



INVESTIGATION OF PARENTS' EXPECTATIONS FROM MATHEMATICS EDUCATION IN TURKEY

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Abstract: In this study, the expectations of middle school students' parents regarding to "conceptual understanding and active student participation" "positive attitude and behavior attitude" and "authority and rule-oriented teaching" were examined. A valid and reliable three-factor instrument developed by the Aytekin, Baltacı, Altunkaya, Kıymaz and Yıldız (2016) was used in collecting parents' expectations. 749 parents participated in the study. It was found that the variables of parental gender, parental age range, and monthly income of the parents, level of loving mathematics and level of helping the child have no significant effect on the expectations. The university graduates had less authority and rule-oriented teaching expectation than the remaining parents. Besides, it is seen that the 5th grade parents had higher expectations of conceptual understanding and active participation and positive attitude and behavior than the other parents. It was determined that parents with very good past math achievement had higher expectations for "conceptual understanding and active participation" and "positive attitude and behavior". On the other hand, it is clear that the mathematical success perceived by the child's parents will have an effect on the behavior of the parents. A student who believes in learning mathematics through passive listening and memorizing rules can be more easily directed, if parent has a high expectation of active participation and conceptual learning. For that reason, educators should give importance to the family dimension that occurs outside the classroom.

Keywords: parents' expectation, mathematics education, conceptual understanding and active student participation, positive attitude and behavior, authority and rule-oriented teaching

1. Introduction

The importance of educating is increasing in a rapidly developing and changing world. For this reason, the education processes need to be developed today and tomorrow in order to train more qualified new generations. Education should not be seen only as a process that is maintained in a classroom environment between a teacher and students. Because every individual starts his/her education with the family and some achievements can be gained in this process. It cannot be said that the families alone are sufficient in the education of the students. But it can be said that it is one of the most influential environments factors outside the school. Booth and Dunn (1996) observed that the academic achievement of the students' whose family provided support and actively pursued their education increased and their emotional development developed faster than the students whose family did not provide such support. Similarly, Nyabuto and Njoroge (2014) observed that the academic achievement of students has significantly increased in a teaching environment, which is actively supported by their families. Henderson and Berla (2004) examined the students whose parents actively involved in their education and found that these students were more likely to attend to a higher education, had higher school grades, and more rapidly developed socially. According to Ateş and Durmaz (2016), family support increased students' self-esteem and escalated their academic achievement.

Eccles and Harold (1993) classified the forms of participation of parents in education under five categories. In this classification, the first level parents were only the audience, and the fifth level

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parents, who are the highest level, were constantly communicating with teachers and school administration, spending extra effort for the development of their children, following their children's daily efforts and their progresses. Hence, it can be concluded that the forms of participation of the parents can be different, and some family behaviors are more effective than the others. Moreover, Cai (2003) noted that the forms of parents' contribution to their children's education vary from country to country. Furthermore, actively participating parents have had higher expectations than the nonparticipating parents. It should be taken into account that parents' expectations from education also affect their involvement. In this context, the families that control and support the school life increases participation of their children in school activities (Astone & McLahanan, 1991; Epstein, 1987; Stevenson & Baker, 1987).

Davies (1991) stated that parents may want to be informed about helping their children to increase their success. For this reason, the parents are happy when their expectations are met. Parents' expectations in general are a better education, more attention to the child, more contemporary education and a stronger communication with the parent (Açıklalın, 1989). Indeed, it is stated in studies that the expectation of parents strongly influences the desires and expectations of students for subsequent education periods (Chen & Fan, 2001; Kutluca & Aydın, 2008; Kotaman, 2008).

As stated by Seginer (1983), educational expectations of parents are a structure affecting students' academic achievement. Chen and Fan (2001) found that a strong relationship exists between the academic expectations of their parents and their academic achievement in their work. Christenson, Rounds and Gorney (1992) in their research on the influence of family on achievement, they have stated that family expectation is one of the most important factors. According to Cai (2003), in order to obtain maximum efficiency from the parents, it is necessary to seek answers to the questions such as how they should be included in the education. A similar suggestion was made by Jeynes (2005) who stated that the studies on the role of the family in education should be done in more detail.

In mathematics education, the involvement of parents in education affects students' success (Thomson, Lokan, Lamb & Ainley, 2003). For this reason, it is necessary for parents to have a correct perspective towards mathematics lesson and to be conscious about this subject. For example, Pezdek, Tiffany, Paul, and Reno (2002) emphasized that students' achievement levels are enhanced if their parents' awareness is increased and they have an accurate view of teaching mathematics. Hatch (1998), Cai (2003), and Schickedanz (2003) reported that direct support of families for mathematics education enhances students' mathematical success. They found that the students whose families followed their progress and motivated them for learning were more successful in mathematics lessons than the students whose families directly assisted them for learning. Hence, it will be more appropriate to determine the tendencies of parents first and then to plan accordingly in order to educate these parents about mathematics education. Therefore, in order to ensure the effectiveness of family support, their expectations from mathematics education need to be determined.

When the studies are examined, there are various studies examining parents with various variables such as socio-economic level, education level of the family, level of participation in mathematics education, level of interest in the mathematics of the family (Kutluca & Aydın, 2010; Phillips, 1998; Şahin & Özbey, 2009). Despite the fact that there are many theories describing the characteristics of the students in the literature, there is a need for more research on the parents who have a big role in their education. In this study, it is aimed to investigate the parents' expectation from mathematics education and comparing the emerging situations aims to provide useful information to mathematics education.

