Parental Influences on Students' Self-Concept, Task Value Beliefs, and Achievement in Science

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The aim of this study was twofold: firstly, to investigate the grade level (elementary and middle school) and gender effect on students' motivation in science (perceived academic science self-concept and task value) and perceived family involvement, and secondly to examine the relationship among family environment variables (fathers' educational level, mothers' educational level, and perceived family involvement), motivation, gender and science achievement in elementary and middle schools. Multivariate Analysis of Variance (MANOVA) showed that elementary school students have more positive science self-concept and task value beliefs compared to middle school students. Moreover, elementary school students appeared to perceive more family involvement in their schooling. Path analyses also suggested that family involvement was directly linked to elementary school students' task value and achievement. Also, in elementary school level, significant relationships were found among father educational level, science self-concept, task value and science achievement. On the other hand, in middle school level, family involvement, father educational level, and mother educational level were positively related to students' task value which is directly linked to students' science achievement. Moreover, mother educational level contributed to science achievement through its effect on self-concept.
Keywords: family involvement, parents' education, science self-concept, task value, science achievement

Este estudio tenía dos objetivos: en primer lugar, investigar el efecto del curso (educación primaria y secundaria) y del género en la motivación de los alumnos en ciencias (autoconcepto académico percibido en ciencias y valor de la tarea) y la implicación percibida de la familia; y en segundo lugar, examinar la relación entre las variables del entorno familiar (nivel de estudios del padre y de la madre, implicación percibida de la familia), motivación, género y logro en ciencias en la educación primaria y media). Análisis de varianza multivariada (MANOVA) mostró que los alumnos de primaria tienen un autoconcepto en ciencias y creencias acerca del valor de la tarea más positivos que los alumnos de educación media. Además, los alumnos de primaria parecían percibir más implicación de la familia en su educación. Análisis de ruta (path analysis) también sugirió que la implicación de la familia estaba directamente relacionada con el valor de la tarea y los logros de los alumnos de primaria. Además, en el nivel de primaria, se encontraron relaciones significativas entre el nivel de estudios del padre, el autoconcepto en ciencias, el valor de la tarea y el logro en ciencias. Por otro lado, en el nivel escolar medio, la implicación de la familia y el nivel de estudios del padre y de la madre se relacionaban positivamente con el valor de tarea del alumno, que está directamente relacionado con el logro en ciencias del estudiante. Además, el nivel de estudios de la madre contribuía al logro en ciencias a través de su efecto en el autoconcepto.
Palabras clave: implicación de la familia, educación de los padres, autoconcepto, valor de la tarea, logro en ciencias

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How to cite the authors of this article: Senler, B., Sungur, S.

Expectancy-value model of achievement proposes that students' achievement behaviors including persistence, choice, and performance are directly linked to their expectancies for success and their perception of task value (Eccles, 1983; Eccles & Wigfield, 2002; Wigfield, 1994). In this model, while expectancy for success refers to students' beliefs about how well they will perform on upcoming tasks, task value refers to beliefs about reasons for doing the task. Eccles (1983) suggested four components of task value: intrinsic value, attainment value, utility value, and cost. Intrinsic value is conceptually similar to the intrinsic motivation defined by Deci and Ryan (1985), and to the interest defined by Renninger, Hidi, and Krapp, (1992). It involves the enjoyment students get from doing the academic task. Attainment value concerns the personal importance of performing well on the academic task. Utility value is refers to how the academic task relates to students' current and future plans. Cost value is involves the anticipated amount of effort needed to complete academic task as well as anticipated negative aspects of performing the task (Eccles, 1983).

