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Developing a Mathematics Homework Evaluation Scale (MHES) for Secondary School Mathematics Teachers

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Abstract

This study aims to develop a valid and reliable scale that shows the secondary school mathematics teachers' evaluations of mathematics homework. A literature review was conducted, and a pool of 41 articles have been prepared for this purpose. Five expert academicians in the field of mathematics education were consulted for the content, construct, and appearance validity of the prepared items. According to the opinions of the field experts, the number of items was reduced from 41 to 38 and applied to 492 mathematics teachers in total. The answers of 20 mathematics teachers were removed from the scope of this study since the answers were either incomplete or coded incorrectly. Therefore, scale forms collected from 472 mathematics teachers were included in this study. This form data was split, Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) were done. The construct validity was analyzed via EFA. The scale is a five-factor scale of the five-point Likert scale, which explains the 64.643% of the total variance with 21 items according to EFA results. The reliability of the scale was tested with Cronbach's Alpha coefficient, and the coefficient was calculated as 0.737. The subscales of the scale are titled "Parent Relationship", "Motivation", "Control and Evaluation", "Time" and "Source Use" respectively. CFA was carried out for the scale, and it was concluded that the fit indices are either acceptable or perfect. As a result, a reliable and valid "Teacher Approaches for Mathematics Homework Scale" has been added to the literature.

Keywords: Mathematics Education, Homework, Scale Development, Mathematics Teachers.

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INTRODUCTION

Education is a multidimensional and comprehensive process in terms of place and time and continues throughout an individual's life sometimes inside and sometimes outside of school. (Beydogan & Sahin, 2000). Education does not only take place at school. The time that is outside of school hours should be planned effectively. Therefore, one of the extracurricular education techniques is homework. Learning activities, which are given by teachers to students either in the form of reading and writing, or problem-solving, and that are done either alone or with the help of the family, are called homework (Oguzkan, 1989; Turkoglu, Karakus, & Iflazoglu, 2007). In addition, homework was described as tasks given by teachers to students to be performed out of school hours. Homework is effective in creating better time management, problem-solving skills in real life and solving problems more independently (Cooper, 1989). Homework is also used for preparing students for exams by following the students' progress and evaluating them. Moreover, homework is used as a leveling evaluation as a supervised evaluation of final exams, or as grading homework and performance exams (Morgan & O'Reilly, 1999). Kumar (2006), highlights that homework has the potential to reveal the weak and strong aspects of the students for teachers. It has been stated that there is a relationship between the extra effort and time spent on homework by students and high motivation and responsibility; and less effort and time spent on homework by students and low motivation and responsibility (Flunger, Trautwein, Nagengast, Ludtke, Niggli, & Schnyder, 2017). The aim of homework should be identified correctly so that the homework will have a positive effect (Warton, 1997). Homework also contributes to the students building study habits and taking responsibility for their own learning as well as contributing to students' success (Cooper & Valentine, 2001). The indifference of children, which is the main cause of many problems experienced by students, teachers and parents, has been attributed to the lack of understanding of academic responsibility and the lack of awareness of doing homework (Warton, 2001).

Teachers and families have a crucial role in completing homework. Since homework is a process, the involvement of parents in this process enables them to share some of the responsibilities of the teacher and acquire information on the state and level of the student. The role of the parents within this process is to check their child's homework, encourage them about doing homework, provide the necessary equipment and a suitable environment and help while solving problems (Gumuseli, 2004). Therefore, the evaluation process is considered as important as assigning homework. Given the fact that homework is a control mechanism, control by the teachers also become prominent. If a given homework is not checked and evaluated, it has no educational value. Therefore, homework should be given according to the students' level and should be checked (Cooper, 1989). If a given homework is not checked and evaluated, it leads students to copy and to weasel. This negative situation, combined with the teacher's failure to review and evaluate the homework, causes the students not to do and hate the given homework (Aytuna, 1998). When students know that the homework is not checked and evaluated, they find the homework pointless and boring. Therefore, it is more appropriate not to do homework that will not be evaluated (Binbasıoglu, 1994a; Binbasıoglu, 1994b). Teachers play an essential role in determining the purpose of the homework, designing, and following up the implementation (Kaplan, 2018). Homework follow-up includes giving verbal or written feedback on the homework and discussing student responses in class (Cooper, 1989).