Beginning with the design of the study, it was thought that the parents could expect the mathematics teacher to teach meaningful mathematics to the children or teach the rules and procedures to them, even if not meaningful. These two opposing expectation types are called meaningful teaching and teaching as rules. Another factor considered at the same stage is that a parent may expect a mathematics lesson in which students' active participation, while another is may expect teacher-centered teaching in which the teacher is an authority. In addition to these expectations, another type of expectation is related to the affective characteristics that are important in teaching mathematics. These are named as expectation of positive attitudes and behaviors. These positive attitudes and

behaviors are considered to be very important in the teaching of mathematics such as responsible, attentive, patient and intelligent decision-making. As a result of the exploratory and confirmatory factor analysis of the development stage of the scale, related items of meaningful teaching and student-centered teaching were combined. The expectation of "conceptual understanding and active student participation" was named of this factor of the scale. Similarly, expectations of teacher-centered instruction and rule-based instruction have been combined and have been named as "expectation of authority and rule-based teaching". The other type of expectation is called the expectation of positive attitude and behavior. Researchers have begun to study that these expectations may be effective in teaching mathematics in behaviors to teachers, students, or school management. However, examining different expectations of the parents can affect teacher and student behavior, or mathematics education in general, can be a matter of further work. In this study, it was investigated how the expectations of the parents differed. Because of these reasons, in this study, we investigated whether the expectations of parents from mathematics education showed statistically significant differences according to parental type (i.e., mother, father, other), parental age level, parental graduation level, family monthly income level, child's class, parent mathematics success, enjoyment from mathematics, level of assisting their children, and children's success of mathematics.

2. Method

The following section covers the research model, design of the research, research group, data collection, and data analysis.

2.1. The Study Sample

The study was carried out in Kirsehir province of Turkey. This province has some differences compared to other provinces of country in terms of education. For instance, the average national test scores of the students in this province is generally within the first three among the 81 provinces. There are other reasons collections of data in this region. First of all, the people in the region are interested in educational studies. It is thought that they will give more reliable answers to the questionnaires. Secondly, there is a competition-oriented structure in education. Because of this competitive environment, the vast majority of families in the city center are taking private lessons for their children in mathematics. Approximately 120 thousand people live in the city. About 44.000 of them are pre-school, primary school and high school students. There are about 4000 teachers. It is stated that the number of students per teacher is 10 and the number of students per classroom is 18. There is also a state university where more than 20.000 active students. The oldest faculty of this university is the education faculty. Half of the teachers in the city are said to have graduated from the education faculty in the city. For this reason, the sampling of the study seems to be crucial in terms of providing comparability between regions with similar characteristics in the world.

The data of the study were collected from two middle schools in the city center. These schools were among the top 10 schools in the city center, both in terms of number of students and high school placement success. For this reason, the students and parents who participated in the study had high expectations from mathematics education unlike the other regions of the country.

Table 1. *The Distribution of Parents by Parental Types*

Parental Type	Number of Person (N)	Percent (%)
Mother	278	37.11
Father	448	59.81
Other	23	3.07
Total	749	100

A total of 749 parents participated in this study in which 448 of these parents were father, 278 of them were mother, and 23 were coded as other (grandfather, grandmother, grandmother, still, aunt, sister, brother etc.) (Table 1).

Table 2. *The distribution of parents according to their educational status*

Educational Status	Number of Person (N)	Percent (%)
Non-trained	9	1.2
Primary school	190	25.4
Middle School	176	23.5
High school	259	34.6
University	115	15.4
Total	749	100

When the education levels of parents were examined, it is seen that nine of them did not attend to a school, 190 of them were primary school graduates, 176 of them were middle school graduates, 259 of them were high school graduates, and 115 of them were university graduates (Table 2).

Table 3. *Distribution of Parents By Age Ranges*

Age Range	Number of Person (N)	Percent (%)
21-30	74	9.9
31-40	449	59.9
41-50	193	25.8
51 years and over	22	2.9
Total	738	98.5

Table 3 showed that among the 749 parents, 74 of them were between the ages of 21-30, 449 of them were between the ages of 31-40, 193 were between the ages of 41-50, and 22 were "51 or over". In this regard, it is seen that approximately 60% of the parents who participated in the study were between 31-40 years of age. Eleven parents did not provide information about their ages, which constituted 1.5% of all the parents.

2. 2. The Data Collection Tool

The data of the study were collected using the "Mathematics Education Parent Expectation Scale" developed by Aytekin, Baltaci, Altunkaya, Kiyamaz and Yildiz (2016). Structural validity of the scale was examined by means of the exploratory and confirmatory factor analysis. Aytekin, et al. (2016) obtained the data from 321 middle school students' parents. Based on the collected data, Kaiser Mayer Olkin (KMO) was calculated as 0.870, and Barlett χ^2 value calculated as 2147. When the eigenvalues of the scale were examined, there were three components that yielded eigenvalues greater than 1. Hence, there were three perpendicular fractures in the line graph. The eigenvalue of the first factor was 5.367, the eigenvalue of the second factor was 2.469, and the eigenvalue of the third factor was 1.514. Therefore, they concluded that item groups with eigenvalues greater than 1 can be taken as different factors. The variances explained by these factors were calculated as 35%, 16% and 10%, respectively.

Evaluating the variances explained by the factors, eigenvalues, and line graph together, they concluded that the scale consists of three distinct factors. As a result of the confirmatory factor analysis, the existence of three sub-dimensions constituting the scale structure has been verified. These factors were; "Conceptual Understanding and Active Student Expectations (first 5 items)", "Positive Attitude and Behavior Expectation (6th, 7th, 8th, 9th and 10th items)", "Authority and Rule-Oriented Teaching Expectation (last 5 items)". The factor loadings of the items belonging to these subscales were between 0.875-0.680 for the "Conceptual Understanding and Active Student Expectations", between 0.945-0.683 for the "Positive Attitude and Behavior Expectation," and between 0,788-0,544 for the "Authority and Rule-Oriented Teaching Expectation." The fitting index values for the three-dimensional the "Parent Expectation from Mathematics Education Scale" were provided as follows: CMMI / DF = 2.526, GFI = 0.924, AGFI = 0.888, CFI = 0.940, NFI = 0.906, NNFI (TLI) = 0.923, IFI = 0.941, RMSEA = 0.069, PGFI = 0.631, and PNFI = 0.770. Corrected item total correlation coefficients were found to be varying between 0.377 and 0.630. Cronbach alpha internal consistency reliability coefficients were calculated as 0.832, 0.886, and 0.787 for the three subscales, respectively.

2. 3. The Data Collection Process

The statutory permits were obtained from the Provincial National Education Directorates before the data collection phase of the study. In addition, the parental expectation survey was examined by a committee formed at the Institutional Review Board, which is affiliated with the Directorate of National Education. After obtaining the permission on the survey, two researchers went to the determined schools to introduce the study to the school administrations.