According to the expectancy-value model, one of the factors influencing students' expectancies for success and task value beliefs is beliefs about ability. Beliefs about ability are defined as students' evaluations of their competence in different domains. It is different from the expectancy for success in that beliefs about ability involve broad competence beliefs in a given domain. On the other hand, expectancy for success which is analogous to Bandura's (1997) efficacy expectations is more task- and context-specific compared to domain specific competence beliefs. These domain specific competence beliefs are generally conceptualized as self-concept in educational literature (Harter, 1982). Shavelson, Hubner, and Stanton (1976) suggested that academic self-concept is multidimensional and hierarchical. Global self-concept at the top of the hierarchy is branched into academic self-concept and non-academic self-concept. In this approach, academic self-concept is further divided into self-concepts in particular domains like mathematics self-concept and science self-concept. Accordingly, it is expected that academic self-concept is more related with academic outcomes such as achievement than global or non-academic self-concept and academic outcomes in a particular domain is more related with the self-concept in the matching domain. Therefore, it is important to investigate domain specific self-concepts rather than global self-concept (Marsh & Hau, 2004).

In the expectancy-value model, the expectancy for success, task value beliefs, and competence beliefs are influenced by the students' interpretations and attributions for their previous performances, students' perceptions of socializers' beliefs and behaviors (teachers, parents, peers) and cultural milieu. In general, the model not only emphasizes social-cognitive processing in the development of motivational beliefs but also social and cultural contexts that constitute students' worlds (Pintrich & Schunk, 2002).

Indeed, Wigfield, Eccles, Schiefele, Roeser, and Davis-Kean (2005) proposed that causal attributions made by parents for their children' academic performance in different domains, parents' expectations for their children's current or future success and beliefs about their children's abilities, and parents' perceptions of task difficulty and task value influence students' motivational beliefs including self and task value beliefs. Moreover, it was suggested that rewards and encouragement provided by the parents for participating in some educational activities rather than others can convey differential task values to students. In addition, students' academic interests can be influenced by the messages provided by the parents as they work with their children on different academic tasks (Eccles & Harold, 1993). In fact, in their review of related research, Gonzalez-DeHass, Willems, and Doan-Holbein (2005) concluded that parents' beliefs and behaviors have great influence on student motivation. More specifically, they reported that parents' involvement is significantly and positively linked to students' effort and concentration. Besides, students whose parents are involved by providing encouragement and praise show higher levels of interest in academic tasks and higher levels of perceived competence. These students tend to take personal responsibility for their learning and adopt mastery goal orientation. However, when parental involvement is perceived as over-controlling by the students and when parents use extrinsic rewards, students are more likely to develop extrinsic motivation. Therefore, this review study (Gonzalez-DeHass et al., 2005) supported the expectancy-value model's assertion that parents' beliefs and behaviors and how students perceive these beliefs and behaviors influence students' competence beliefs (self-concept) and their interest in academic tasks directly or indirectly.

Furthermore, Juang and Silbereisen's (2002) study with 641 adolescents demonstrated that higher levels of parental warmth, parental involvement, discussion on academic matters with adolescents, and positive beliefs concerning adolescents' abilities were associated with higher levels of adolescents' personal competence beliefs and academic achievement. Gottfried, Fleming, and Gottfried (1998) also reported that students whose home environments provide greater opportunities and activities for learning were more likely to develop academic intrinsic motivation.

In other study, Hung (2007) investigated the relationship between parents' involvement and Grade 6 students' school-related outcomes. Results revealed that students' perception of classroom learning environments, parents' involvement at home, and parents' aspirations were linked to students' self-concept. Moreover, parents' social status and students' perception of family learning environments were found to be related to students' achievement. In addition, Wang, Wildman, and Calhoun (1996) found that parents' educational level, expectations, support, and beliefs about their children's ability were positively linked to seventh grade students' achievement. Similarly, in the study by Sui-Chu and Willms

(1996) parental involvement in terms of discussion of schooling with children at home was found to be significantly related to academic achievement. Therefore, findings in the literature in general indicated that parental influences not only related to students' motivation but also their achievement. Indeed, Eccles (2005), in her review study, suggested that parents' influence on students' achievement is mediated in part, through its direct and indirect effect on students' self-concept and the subjective task value beliefs.