According to TIMSS 2011 implementation results for Turkish sampling, in the field of mathematics, the more homework is given, the less successful the students are (Arıkan, 2017). In retrospect, various results have been achieved from the studies regarding homework. While some studies concluded that homework enhances academic success, some concluded that homework does not improve academic success. In addition, there is an inverse correlation between the time allocated for homework and academic success, and there are studies showing that the least effect is seen in mathematics courses (Cooper, 1989). On the other hand, studies are showing that the homework frequency in mathematics courses have a positive effect on mathematical success (Trautwein, Koller, Schmitz, & Baumert, 2002). When the related literature in the field is analyzed, it is understood that currently, there is not a scale that can put forward the opinions of teachers, especially on homework given in secondary school mathematics courses. A limited number of studies have been found in our country on the relation between homework and especially mathematics courses. Referring to studies on homework assignment in Turkey, the studies focus on various branches such as elementary school teachers (Iflazoglu & Hizmetci, 2006), the primary school first stage (Ozer & Ocal, 2013), Turkish (Gedik & Orhan, 2013), Chemistry (Sarıgoz, 2011; Yucel, 2004), Science and Technology (Benli & Sarikaya, 2011; Aladag & Dogu, 2009).

The main reason for the lack of research in the mathematics field is the lack of a scaling tool on homework evaluation (Ozcan & Erktin, 2014). It is necessary to have valid and reliable scales developed to evaluate the teachers' views while evaluating. When the literature was analyzed in Turkey only two scaling studies on the homework given in mathematics courses were found. These studies are "Mathematics Homework Behavior Scale: Reliability and Validity Scale" (Ozcan & Erktin, 2014) and "A Project Evaluation Score Development Study Related to Mathematics Course" (Bal, 2012). Mathematics Homework Behavior Scale is a scaling study focused on students and parents. Mathematics course project evaluation score is developed for mathematics projects. However, one of the crucial shortcomings in this field is the lack of studies about the attitudes and behaviors on homework, the identification of the homework, checking and evaluation styles, strategies, methods of assigning homework, use of reference books, communication strategies with parents of the teachers, who are at the coalface and the main players rather than parents and students. As a result, this study aims to develop a Mathematics Homework Evaluation Scale (MHES) aimed at secondary school mathematics teachers to eliminate the shortcomings stated above.

METHOD

Research Model

A descriptive survey model was preferred since the data were collected from a large group consisting of 472 mathematics teachers, and a scale development study was conducted. The survey model is the preferred research model in studies that require extensive participation sampling (Cohen, Manion, & Morrison, 2007). Therefore, the study aims to develop a reliable and valid evaluation tool aimed at identifying the evaluation of secondary school mathematics teachers on homework.

Study Participants

It has been stated that in scale development studies, the number of the samplings should be at least five times the number of items in a scale to carry out a factor analysis (Bryman & Cramer, 1999; Tavsancıl, 2002). Since there are 38 items in the draft scale of the research, special attention was paid to keep the study sampling larger than 190. Accordingly, the study group of the research consists of 492 mathematics teachers working in all secondary schools of Elazıg and Malatya province. The scale form was applied in a meeting where all these mathematics teachers were together during the 2019-2020 academic year. Six mathematics teachers could not attend the meeting, so the form was applied to 492 mathematics teachers who were present. However, the answers given by 20 mathematics teachers were either lacking or incorrect; therefore, they were excluded from the study, and the remaining data regarding 472 scaling forms were analyzed. This form data was split, EFA and CFA were done.

Scale Development Process

This study aims to develop an evaluation scale aimed at identifying the teachers' homework evaluation. First, an item pool of 41 items was developed within this process. Accordingly, the construct and extent validity of the scale was tested. After the construct and extent validity test, the application phase started. Following the application phase, validity was calculated, and the scale was finalized in accordance with the CFA. Details regarding these phases can be found below.