Before collecting the parents' responses to understand their perspectives on mathematics, we conducted interviews with mathematics teachers of the selected classes. In these interviews, mathematics teachers in middle schools, we determined that the perspectives of the parents varied in the context of the dependent variables in this study. According to these parents, the children's school grades and national examination scores were the most important criteria for success in mathematics. Besides, in this group of parents, the impression that children should be forced to control the authority on their success in mathematics has also been obtained from the interviews with teachers.

With the support of the school administrations, the survey was given to the parents. A copy of the document indicating that the legal permissions have been obtained is attached on the back page of the survey. In the first page of the survey, the information about the purpose of the study was presented.

2. 4. Analysis of the Data

Data from the study were analyzed using the SPSS 18.00 package program. First, statistically significant independent variables were determined with Manova test. Secondly, for the meaningful independent variables, Anova test was also performed. Benferroni test was used for multiple comparisons. The Bonferroni test is a widely used multiple-comparison test, and is preferred because it does not require the "equal number of samples" principle to compare different groups (Miller, 1969). Conducting a one-way analysis of covariance (ANCOVA) analysis, the descriptive statistics such as mean, standard deviation, standard error, confidence interval, maximum and minimum values, percentage and frequency, and inferential statistics were provided.

3. Findings

Parents' expectation from mathematics education were analyzed according to independent variables. The results are given in Table 4.

Table 4. Results of multivariate analysis of variance according to some variables of parents expectations

Multivariate Tests						
Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Wilks' Lambda	.229	709.869b	3.000	634.000	.000
Parents Type (Mother, Father)	Wilks' Lambda	.981	2.017b	6.000	1268.000	.061
Parental education level	Wilks' Lambda	.936	3.542	12.000	1677.698	.000
Parent Age Range	Wilks' Lambda	.985	1.077	9.000	1543.140	.377
Monthly Income Level of Family	Wilks' Lambda	.985	.625	15.000	1750.596	.857
Child's Class	Wilks' Lambda	.962	2.740	9.000	1543.140	.004
Parent Mathematics Success	Wilks' Lambda	.968	2.321	9.000	1543.140	.014
Level of enjoying mathematics	Wilks' Lambda	.982	1.257	9.000	1543.140	.256
The level of assisting child	Wilks' Lambda	.974	1.850	9.000	1543.140	.055
Child's Perception of Math Achievement	Wilks' Lambda	.970	2.195	9.000	1543.140	.020

a. Design: Intercept + Parents Type (Mother, Father) + Parental education level + Parent Age Range + Monthly Income Level of Family + Child's Class + Parent Mathematics Success + Level of enjoying mathematics + The level of assisting child + Child's Perception of Math Achievement

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

When the results of multivariate analysis of variance according to the independent variables mentioned in the study are examined, it is seen that the common effect is statistically significant [Wilks Lambda (Λ)= .229, $F(3,634)= 709.86$, $p<.05$].

When looking at the results of independent variables; Parental education level [Wilks Lambda (Λ)= .936, $F(12,1677)= 3.542$, $p<.05$], Child's Class Level [Wilks Lambda (Λ)= .962, $F(9,1543)= 2.740$, $p<.05$], Child's Perception of Math Achievement [Wilks Lambda (Λ)= .970, $F(9,1543)= 2.195$, $p<.05$] and parents their own past mathematics success [Wilks Lambda (Λ)= .968, $F(9,1543)= 2.321$, $p<.05$] are statistically significant. The analysis results for the sub-dimensions of the expectation scale are shown in Table 5.

Table 5. Tests of between subjects effects on parents' perspectives according to independent variables

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Conceptual Understanding and Active Student Expectations	742.449a	29	25.602	2.433	.000
	Positive Attitude and Behavior Expectation	740.081b	29	25.520	1.814	.006
	Authority and Rule-Oriented Teaching Expectation	2447.363c	29	84.392	3.626	.000
Intercept	Conceptual Understanding and Active Student Expectations	20058.885	1	20058.885	1906.171	.000
	Positive Attitude and Behavior Expectation	19545.784	1	19545.784	1389.206	.000
	Authority and Rule-Oriented Teaching Expectation	13638.304	1	13638.304	585.987	.000
Parents Type (Mother, Father)	Conceptual Understanding and Active Student Expectations	50.834	2	25.417	2.415	.090
	Positive Attitude and Behavior Expectation	42.920	2	21.460	1.525	.218
	Authority and Rule-Oriented Teaching Expectation	66.340	2	33.170	1.425	.241
Parental education level	Conceptual Understanding and Active Student Expectations	55.052	4	13.763	1.308	.266
	Positive Attitude and Behavior Expectation	48.507	4	12.127	.862	.486
	Authority and Rule-Oriented Teaching Expectation	667.068	4	166.767	7.165	.000
Parent Age Range	Conceptual Understanding and Active Student Expectations	31.230	3	10.410	.989	.397
	Positive Attitude and Behavior Expectation	57.909	3	19.303	1.372	.250
	Authority and Rule-Oriented Teaching Expectation	50.503	3	16.834	.723	.538
Monthly Income Level of Family	Conceptual Understanding and Active Student Expectations	17.285	5	3.457	.329	.896
	Positive Attitude and Behavior Expectation	46.596	5	9.319	.662	.652
	Authority and Rule-Oriented Teaching Expectation	86.673	5	17.335	.745	.590
Child's Class	Conceptual Understanding and Active Student Expectations	139.328	3	46.443	4.413	.004
	Positive Attitude and Behavior Expectation	164.084	3	54.695	3.887	.009
	Authority and Rule-Oriented Teaching Expectation	181.862	3	60.621	2.605	.051
Parent Mathematics	Conceptual Understanding and Active Student Expectations	116.570	3	38.857	3.692	.012