However, considerable research indicated that students' motivation decline as they move from one grade one grade level to another (Anderman & Midgley, 1997; Eccles, Wigfield, Harold, & Blumenfeld, 1993; Urdan & Midgley, 2003; Wigfield, Eccles, Mc Iver, Reman, & Midgley, 1991; Wigfield et al., 1997). For example, in their longitudinal study, Anderman and Midgley (1997) reported that students' self-concept and task goals in English and mathematics decreased after they moved to middle school. Similarly, Wigfield et al., (1991) showed that students' self-concept in English, mathematics, and social activities declined across sixth and seventh grades.

In other study, Wigfield et al., (1997) investigated changes in self-concept and task value beliefs in the domains of mathematics, reading, sports, and music across elementary school years. A decline in students' self-concept and usefulness and importance beliefs was determined in each domain. Moreover, boys were found to have more favorable self-concept than girls in the domains of mathematics and sports. Similarly, Eccles et al., (1993) showed in their longitudinal study that self-concept and task value beliefs declined across elementary school years and boys had more positive self-concept and task value beliefs than girls for sport. Concerning domains of reading and music, girls were found to have more positive competence and value beliefs.

In sum, studies suggested that students' motivation is closely related to achievement related outcomes and can be influenced by parental involvement. Furthermore, many research showed that students' motivation decline across school years and gender differences with respect to motivational variables can be found in different academic domains. Accordingly, there are two bodies of research that constituted the background of the present study. One having to do with the grade level and gender effect on students' motivation and the other examining how family environment variables influence students' motivation and academic performance. The present study aims at comparing the relationships among family environment variables, motivational variables, and achievement in elementary and middle school levels. Indeed, according to expectancy-value theory, expectancies for success and task value beliefs are influenced by multiple factors including grade level, gender, and parental involvement. Therefore, this study was a natural extension of existing research. Specifically, current study examines following research questions: (1) Are there any differences between elementary and middle school students with respect to perceived academic science self-concept, task value, and family involvement? (2) Is there a difference between boys and girls with respect to perceived academic science self-concept, task value, and family involvement? (3) What is the relationship among parents' educational level, perceived family involvement, academic science self-concept, task value, and science achievement in elementary school level? (4) What is the relationship among parents' educational level, perceived family involvement, academic science self-concept, task value, and science achievement in middle school level?

Method

Sample

Participants were 502 students (253 girls and 249 boys) in Grades 4 through 8 in urban elementary and middle schools. While 46.4 % of participants was elementary school students (Grades 4 to 5), 53.6 % of them were middle school (Grades 6 to 8) students. They ranged in age from 9 to 14 years. The sample was obtained through cluster random sampling integrated with convenience sampling. The district, from which the sample of the study was chosen, was selected by convenience sampling method. Schools considered as clusters were randomly selected from the district. In Turkish elementary and middle schools, the science lessons are compulsory for all the students. Turkish students receive the regular instruction as specified in the National Curriculum which is spiraled so that the students can revisit fundamental topics at increasingly sophisticated levels. Turkish educational system is highly competitive and examination oriented. Normative exams are implemented countrywide to select students for highly recognized universities and high schools

Instruments

The Academic Self-Concept Questionnaire (ASCQ; Marsh,1990) was used to measure students' science self-concept. It consists of six items scored on a five-point Likert scale from 1 (*completely disagree*) to 5 (*completely agree*). A sample item includes "compared to others my age I am good at science". Coefficient alpha estimate of reliability was found to be .89.

The Academic Interest Questionnaire (AIQ; Corbiere, Fraccaroli, Mbekou, & Perron, 2006) was used to assess students' perceived science task value in terms of inherent positive feelings, intrinsic interest, and the perceived usefulness and importance of succeeding in science. It is a six item five-point Likert type scale, anchored with 1 = *completely disagree*, and 5 = *completely agree*. One sample

item from this instrument is "for me it is important to succeed in science". Coefficient alpha estimate for the instrument was .71.

The Parental Influence Questionnaire (PIQ; Wang, Wildman & Calhoun, 1996) was used to measure parental involvement. It consists of 10 items. All items were scored on a five-point Likert scale from 1 (*completely disagree*) to 5 (*completely agree*). A sample item includes "parents find time to talk". Cronbach's alpha reliability was found to be .70.