1. Item pool phase: First, a literature scan on the topic was conducted. Since a scale that could measure the desired situation was not found in the literature, new and original scale items were started to be prepared. In total, 58 items that are suitable for sub-problems assessing different objectives were developed, but items that do not directly measure the objective and based on the advice of three linguist experts, the items that focus on the same concepts were deleted. As a result, an item pool of 41 items was developed.

2. Content validity determination: Referring to expert opinions is one of the methods frequently used in determining the content validity that expresses the quantitative and qualitative adequacy of the items used for the properties to be measured (Buyukozturk, 2007). Five expert academicians in the field of mathematics education were consulted for the content validity of the scale. The Lawshe method (1975) was preferred. Minimum 5, a maximum of 40 expert opinions is required for the Lawshe method. Each item's expert opinions are rated as "the item evaluates the targeted construct", "the item is related to the construct but unnecessary", "the item does not evaluate the targeted construct". For each item, the content validity ratio is calculated via the formula below;

$$CVR=\frac{Number\ of\ experts\ indicating\ essential}{Half\ of\ the\ total\ expert\ number}-1$$

After the expert opinion was taken, three questions with a minimum CVR value of less than 0.99 were removed from the scale, and draft scale form of five-point Likert type was prepared for 34 positive four negative total 38 items consisted of "I totally disagree (1)", "I disagree (2)", "I partially agree (3) "I agree" (4) "and" I totally agree "(5)". In addition, the relevant literature and MoNE (2018) curriculum were taken into consideration to ensure the content validity.

3. Application Phase: The draft scale form prepared by the researchers was first reproduced, and then it was aimed to make the conditions related to the application process suitable. The scale form was applied to the research sample in 2019-2020 academic year, after a meeting in which mathematics teachers were together. The sample forms were distributed to the mathematics teachers on a voluntary basis. All the teachers present in the meeting room agreed to participate in the research, voluntarily. General information on the scale was given, and mathematics teachers' questions were answered after the forms were handed out. There was not a time restraint in the application phase, and the application process took approximately 40 minutes. In addition, teachers' pen needs, if any, were met by researchers, and the application process was completed without any problems.

4. Determination of construct validity: In the research, the results were converted to z scores to obtain univariate normality, and z-values outside the ±3.29 ($p<0.001$) range were accepted as extreme values by Field (2009) and Tabachnick and Fidell (2013). This analysis was determined that there was no univariate extreme value in the data set and the EFA process was started. In order to determine the factor structure of the scale, firstly EFA was performed. EFA was carried out on the data obtained to determine the construct validity of the draft scale. EFA is an analysis technique that aims to group the items that measure the same construct or quality among the items determined by the researchers and to explain these meaningful groups (factors) (Bryman & Cramer, 1999; Buyukozturk, 2007; Karagoz & Kosterelioglu, 2008). In this context, the study tried to find out the factors reflected by the items in the draft scale using EFA. Varimax rotation method, analysis results of principal components, eigenvalue line chart, common factor variance values of the items, Bartlett Sphericity test and Kaiser–Meyer-Olkin (KMO) were preferred in this process.

5. Reliability Identification: Whether the scale is reliable is one of the main problems related to the scale used in educational research (Reid, 2006). The first requirement of a scale is to be reliable. Cronbach-Alpha's reliability coefficient was calculated to determine the reliability of the scale due to the developed scale being the five-point Likert scale. Cronbach-Alpha reliability coefficient value is a measure of the consistency between the test scores of the scale. If this value is over 0.70, it is considered sufficient for test reliability (Buyukozturk, 2007).

6. CFA: CFA studies were included in the last phase of the research. There are different goodness of fit indexes and statistical functions of these indices used in evaluating model fit. According to Joreskog and Sorbom (2001) Root Mean Square Error of Approximation (RMSEA), Square Root Mean Score Residual (SRMSR), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), Normed Fit Index (NFI), Comparative of Fit Index (CFI), Relative of Fit Index (RFI) are the most commonly used among the suggested indices. For this reason, each one of these indices were calculated while carrying out CFA.

7. Finalizing the Scale: The items that should be removed from the scale were removed, factor constructs were determined, reliability controls were carried out among with content and construct validity of the scale, and the five-factor scale consisting of 21 items was finalized according to the framework findings obtained in the study (See Appendix 1).