Success	Positive Attitude and Behavior Expectation	111.211	3	37.070	2.635	.049
	Authority and Rule-Oriented Teaching Expectation	168.015	3	56.005	2.406	.066
Level of enjoying mathematics	Conceptual Understanding and Active Student Expectations	48.097	3	16.032	1.524	.207
	Positive Attitude and Behavior Expectation	35.121	3	11.707	.832	.477
	Authority and Rule-Oriented Teaching Expectation	151.483	3	50.494	2.170	.090
The level of assisting child	Conceptual Understanding and Active Student Expectations	47.711	3	15.904	1.511	.210
	Positive Attitude and Behavior Expectation	29.433	3	9.811	.697	.554
	Authority and Rule-Oriented Teaching Expectation	183.512	3	61.171	2.628	.059
Child's Perception of his/her own Math Achievement	Conceptual Understanding and Active Student Expectations	127.776	3	42.592	4.047	.007
	Positive Attitude and Behavior Expectation	205.244	3	68.415	4.863	.002
	Authority and Rule-Oriented Teaching Expectation	61.969	3	20.656	.888	.447
Error	Conceptual Understanding and Active Student Expectations	6692.711	636	10.523		
	Positive Attitude and Behavior Expectation	8948.359	636	14.070		
	Authority and Rule-Oriented Teaching Expectation	14802.302	636	23.274		
Total	Conceptual Understanding and Active Student Expectations	305737.000	666			
	Positive Attitude and Behavior Expectation	319787.000	666			
	Authority and Rule-Oriented Teaching Expectation	238431.000	666			
Corrected Total	Conceptual Understanding and Active Student Expectations	7435.161	665			
	Positive Attitude and Behavior Expectation	9688.440	665			
	Authority and Rule-Oriented Teaching Expectation	17249.665	665			

a. R Squared = .100 (Adjusted R Squared = .059)

b. R Squared = .076 (Adjusted R Squared = .034)

c. R Squared = .142 (Adjusted R Squared = .103)

When the table is examined, it is seen that there is a statistically significant difference between the parental education level [$F(4) = 7,165, p < .05$] on authority and rule-oriented mathematics education expectation. In addition, child's class, parents' perception of their own child's math achievement, parent mathematics success show statistically significant differences on the "conceptual understanding and active participation expectation" and "positive attitude and behavioral expectation". Anova test and Bonferroni multiple comparison were used to make more detailed conclusions on the detected statistically significant differences.

Table 6. Descriptive statistics on "expectation of authority and rule-based teaching" according to the learning status of the parents

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Elementary and Below	194	19.2680	4.75082	.34109	18.5953	19.9408	5.00	25.00
Middle School	169	19.1953	4.34012	.33386	18.5362	19.8544	5.00	25.00
High School	247	18.0486	5.11471	.32544	17.4076	18.6896	5.00	25.00
University	111	15.1261	5.30714	.50373	14.1278	16.1244	5.00	25.00
Total	721	18.1956	5.06862	.18877	17.8250	18.5662	5.00	25.00

When the descriptive statistics in Table 6 are examined, it is seen that as the educational status of the parents increases, "authority and rule-oriented teaching expectancies" decrease. The ANOVA test results for examining whether these changes are statistically significant are shown in Table 7.

Table 7. ANOVA test results on "expectation of authority and rule-based teaching" according to the learning status of the parents

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1443.156	3	481.052	20.225	.000
Within Groups	17054.269	717	23.786		
Total	18497.426	720			

When the ANOVA test results are examined, it is seen that there is a statistically significant difference. The Bonferroni test was performed as in Table 8 to determine which groups show statistically significant difference.

Table 8. Bonferroni test results on "expectation of authority and rule-based teaching" according to the learning status of the parents

Multiple Comparisons						
Dependent Variable: Expectation of Authority and Rule-Based Teaching						
Bonferroni						
(I) Parents' graduate level	(J) Parents' graduate level	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Elementary and Below	Middle School	.07277	.51318	1.000	-1.2849	1.4304
	High School	1.21946	.46787	.056	-.0183	2.4573
	University	4.14192*	.58042	.000	2.6063	5.6775
Middle School	Elementary and Below	-.07277	.51318	1.000	-1.4304	1.2849
	High School	1.14668	.48687	.113	-.1414	2.4347
	University	4.06914*	.59584	.000	2.4928	5.6455
High School	Elementary and Below	-1.21946	.46787	.056	-2.4573	.0183
	Middle School	-1.14668	.48687	.113	-2.4347	.1414
	University	2.92246*	.55730	.000	1.4481	4.3968
University	Elementary and Below	-4.14192*	.58042	.000	-5.6775	-2.6063
	Middle School	-4.06914*	.59584	.000	-5.6455	-2.4928
	High School	-2.92246*	.55730	.000	-4.3968	-1.4481

*. The mean difference is significant at the 0.05 level.

When Bonferroni test results are examined, it is seen that "authority and rule-oriented teaching expectancies" of university graduates are statistically different from all groups. These results suggest that university graduates have a less authoritarian and less rule-oriented teaching expectation.

Descriptive statistics of "conceptual understanding and active participation" and "positive attitude and behavior" expectancy according to the class levels of the students are given in Table 9.

Table 9. Descriptive statistics of "conceptual understanding and active participation" and "positive attitude and behavior" expectancy according to the class levels of the students

Descriptives									
		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Conceptual understanding and active participation	5.Grade	178	21.629	3.15291	.23632	21.1628	22.0956	5.00	25.00
	6.Grade	152	21.171	3.01382	.24445	20.6881	21.6540	5.00	25.00
	7.Grade	163	21.214	3.73628	.29265	20.6368	21.7926	5.00	25.00
	8.Grade	223	20.488	3.59787	.24093	20.0140	20.9636	6.00	25.00
	Total	716	21.082	3.42801	.12811	20.8309	21.3339	5.00	25.00
Positive attitude and behavior	5.Grade	180	22.266	3.24700	.24202	21.7891	22.7442	5.00	25.00
	6.Grade	154	21.246	3.82512	.30824	20.6378	21.8557	5.00	25.00
	7.Grade	167	21.437	3.99479	.30913	20.8268	22.0475	5.00	25.00
	8.Grade	226	21.163	4.07100	.27080	20.6301	21.6973	7.00	25.00
	Total	727	21.517	3.82927	.14202	21.2384	21.7960	5.00	25.00

When the descriptive statistics in Table 9 are examined, it is seen that 5th grade student parents have the highest average for both types of expectation. However, it is noteworthy that the 8th grade parents have the lowest average level of "conceptual understanding and active participation". ANOVA test results are presented in the table below.