In order to provide validity evidence for the interpretations of the results of the present study, confirmatory factor analyses (CFA) were conducted with the data obtained from administration of each of the questionnaire, i.e., the ASCQ, the AIQ, and the PIQ As shown in Table 1, of the four fit statistics reported, two were in optimal range (Goodness of Fit Index (GFI) > .90 and Standardized Root Mean Square Residuals (SRMR) < .10). While the Comparative Fit Index (CFI) was .98 for self-concept, it was slightly below the critical value of .90 for family involvement and task value. In order to determine whether these low CFI values for family involvement and task value were due to some kind of correlation between the measurement errors, we run the CFAs again considering the modification indexes suggested by LISREL. When the covariance between the standard error of three pairs of the items in family involvement and the standard error of a pair of the items in task value were allowed, the CFI raised to .93 and .94, respectively. This finding may imply that the items with correlated errors were understood by the participants as very close.

Furthermore, examination of the fit indices revealed that the chi-square estimates for all factors were statistically significant. However, these estimates were likely elevated due to large sample size (Tabachnick & Fidell, 1996).

Demographic Information

Demographic information such as gender, GPA, mother's and father's highest education was collected from the sample. Self-reported GPA was used as a measure of academic achievement. Parents' educational level was presented in Table 2. As is displayed in Table 2, the profile of the parents' educational level is similar for elementary and middle schools. The majority of fathers of the elementary (37.9 %) and the middle (41.3) school students have a university degree, and the majority of mothers of the elementary (36.1 %) and the middle (36 %) school students graduated from high school. Therefore, it appeared that while elementary and middle school students have fathers educated mostly to university level, they have mothers educated mostly to high school level.

Results

Descriptive Statistics

Descriptive statistics concerning students' self-report family involvement, self-concept, and academic task value and with respect to grade level and gender are presented in Table 3.

Table 1
Fit statistics for the instruments

Subscale	Fit statistics					
	χ^2	df	p	GFI	SRMR	CFI
Family Involvement	224.51	27	.000	.91	.07	.86
Self-Concept	49.54	9	.000	.97	.03	.98
Task value	70.52	9	.000	.92	.05	.88

Table 2
Educational level and employment status of parents in elementary and middle schools

Educational Level	Elementary School (%)		Middle School (%)	
	Father Education	Mother Education	Father Education	Mother Education
Illiterate	.4	1.7	—	—
Elementary School	11.2	17	7.1	16.7
Middle School	7.8	9.1	10.4	15.5
High School	31.9	36.1	32	36
University	37.9	30.4	41.3	26.5
MS & PhD	10.8	5.7	9.3	5.3

Table 3
Descriptive statistics

| | Grade Level | | | | | | | | Gender | | | | | | | |
| | Elementary | | | | Middle | | | | Boys | | | | Girls | | | |
	M	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis
Family involvement	4.63	.35	−1.34	1.99	4.39	.46	−1.27	2.17	4.44	.47	−1.52	3.78	4.57	.38	−1.31	2.02
Self-concept	4.50	.58	−1.34	1.68	3.61	.73	−.18	−.17	4.03	.82	−.53	−.61	4.00	.78	−.55	−.21
Task value	4.54	.39	−1.35	2.62	4.25	.57	−1.44	2.14	4.36	.53	−1.30	2.27	4.42	.50	−1.68	2.28

As shown in the Table 3, middle school students appear to have lower levels of perceived self-concept and task value in science and perceived family involvement in their academic work compared to elementary school students. On the other hand, boys and girls appear to have similar levels of perceived confidence, task value and family involvement.

Moreover, skewness and kurtosis values suggest that the distribution of scores for majority of the variables is not normal. Therefore, while conducting the path analyses in order to address the third and the fourth research questions Generalized Least-Squares (GLS) was used as the method of estimation.

Inferential Statistics

Grade Level and Gender Effect on Motivation and Perceived Family Involvement

In order to address the first and the second research questions two-way multivariate analysis of variance (MANOVA) was conducted. The F ratio for the interaction effect indicated that there was no interaction between grade level and gender, $F(3,496) = 0.37$, $p > .05$. That is, the effect of grade level on collective dependent variables of perceived family involvement, academic self-concept, and task value did not depend on the effect of gender and vice versa.