Data Analysis

SPSS package software program was used for the analysis of the data. In the data analysis process, firstly, the suitability of the factor analysis was examined. Bartlett test and KMO test that checks the sampling adequacy was used in this context. Within a research, if KMO value is 1.00≤KMO≤0.9, then it is perfect, if the value is 0.90<KMO≤0.80, then it is good; if the value is 0.80<KMO≤0.70, then it is medium; if the value is 0.70<KMO≤0.60, then it is weak; and if the value is 0.60<KMO, then it is bad (Buyukozturk, 2007). Field (2009) stated that the lower limit for KMO value should be 0.50, data sets cannot be factored if KMO≤0.50. In addition, the Bartlett globality test is another test used for factor analysis. Factor analysis can be carried out if the Bartlett test is statistically significant. Bartlett test is a chi-squared statistic and the fact that the chi-squared value obtained by the Bartlett test results is less than 0.05 means that the data show a multivariate normal distribution. In this case, it is accepted that the data are suitable for factor analysis (Tatlıdil, 2002). Varimax rotation method was used during the factor analysis process in the study. It is stated that it is a good criterion for the selection in factor analysis made with this technique if the load value of the items in the factor where the items are located is 0.45 or higher so that the items that do not measure the same structure will be sorted out (Buyukozturk, 2007). In addition, CFA was carried out to verify the factor construct of the scale. CFA, in addition to the EFA, is used to test the verification of a factor construct that was priory determined by the researcher. It is assumed that more than one implicit variable, thought to be constructed by scale items, is explained by another implicit variable, and the suitability of this assumption is tested in such studies. (Simsek, 2006).

FINDINGS

While obtaining data in the study, the EFA was conducted in three phases as evaluating the suitability of the data for factor analysis, evaluating the construct validity of the draft scale and evaluating the reliability of the draft scale. In addition, CFA was also carried out. First, Bartlett test values and CVR values were calculated to see whether the data are suitable for factor analysis. CVR and Bartlett Test results of the scale were given in Table 1.

Table 1. Evaluating the suitability of the data for factor analysis

KMO	0,748
Bartlett Test Results	
Chi-squared value (x2)	2966,698
Degree of freedom (sd)	703
Statistical value (p)	0,000

When Table 1 is examined, it can be seen that the KMO value for the draft scale was calculated as 0.748. The data showed significant difference (x^2=2966,698; P<0,05) according to

Bartlett Test results. KMO value must be calculated higher than 0.50 and Bartlett Test has to result as significant to carry out factor analysis (Buyukozturk, 2007). Carrying out factor analysis is thought as suitable according to the results obtained. In factor analysis, firstly, the skewness and sharpness coefficients of the items, the item-total score correlations, the correlation matrix values of the items, and factor loadings were examined, and overlapping items that are loaded on more than one factor (Items 4, 11, 14, 16, 17, 19, 22, 24, 27, 30, 32, 33, 34, 35, 36, 37, 38) were removed from the scale. The varimax rotation method and principal components factor extraction method were used for this process. First, the number of total variances was determined to identify the construct validity of the scale. Kalaycı (2010) states that factor analysis can be carried out again by removing the items that have a variance value below 0.50, from the analysis. On the other hand, Pallant (2001) states that the item correlation above 0.40 is strong and should not be removed from the analysis (Buyukozturk, 2007). For this reason, it was paid attention to the fact that the factor load values to be above 0.50 for each item to show one factor, and items that are below 0.50 were removed from the scale. Since the load values were multi-dimensional, they were examined through Rotated Component Matrix. In addition, by determining how much of the variance was explained by the item via the Communalities table, the items that were below 0.50 were removed from the scale. It was seen that the load values of 21 items change between 0.535 and 0.860. It was also seen that the remaining twenty-one items, after the factor analysis, were grouped under five factors. The explained variance values regarding the scale were given in Table 2.