Table 10. ANOVA test results regarding "conceptual understanding and active participation" and "positive attitude and behavior" anticipation according to the class levels of the students

ANOVA						
	Sum of Squares	df	Mean Square	F	Sig.	
Conceptual understanding and active participation	Between Groups	135.851	3	45.284	3.900	.009
	Within Groups	8266.287	712	11.610		
	Total	8402.138	715			
Positive attitude and behavior	Between Groups	141.679	3	47.226	3.251	.021
	Within Groups	10503.856	723	14.528		
	Total	10645.535	726			

As shown in Table 10, a statistically significant difference was found for both types of expectation. The Bonferroni test was performed as in Table 11 to determine which groups this difference was.

Table 11. Bonferroni test results for "conceptual understanding and active participation" and "positive attitude and behavior" anticipation according to class levels of students

Multiple Comparisons							
Bonferroni							
Dependent Variable	(I) Grade level of students	(J) Grade level of students	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Conceptual understanding and active participation	5. Grade	6. Grade	.45816	.37631	1.000	-.5374	1.4537
		7. Grade	.41449	.36939	1.000	-.5628	1.3918
		8. Grade	1.14042*	.34247	.005	.2344	2.0465
	6. Grade	5. Grade	-.45816	.37631	1.000	-1.4537	.5374
		7. Grade	-.04367	.38420	1.000	-1.0601	.9728
		8. Grade	.68226	.35839	.344	-.2659	1.6304
	7. Grade	5. Grade	-.41449	.36939	1.000	-1.3918	.5628
		6. Grade	.04367	.38420	1.000	-.9728	1.0601
		8. Grade	.72593	.35113	.234	-.2030	1.6549
	8. Grade	5. Grade	-1.14042*	.34247	.005	-2.0465	-.2344
		6. Grade	-.68226	.35839	.344	-1.6304	.2659
		7. Grade	-.72593	.35113	.234	-1.6549	.2030
Positive attitude and behavior	5. Grade	6. Grade	1.01991	.41839	.090	-.0870	2.1268
		7. Grade	.82954	.40952	.259	-.2539	1.9129
		8. Grade	1.10295*	.38078	.023	.0956	2.1103
	6. Grade	5. Grade	-1.01991	.41839	.090	-2.1268	.0870
		7. Grade	-.19037	.42583	1.000	-1.3169	.9362
		8. Grade	.08304	.39827	1.000	-.9706	1.1367
	7. Grade	5. Grade	-.82954	.40952	.259	-1.9129	.2539
		6. Grade	.19037	.42583	1.000	-.9362	1.3169
		8. Grade	.27341	.38895	1.000	-.7556	1.3024
	8. Grade	5. Grade	-1.10295*	.38078	.023	-2.1103	-.0956
		6. Grade	-.08304	.39827	1.000	-1.1367	.9706
		7. Grade	-.27341	.38895	1.000	-1.3024	.7556

*. The mean difference is significant at the 0.05 level.

When the results of the Bonferroni test regarding the expectation of "conceptual understanding and active participation" and "positive attitude and behavior" according to the class levels of the students are examined, both types of expectation of the 5th and 8th grade student parents show a statistically significant difference. In this case, it can be said that these two expectation levels of the 5th grade student parents are statistically significantly higher than the 8th grade parents.

Table 12. Descriptive statistics of "conceptual understanding and active participation" and "positive attitude and behavior" anticipation according to parents' past mathematical success

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Conceptual understanding and active participation	Low	59	20.8644	4.34883	.56617	19.7311	21.9977	5.00	25.00
	Middle	269	20.4796	3.33409	.20328	20.0793	20.8798	6.00	25.00
	Good	261	21.2682	3.29407	.20390	20.8667	21.6697	8.00	25.00
	Very Good	129	22.0388	3.20986	.28261	21.4796	22.5980	5.00	25.00
	Total	718	21.0780	3.43167	.12807	20.8266	21.3294	5.00	25.00
Positive attitude and behavior	Low	60	21.4833	4.57514	.59065	20.3014	22.6652	5.00	25.00
	Middle	275	21.0145	4.11422	.24810	20.5261	21.5030	5.00	25.00
	Good	267	21.8015	3.41188	.20880	21.3904	22.2126	10.00	25.00
	Very Good	127	22.0472	3.52960	.31320	21.4274	22.6671	5.00	25.00
	Total	729	21.5213	3.82766	.14177	21.2429	21.7996	5.00	25.00

When the descriptive statistics of "conceptual understanding and active participation" and "positive attitude and behavior" were examined according to parents' past mathematical success, it is seen that the parents having the highest success in the past have the highest average for both types of expectation. ANOVA test results are as follows.

Table 13. Anova test results regarding "conceptual understanding and active participation" and "positive attitude and behavior" anticipation according to Parents' past mathematics success

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Conceptual understanding and active participation	Between Groups	227.547	3	75.849	6.591	.000
	Within Groups	8216.085	714	11.507		
	Total	8443.632	717			
Positive attitude and behavior	Between Groups	126.799	3	42.266	2.908	.034
	Within Groups	10539.121	725	14.537		
	Total	10665.920	728			

When the ANOVA test results in Table 13 were examined, a statistically significant difference was found for both types of expectation. The Bonferroni test was performed as in Table 14 to determine which groups this difference was.

