmaların sonuçlarına göre dersi işlemek zaman kaybıdır.	☐	☐	☐	☐	☐
14. Yapılan eğitim araştırmaları öğretimde karşılaştığım problemlere çözüm üretir.	☐	☐	☐	☐	☐
15. Yapılan eğitim araştırmalarının uygulanabilir olduğuna inanmıyorum.	☐	☐	☐	☐	☐
16. Eğitim araştırmaları öğretmenlik mesleğinin gelişimine katkı sağlar.	☐	☐	☐	☐	☐
17. Seminerlerde anlatılan, eğitim ile ilgili araştırma sonuçları fayda sağlar.	☐	☐	☐	☐	☐
18. Eğitim araştırmalarının okul ortamında uygulanabilirliği yoktur.	☐	☐	☐	☐	☐
19. Eğitim araştırmalarının sonuçlarına göre ders işlenmesi öğrencilerin başarılarını düşürür.	☐	☐	☐	☐	☐
20. Öğretim sürecinde konuya göre öğretim model, yöntem ve teknik seçiminde eğitim araştırma sonuçları benim için önemli bir yere sahiptir.	☐	☐	☐	☐	☐