Table 2. Explained Variance Values

Determined Factor	Eigenvalue	Variance Value explained by the Factor	
		Variance %	Cumulative Variance %
1	3,581	17,054	17,054
2	2,980	14,193	31,247
3	2,778	13,231	44,478
4	2,169	10,330	54,808
5	2,065	9,835	64,643

As it is seen in table 2, five factors explain 64,643% of the total variance. The variance ratio explained by the factors are at an acceptable level (Buyukozturk, 2007). After this process, to identify the components of the scale; identifying the number of factors, identifying factor variables, and naming the factors phases were carried out, respectively. Two criteria were used to determine the number of factors that can most effectively show the relationship between the items. The first one of these criteria is to evaluate the eigenvalue and a line chart (Buyukozturk, 2007; Karagoz & Kosterelioglu, 2008). The factor point with high acceleration rapid declines in the data analysis chart gives the number of factors (Buyukozturk, 2007). The line chart obtained for the scale consisting of 21 items can be seen in Figure 1.

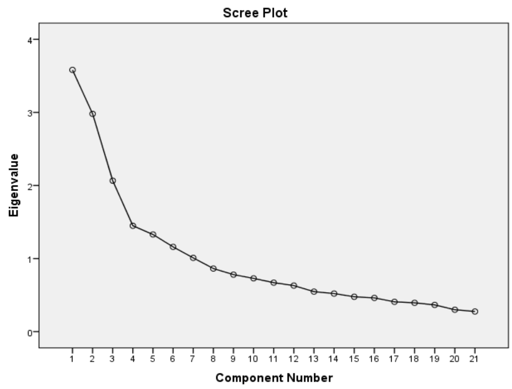

Figure 1. Line Chart

When this chart is examined, it can be seen that there are accelerated declines between the first six factors and there are routine declines between the seventh and the subsequent factors. Therefore, it was decided that the scale to have five factors since a horizontal course was identified in the sixth and the subsequent factors. In addition, one of the most frequently used criteria to determine factor variables the varimax rotation method was used. The rotated component matrix was examined for this, and obtained findings are presented in Table 3.

Table 3. Rotated Component Matrix

Item	Component				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Item 9	,814				
Item 6	,772				
Item 8	,652				
Item 31	,648				
Item 2		,860			
Item 1		,759			
Item 3		,725			
Item 5		,696			
Item 25			,817		
Item 23			,612		
Item 26			,570		
Item 18			,535		
Item 15				,834	
Item 21				,695	
Item 20				,687	
Item 7				,858	
Item 10				,764	
Item 29					,807
Item 28					,787
Item 12					,798
Item 13					,704

Considering the items that they comprise of, the five factors obtained after the rotated component matrix was created, were named as follows:

Factor 1: Parent Relationship

Factor 2: Motivation

Factor 3: Control and Evaluation

Factor 4: Time

Factor 5: Resource Use

There are different ways to identify the reliability of a scale. One of them is the Cronbach-Alpha value, which is the internal consistency coefficient. The internal consistency coefficient shows the compatibility between the items that make up the scale. It is expected that the Cronbach-Alpha coefficient of a scale to be over 0.70 (De-Vellis, 2012). In addition, the values that are over 0.80 are accepted as highly reliable (Kalaycı, 2010). The Cronbach-Alpha value of the developed draft scale consisting of 38 items was calculated as 0.842. Also, the Cronbach-Alpha reliability coefficient of the final scale consisting of 21 items was calculated as 0.737 as a result of the analysis. When the reliability coefficients of sub-dimensions of the scale are examined, it can be seen that the sub-dimensions of Parent Relationship (α=0.750), Motivation (α=0.793), Homework Check and Evaluation (α=0.710), Time (α=0,734), and Use of Reference Books (α=0,720) are reliable. Lastly, the factor construct of the developed scale was tested with CFA. Findings regarding CFA results are presented in Table 4.