Table 14. Bonferroni test results for "conceptual understanding and active participation" and "positive attitude and behavior" anticipation according to Parents' past mathematics success

Dependent Variable	(I) Parents' past mathematics success	(J) Parents' past mathematics success	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Conceptual understanding and active participation	Low	Middle	.38485	.48766	1.000	-.9053	1.6750
		Good	-.40379	.48900	1.000	-1.6975	.8899
		Very Good	-1.17435	.53314	.168	-2.5848	.2361
	Middle	Low	-.38485	.48766	1.000	-1.6750	.9053
		Good	-.78865*	.29473	.046	-1.5684	-.0089
		Very Good	-1.55921*	.36329	.000	-2.5203	-.5981
	Good	Low	.40379	.48900	1.000	-.8899	1.6975
		Middle	.78865*	.29473	.046	.0089	1.5684
		Very Good	-.77056	.36509	.211	-1.7365	.1953
	Very Good	Low	1.17435	.53314	.168	-.2361	2.5848
		Middle	1.55921*	.36329	.000	.5981	2.5203
		Good	.77056	.36509	.211	-.1953	1.7365
Positive attitude and behavior	Low	Middle	.46879	.54327	1.000	-.9684	1.9060
		Good	-.31816	.54472	1.000	-1.7592	1.1229
		Very Good	-.56391	.59728	1.000	-2.1440	1.0162
	Middle	Low	-.46879	.54327	1.000	-1.9060	.9684
		Good	-.78695	.32758	.099	-1.6536	.0797
		Very Good	-1.03270	.40905	.071	-2.1149	.0495
	Good	Low	.31816	.54472	1.000	-1.1229	1.7592
		Middle	.78695	.32758	.099	-.0797	1.6536
		Very Good	-.24575	.41098	1.000	-1.3330	.8415
	Very Good	Low	.56391	.59728	1.000	-1.0162	2.1440
		Middle	1.03270	.40905	.071	-.0495	2.1149
		Good	.24575	.41098	1.000	-.8415	1.3330

*. The mean difference is significant at the 0.05 level.

When the Bonferroni test results are examined, it is seen that as the parents' past mathematics success increase the expectation of conceptual understanding and active participation. Bonferroni test results did not show any significant difference between the groups in the expectation of positive attitude and behavior. However, when evaluated together with the results of the ANOVA test, it can be deduced that as the parents' past mathematics success of the parents increases, the positive attitude and the behavioral expectation also increases.

Descriptive statistics of "conceptual understanding and active student participation" and "expectation of positive attitude and behavior" according to the perceived success of the student by their family are given in Table 15.

Table 15. Descriptive statistics of "conceptual understanding and active student participation" and "expectation of positive attitude and behavior" according to the perceived success of the student by their family

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Conceptual understanding and active participation	Low	42	20.7381	3.87651	.59816	19.5301	21.9461	5.00	25.00
	Midle	290	20.4138	3.48816	.20483	20.0106	20.8169	5.00	25.00
	High	266	21.4098	2.94627	.18065	21.0541	21.7655	9.00	25.00
	Very High	121	22.0661	3.81824	.34711	21.3789	22.7534	5.00	25.00
	Total	719	21.0793	3.43310	.12803	20.8279	21.3306	5.00	25.00
Positive attitude and behavior	Low	40	20.8000	4.10878	.64965	19.4859	22.1141	5.00	25.00
	Midle	297	20.9495	4.06295	.23576	20.4855	21.4135	5.00	25.00
	High	271	21.7712	3.41555	.20748	21.3627	22.1797	7.00	25.00
	Very High	123	22.5610	3.79634	.34230	21.8833	23.2386	5.00	25.00
	Total	731	21.5171	3.83219	.14174	21.2388	21.7954	5.00	25.00

When the descriptive statistics are examined, it can be said that the average level of the expectation level increases as the success level of the student increases. ANOVA test was conducted to examine whether this change was statistically significant and the results are given below.

Table 16. Anova test results regarding "conceptual understanding and active student participation" and "expectation of positive attitude and behavior" according to the perceived success level of the student by parents

		Sum of Squares	df	Mean Square	F	Sig.
Conceptual understanding and active participation	Between Groups	280.212	3	93.404	8.162	.000
	Within Groups	8182.270	715	11.444		
	Total	8462.481	718			
Positive attitude and behavior	Between Groups	267.786	3	89.262	6.208	.000
	Within Groups	10452.751	727	14.378		
	Total	10720.536	730			

As seen in Table 16, it was found that there were significant differences for both types of expectation. A Bonferroni test was conducted to determine which groups show significant differences and results presented in Table 17.

Table 17. Bonferroni test results regarding "conceptual understanding and active student participation" and "expectation of positive attitude and behavior" according to the perceived success level of the students by family

Multiple Comparisons							
Bonferroni							
Dependent Variable	(I) perceived success level of the students by family	(J) perceived success level of the students by family	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Conceptual understanding and active participation	Low	Middle	.32430	.55851	1.000	-1.1533	1.8019
		Good	-.67168	.56169	1.000	-2.1577	.8143
		Very Good	-1.32802	.60584	.172	-2.9309	.2748
	Middle	Low	-.32430	.55851	1.000	-1.8019	1.1533
		Good	-.99598*	.28720	.003	-1.7558	-.2362
		Very Good	-1.65232*	.36611	.000	-2.6209	-.6837
	Good	Low	.67168	.56169	1.000	-.8143	2.1577
		Middle	.99598*	.28720	.003	.2362	1.7558
		Very Good	-.65634	.37094	.464	-1.6377	.3250
	Very Good	Low	1.32802	.60584	.172	-.2748	2.9309
		Middle	1.65232*	.36611	.000	.6837	2.6209
		Good	.65634	.37094	.464	-.3250	1.6377
Positive attitude and behavior	Low	Middle	-.14949	.63864	1.000	-1.8390	1.5400
		Good	-.97122	.64226	.786	-2.6703	.7279
		Very Good	-1.76098	.69018	.066	-3.5868	.0649
	Middle	Low	.14949	.63864	1.000	-1.5400	1.8390
		Good	-.82172	.31854	.061	-1.6644	.0210
		Very Good	-1.61148*	.40658	.000	-2.6871	-.5359
	Good	Low	.97122	.64226	.786	-.7279	2.6703
		Middle	.82172	.31854	.061	-.0210	1.6644
		Very Good	-.78976	.41225	.335	-1.8804	.3008
	Very Good	Low	1.76098	.69018	.066	-.0649	3.5868
		Middle	1.61148*	.40658	.000	.5359	2.6871
		Good	.78976	.41225	.335	-.3008	1.8804

*. The mean difference is significant at the 0.05 level.