Concerning the main effects, results showed that there were significant grade level and gender effects on the collective dependent variables, $F(3,496) = 76.39$, $p < .0001$, $\eta^2 = .32$ and $F(3,496) = 5.74$, $p = .001$, $\eta^2 = .03$ respectively. The multivariate eta-squared values based on Wilk's L indicated that while 32 % of multivariate variance of the dependent variables was associated with the grade level, only 3 % of the variance was explained by the gender.

Since statistically significant MANOVA F ratios were obtained for the collective dependent variables, univariate ANOVAs were conducted to further understand how the elementary (Grades 4 to 5) and middle school (Grades 6 to 8) students and boys and girls differ regarding each of the dependent variable. Table 4 displayed results of the univariate ANOVA analyses on students' perception of family involvement, academic self-concept, and task value scores. As seen in the Table, there was a statistically significant mean difference between the elementary and the middle school students with respect to all dependent variables ($p < .05$) When the mean scores given in Table 3 were examined, it was found that elementary school students had higher levels of academic self-concept and task value. In addition, they reported higher levels of family involvement in their academic work compared to middle school students.

On the other hand, concerning gender effect, results indicated that there was a significant mean difference between boys and girls with respect to only perceived family involvement. Examination of mean scores revealed that girls reported more family involvement in their schooling than boys.

Table 4
MANOVA follow-up pairwise comparisons

Source	Dependent Variable	df	F value	p value	Eta-Squared
Grade Level	Family involvement	1	46.78	.000	.09
	Self-concept	1	222.80	.000	.31
	Task value	1	45.35	.000	.08
Gender	Family involvement	1	16.51	.000	.03
	Self-concept	1	1.31	.253	.00
	Task value	1	3.63	.057	.01
Error		498			

Relationship among Family Environment, Motivation and Science Achievement

In order to address the third and the fourth research questions, path analyses were conducted. In the model, it was hypothesized that family environment variables (perceived family involvement, father educational level, and mother educational level), and gender are all related directly to students' perceived science self-concept, task value, and science achievement and indirectly to science achievement through their effect on self-concept and task value. Moreover, a path was specified from perceived self-concept to task value. Bivariate correlations among all the variables in the study were presented in the Appendix.

Concerning the relationship among the variables in elementary school level, path analysis using Generalized Least-Squares (GLS) revealed that there was evidence to support adequate model-to-data fit (i.e., the GFI and the CFI = 1 and the SRMR = 0.00). Moreover, the chi-square estimate was found to be non-significant ($\chi2 = 0.00$, $df = 0$). Fit indices for the model are presented in Table 5.

Since the fit indices indicated a theoretically sound model that explained the data well, the standardized path coefficients for direct effect are analyzed and displayed in Table 6. The standardized path coefficients for direct effects are also graphically displayed in Figure 1.

In the model, family involvement, father educational level, mother educational level, and gender accounted for 13 % of the variance in perceived science self-concept and 57 % of variance in perceived task value. Parameter estimates revealed that higher levels of family involvement ($\beta = .30$) and father educational level ($\beta = .64$) were positively associated with task value. However, father educational level was found to be negatively related to self-concept ($\beta = -.35$). The relationships between mother educational level and science self-concept ($\beta = .08$) and task value ($\beta = .07$) were not statistically significant (see Table 6).