Table 4. CFA results of the scale

	Good Fit	Acceptable Fit	Scale Value
RMSEA	0,00<RMSEA<0,05	0,05<RMSEA<0,10	0,035
SRMSR	0,00<SRMSR<0,05	0,05<SRMSR<0,10	0,044
GFI	0,95<GFI<1,00	0,90<GFI<0,95	0,910
AGFI	0,90<AGFI<1,00	0,85<AGFI<0,90	0,870
NFI	0,95<NFI<1,00	0,90<NFI<0,95	0,960
CFI	0,95<CFI<1,00	0,90<CFI<0,95	0,920
RFI	0,90<RFI<1,00	0,85<RFI<0,90	0,880

x^2=231,710, df=235, x^2/df=0,986, p=0,000

When the data in Table 4 is examined, it can be seen that the chi-squared statistic was calculated as x^2=231,710, P<0,01. RMSEA equals to 0.035, SRMSR equals to 0.044, GFI equals to 0.910, AGFI equals to 0.870, NFI equals to 0.960, CFI equals to 0.920, and RFI equals to 0.880. When these values are examined, it can be seen that the fit indices show either a good fit or an acceptable fit. Therefore, it is possible to say that the five-factor scale construct is verified.

RESULTS, DISCUSSION, AND RECOMMENDATIONS

This study aims to develop a valid and reliable scale that shows the secondary school mathematics teachers' evaluations of mathematics homework. A descriptive survey model was used due to the scale development study in the research. The study participants are all the 492 mathematics teachers in secondary schools within Elazıg and Malatya province. The scale form was applied in a meeting where all these mathematics teachers were together during the 2019-2020 academic year seminar semester. Six mathematics teachers could not attend the meeting, and the form was applied to 492 mathematics teachers who were present. However, the answers in 20 mathematics teachers' forms were either lacking or incorrect; therefore, they were excluded from the study and the remaining data regarding 472 scaling forms were analyzed. This form data was split, EFA and CFA were done.

First, an item pool consisting of 41 items was developed within the scale development process. Accordingly, the construct and extent validity of the scale was tested. After testing the validity of the construct and the extent, the application phase started. Validity calculations were done after the application, and the scale was finalized in accordance with the CFA. First, the factor analysis suitability of the scale was assessed in the data analysis process. In this regard, KMO and Bartlett Test that test the adequacy of the sampling were used. Varimax rotation method was used in the factor analysis process. While obtaining data in the study the EFA was conducted in three phases as evaluating the suitability of the data for factor analysis, evaluating the construct validity of the draft scale and evaluating the reliability of the draft scale. In addition, CFA was also carried out. First, the KMO coefficient and Bartlett's Test values were calculated to find out whether the data are suitable for factor analysis. It was determined that the KMO value is enough for the draft scale. The data showed a significant difference according to the Bartlett Test results. KMO value has to be calculated higher than 0.50, and Bartlett Test has to result as significant to carry out factor analysis (Buyukozturk, 2007). Carrying out factor analysis is thought as suitable according to the results obtained.

In factor analysis, firstly, the skewness and sharpness coefficients of the items, the item-total score correlations, the correlation matrix values of the items, and factor loadings were examined, and overlapping items that are loaded on more than one factor were removed from the scale. The varimax rotation method and principal components factor extraction method were used for this process. The total variance in the scale was identified to determine the construct validity of the scale. Kalaycı (2010) states that factor analysis can be carried out again by removing the items that have a variance value below 0.50, from the analysis. On the other hand, Pallant (2001) states that the item correlation above 0.40 is strong and should not be removed from the analysis (Buyukozturk, 2007). For this reason, it was paid attention to the fact that the factor load values to be above 0.50 for each item to show one factor, and items that are below 0.50 were removed from the scale. Since the load values were multi-dimensional, they were examined through Rotated Component Matrix. In addition, by determining how much of the variance was explained by the item via the Communalities table, the items that were below 0.50 were removed from the scale. It was seen that the remaining twenty-one items, after the factor analysis, were grouped under five factors and the variance ratio explained by the factors are acceptable (Buyukozturk, 2007). After this process, to identify the components of the scale; identifying the number of factors, identifying factor variables, and naming the factors phases were carried out, respectively.