When the results of the Bonferroni test on the "conceptual understanding and active student participation" expectation were examined according to the perceived success level of the students by their family, it was found that there was a statistically significant difference between the students with very high and high success by their family with students who have middle success mathematics achievement. Accordingly, it can be said that as the perceived success of students by the family increases, the expectation of conceptual understanding and active participation increases. Bonferroni results regarding expectancy of positive attitude and behavior were examined and it was found that there was a statistically significant difference between those who had a very high perceived success and the middle perceived success by their families.

4. Discussion and Conclusions

Research on which factors influence the success of mathematics constitutes an important part of mathematics education research (Pezdek, Tiffany, Paul & Reno, 2002; Pourselami, Erfani & Firoozfar, 2013; Zakaria & Nordin, 2008). When these researches are examined, it is seen that one of the most important factors affecting academic success is the family factor. Family is an effective factor in the academic achievement of the students because they spend most of their time in the family from the pre-school period. Children acquire preliminary knowledge that is the basis for many concepts through their experiences with the family (Şişman, 2000; McBride & Lutz, 2004). This explains how some students learn mathematics concepts faster than other students. Of course it can not be argued that the family factor alone explains the differences in success in mathematics, but it is indisputable that it is

one of the most effective when the extracurricular factors are listed (Booth ve Dunn, 1996; Pezdek, Tiffany, Paul ve Reno, 2002). In this study, the expectations of the family for mathematics education were discussed. Due to the method used, definite judgments based on the causal relation can not be reached. However, it is thought that the family reflects these expectations towards mathematics education to their child and mathematics teacher. There are studies in the literature that examine the expectations of parents about education. For example, in a survey conducted by Akdoğan (2014), the students and their parents stated their expectations from the school as follows: quality education, cleanliness of the school, good teaching staff, communicating with the parents, and good orientation of the students. Rather than examining the parents' expectations from the school, in this study, we examined the parents' expectations from mathematics education.

When the results of multivariate analysis of variance according to the independent variables mentioned in the study are examined, it is seen that the common effect is statistically significant. Accordingly, it can be said that some of the independent variables studied in the study have significant differences on these expectation types. It was concluded that it was meaningful to examine the parents' expectation in terms of independent variables (parental gender, parental education level, parental age range, family monthly income, child's class, parental mathematics success, child's mathematical success, level of loving mathematics). However, it was found that the variables of parental gender, parental age range, and monthly income of the parents, level of loving mathematics and level of helping the child have no significant effect on the expectations. DeRoche and Williams (1998) state that parents are expected to send their children to school, to gain positive social and personal behavior, to become a productive citizen, to learn the values of their own history, traditions and democratic society, and that these expectations are common.

In the current study, the parents who graduated from a university had a statistically significant lower "Authority and Rule-Oriented Teaching" expectancy than the parents who graduated from a primary, secondary, and high school. When descriptive statistics on "authority and rule-oriented teaching expectation" are examined according to the learning status of the parents, "authority and rule-oriented teaching expectancies" decrease as the learning status of the parents increases. When examining Bonferroni test results for "authority and rule-oriented teaching expectation" according to the learning status of the parents, it is seen that the "authority and rule-oriented teaching expectation" of university graduates is statistically lower than all groups. These results suggest that university graduates have a less authoritarian and less rule-oriented mathematics teaching expectation. They may have thought that it would be more beneficial for their children to establish their own internal motivation, rather than an external authority, when it is thought that the experience of the university graduate educators is longer than others graduate levels.

In addition, it is a reality that a rule-based education inhibits creativity and entrepreneurial skills (Trivette & Anderson, 1995; Ablard & Parker, 1997; Kawamura, Frost & Hartz, 2002). As a matter of fact, the university education is based on creativity and entrepreneurship (Michael, 2000; Kwache, 2007). The university graduates may have realized this situation with their own experience. Therefore, they may have a lower expectation of "authority and rule-oriented education" for their children. In addition to these, it can be said that authority and rule-oriented education make children unhappy. Democratic attitudes of parents who receive university education may be improved according to other parents. So they may not have wanted an education that their children would be unhappy with. Kawamura, Frost, and Hartz (2002) and Trivette and Anderson (1995) found that families with authoritarian attitudes are both in such an educational expectation, and that students in such families exhibit more negative attitudes than others. This fact may have been observed in the educational experiences of university graduates. Kotaman (2010) and Keith and others (1993) emphasized that parents with higher education levels are more involved in their children's education and training processes. Parents with a high level of education are able to reflect their own observations and ideas into their children's educational processes. Pena (2000) also concluded that families with high levels of education had higher contributions to their children's education and more expectations of their schooling. Some studies have shown that the educational level of the parents does not play a role in the success of the students (Balli, Demo & Wedman, 1998; Xu & Corno, 2003). As noted by Kay, Fitzgerald, Paradee and Mellencamp (1994), low-educated parents may have more authoritarian and

rule-based educational expectations. This view is also supported by the results of the current research. The fact that the parents of university graduates have different characteristics compared to the other parents is also a case that is found in other researches. For example, Kutluca and Aydın (2010) determined that parents of university graduates enjoyed to answer their children's questions about mathematics but other parents did not enjoy. On the other hand, a study by Jacopson and Engelbrecht (2000) found that parents who are not university graduates had more expectations from their child's education. When these two results are evaluated together, it is thought that low-level educated parents have a higher educational expectation but may have a wrong perspective for their children.

The class level of the child appears to have statistically significant differences in expectations. According to this, it is seen that the 5th grade parents had higher expectations of conceptual understanding and active participation and positive attitude and behavior than the other parents. However, it is noteworthy that the 8th grade parents have the lowest average level of "conceptual understanding and active participation". When Bonferroni test results were examined, it was determined that there was a statistically significant difference between "conceptual understanding and active participation" and "positive attitude and behavior" expectancy of 5th and 8th grade student parents. In Turkey, grade 8 students are working more exam-oriented center. For this reason, the grade 8 parents may have a lower "conceptual understanding and active participation" expectation. Because active participation is time consuming, conceptual learning can be slow. Even if they do not know their meaning, they think implementing the rules is more useful in centralized test exams (Baki, 2008). However, since there is no such test at the 5th class, the parents may have had a much more active and time-consuming teaching expectation based on conceptual meaning.