Two criteria were used to determine the number of factors that can most effectively show the relationship between the items. The first one of these criteria is eigenvalue and evaluation of a line chart (Buyukozturk, 2007; Karagoz & Kosterelioglu, 2008). The factor point with high acceleration rapid declines in the data analysis chart gives the number of factors (Buyukozturk, 2007). When the factor chart of the scale was evaluated, it can be seen that there are accelerated declines between the first six factors and there are routine declines between the seventh and the subsequent factors. Therefore, it was decided the scale to have five factors since a horizontal course was identified in the sixth and the subsequent factors. In addition, one of the most frequently used criteria to determine factor variables the varimax rotation method was used. After the Rotated components matrix was created, considering the items that they consist of, the obtained five factors were named as “Parent Relationship”, “Motivation”, “Control and Evaluation”, “Time”, and “Resource Use”. When the Cronbach Alpha reliability coefficient of the draft and final scales are evaluated, it can be seen that the reliability value is enough. In addition, the sub-dimensions of the final scale are also reliable. Lastly, the factor construct of the developed scale was tested with CFA. It can be seen that fit indexes are either acceptable or show a good fit when the CFA value results are evaluated. Therefore, it can be said that the scale construct of five factors is confirmed. Only two scaling studies on the homework given in mathematics courses were found within the country when the literature was analyzed. In other words, a scale development study is needed in this field. These studies are “Mathematics Homework Behavior Scale: Reliability and Validity Scale” (Ozcan & Erktin, 2014) and “A Project Evaluation Score Development Study Related to Mathematics Course” (Bal, 2012). Mathematics homework behavior scale is a scaling study aimed at students and parents. Mathematics course project evaluation score by Bal (2012) is developed for mathematics projects. The following recommendations were made within the framework of the findings obtained in the study, to the researchers who wish to study in this field in the future:

1. Secondary school teachers’ mathematics homework evaluations can be analyzed through different sample groups with the developed MHES.

2. Homework evaluation scales can be developed for primary or secondary school mathematics teachers using the developed MHES. Thus, homework evaluations of these sample groups can be analyzed.

3. Pre-service mathematics teachers' homework evaluations can be researched with the developed MHES.

4. New homework evaluation scales for different subject matter teachers can be developed using the items in the developed MHES. Thus, homework evaluations of these sample groups can be analyzed.

5. Using this scale, "Parent Relationship", "Motivation", "Control and Evaluation", "Time" and "Source Use" can be evaluated with the studies to be done on teachers.

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Appendix 1. Final MHES Scale

This scale study was prepared to contribute to mathematics education with your opinions. The results will not be shared by third parties and will be kept confidential. It is important for us that you answer the questions sincerely so that we can contribute to science. Thank you for your answers.

Item		I totally disagree	I disagree	I partially agree	I agree	I totally agree
1.	I give homework by taking into account when parents say, “Please give much homework.”.	①	②	③	④	⑤
2.	I enable parents to pay attention to their children and understand a teacher’s position at school by giving much homework.	①	②	③	④	⑤
3.	I want the students to spend time with their families and be happy together by giving many homework.	①	②	③	④	⑤
4.	I have the parents to follow-up on the homework.	①	②	③	④	⑤
5.	I change the way I give homework based on each subject.	①	②	③	④	⑤
6.	I include different practices to make the homework appeal more to the students.	①	②	③	④	⑤
7.	I motivate the students to do homework.	①	②	③	④	⑤
8.	I provide reinforcements aimed at enhancing the students’ homework performance and productivity.	①	②	③	④	⑤
9.	I solve the questions that the students have answered incorrectly on the board after I check the homework.	①	②	③	④	⑤
10.	I evaluate and mark students after each homework.	①	②	③	④	⑤
11.	I use the participation in the course activity section in the e-school website to mark homework.	①	②	③	④	⑤
12.	I evaluate homework by a graded score key.	①	②	③	④	⑤
13.	There is not enough time to check student homework.	①	②	③	④	⑤
14.	I have enough time to check the homework.	①	②	③	④	⑤
15.		①	②	③	④	⑤
16.	Giving too much homework indeed limits the communication time between the parents and the children.	①	②	③	④	⑤
17.	I believe that homework limits the time that will be spent on social activities within the family.	①	②	③	④	⑤
18.	The course book is not enough to give homework.	①	②	③	④	⑤
19.	I think that it is beneficial to have students buy reference books to help them while doing homework.	①	②	③	④	⑤
20.	I usually give homeworks that require individual use of references.	①	②	③	④	⑤
21.	I let the student choose the reference for homework.	①	②	③	④	⑤