Parents' own past mathematical success was found to be statistically significant on parental expectation types. It was determined that parents with very good past math achievement had higher expectations for "conceptual understanding and active participation" and "positive attitude and behavior". Parents with high mathematical success in past studenthoods may have associated these achievements with active participation and conceptual meaning. It is quite obvious that teaching based on active participation and conceptual understanding will increase student achievement. Besides, it was determined that the parents who defined their past mathematical success as high have a high expectation of positive attitude and behavior. When examining the items related to the expectation of "positive attitude and behavior" of the scale, it is seen that there are ways of thinking that will enable the child to make wise decisions. It may be that the parents of those who have defined their past mathematical success as high have associated these achievements with these characteristics. Therefore, they may have had an educational expectation that focuses on them for their children. Indeed, these features increase children's math achievements (Chen & Fan, 2001; Kutluca & Aydın, 2010; Kotaman, 2008). If they see that these attitudes and behaviors are effective in their past mathematical achievements, it is natural that they have the same expectation for their own children as well. Along with the participation of parents in the education process, the positive behaviors and emotional development of the students were better and the achievements were improved (Booth & Dunn, 1996; Cai, Moyer & Wang, 1999; Henderson & Berla, 2004; Nyabuto & Njoroge, 2014). Perhaps the academic success of children may be increasing because of the development of these "*positive attitudes and behaviors*" in children whose parents support the educational process.

The mathematical success perceived by the child's parents appears to be statistically significant on parental expectations. The mathematical success perceived by the child's parents may not be the real success of the child. However, it is clear that the mathematical success perceived by the child's parents will have an effect on the behavior of the parents. If mathematical success perceived by the child's parents is not high enough, even if it is too high in actual, it is highly likely that this negative perception will affect his or her behavior towards the child or teacher. As the level of success perceived by the family of the learners increases, expectations of "positive attitude and behavior" with "conceptual understanding and active student participation" are also increasing. In the study conducted by Eccles and Harold (1993), it is stated that the parents who follow the daily work of their children increase the student success. Similarly, Chen and Fan (2001) found that there is a strong relationship between the academic expectations of the parents and the academic achievement of their children. Chen and Fan (2001), however, refer to parents who expect their child to achieve academic excellence.

When evaluated together with the current research results, the following conclusion can be reached. It is not enough for the parents to expect high success from only their children. They should have the correct expectation and perspective that their children will progress academically. A parent who has a rule and authority expectation can both lead the child to cool off from school and to memorize facts instead of understanding them.

Teachers who are expecting higher success from their students can reflect this on their behaviors. Similarly, the expectations of the parents may be reflected in their communication with the child and the teacher. It is stated in the literature that parents who regularly deal with children's education have a positive impact on academic achievement (Booth & Dunn, 1996; Cai, Moyer & Wang, 1999; Eccles & Harold, 1993; Henderson & Berla, 2004; Nyabuto & Njoroge, 2014). This research opens up a new dimension to these findings. Accordingly, supporting the child's education and having high expectations may not affect the academic achievement alone. The educational vision of parents should be based on useful perspective. If children feel what their parents expect and the expectation of the family is to make more memorization instead of making meaning and the expectation of the family based on an authoritarian teaching of mathematics instead of active participation, there is something that does not go right. However, if parents have a higher level of conceptual learning and active participation in mathematics education and a lower expectation of authority and rule-based instruction, children and teachers may be appropriately directed towards this expectation. Parents' expectations may lead to the advancement of education and training, as well as obstruct positive changes.

A student who believes in learning mathematics through passive listening and memorizing rules can be more easily directed, if parent has a high expectation of active participation and conceptual learning. For that reason, educators should give importance to the family dimension that occurs outside the classroom. A similar situation can be said for positive attitude and behavioral expectation. For example, if the student feels that his/her family is expecting positive attitudes and behavior (systematic thinking, attentive, patient, responsibility), the teacher can also make it easier for the child to acquire them. If the expectations of teachers and parents are in harmony with "active participation and conceptual understanding" and "positive attitude and behavior", this is a positive factor that promotes the student. As stated by Davies (1991), parents want to be informed throughout the year about the ways that they can help their children in improving their academic achievement. Hence, if parents can get useful feedbacks from schools about their children, we assume that they can keep up having high expectations of "conceptual understanding and active student participation" from mathematics education. In addition, even if it takes their time, the parents should assist their children in learning the meanings of the mathematics concepts and encourage children's active participation in class activities.

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Appendix

Scale: "Parents' Expectation from Mathematics Education (PEME): Development, Reliability and Validity"

Dear Parent;

The aim of this study is to reveal and evaluate the expectations of the parents about the mathematics lesson. You are not asked to write your name in the study. Your sincere reply will contribute to the results being more reliable. Thank you for your participation. Answer the box that best suits you with an (X).

	Vey High	High	Sometimes	Low	Very Low
1. I expect a mathematics education that aims to teach how mathematics is used in other fields.					
2. I expect a mathematics education for my child that aims to teach relations between different mathematics subjects in order to better understand mathematics.					
3. I want my child to be taught the logic of the subject even if it takes time instead of the procedures and rules that he does not know.					
4. I expect my child to be learn how mathematics is related to everyday life.					
5. I expect my child to find different solutions. I also expect from teachers to support this effort.					
6. I expect from math teachers to give my child a way of thinking that will make smarter decisions in life.					
7. I expect from math teachers to give my child a sense of responsibility.					
8. I expect from math teachers to teach my child how to be systematic.					
9. I expect from math teachers to teach my child how to be careful.					
10. I expect from math teachers to teach my child how to be patient.					
11. I expect mathematics to be taught as a lesson in which the students listen quietly to the teacher.					
12. I expect mathematics to be taught as a lesson that the teacher mostly writes on the board and solves problems.					
13. I expect my child to learn how to do procedures quickly instead of the underlying meanings.					
14. I expect my child to learn mathematics enough to successfully complete his/her education, instead of learning mathematics in depth					
15. I expect from the teacher to use the smart board to show how to solve problems quickly during the problem solving process.					

*This scale has been translated from Turkish into English by the Authors.