Table 5
Measures of model fit for elementary and middle school students

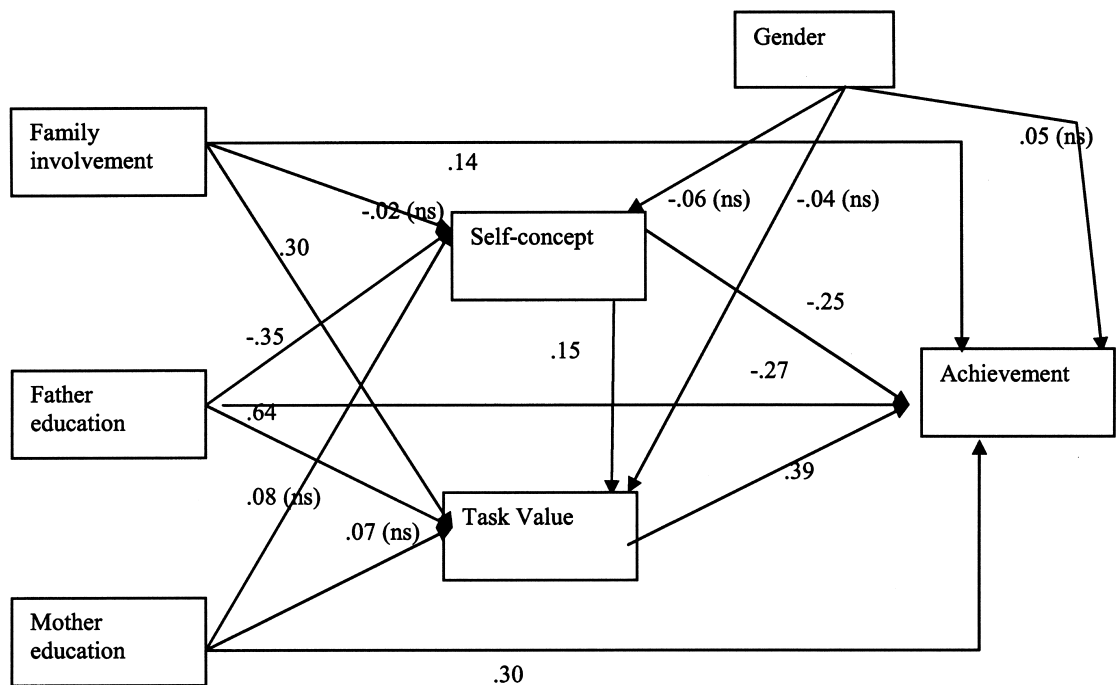| Subscale	Fit statistics					
	χ^2	*df*	*p*	GFI	SRMR	CFI
Elementary School	.00	0	1.000	1	.00	1
Middle School	.00	0	1.000	1	.00	1

Figure 1. Path model for elementary school students.

Moreover, perceived science self-concept, perceived task value, perceived family involvement, father educational level, mother educational level, and gender accounted for 33 % of variance in students' science achievement. The strongest positive total effect on students' science achievement was from the task value ($\beta = .39$). The second strongest total effect on science achievement was from mother educational level ($\beta = .31$). Results also showed that direct effect of family involvement, father educational level, mother educational level, self-concept and task value on science achievement was significant ($\beta = .14$, $\beta = -.27$, $\beta = .30$, $\beta = -.25$, , and $\beta = .39$, respectively). In addition, a positive relationship was found between self-concept and task value.

To sum up, in elementary school level, family involvement was found to be directly related to students' task value and achievement. In addition, significant relationships were found among father educational level, science self-concept, task value, and science achievement. However, there was no gender difference with respect to science self-concept, task value, and achievement.

In order to provide a validity evidence for the findings, the elementary school students sample was split in two halves. With the first half, a path analysis was conducted. Then, the previously obtained models were proved in the second half of the sample. In each case, the fit indices and the sign of the path coefficients found were the same as those obtained using the total sample. Fore example, self-concept was found to be negatively associated with achievement. Similarly, a negative relation was found between father educational level and self-concept.

The path analysis conducted to examine the relationship among perceived science self-concept, perceived task value, perceived family involvement, father educational level, mother educational level, gender and achievement in middle school level also resulted in fit indices indicative of perfect model to data fit (see Table 5). In the model (see Figure 2), family involvement, father educational level, mother educational level, and gender accounted for 5 % of the variance in science self-concept and 50 % of variance in task value. Parameter estimates revealed that among the family environment variables only mother educational level was found to be significantly related to science self-concept ($\beta = -.22$). The relationships between family involvement ($\beta = .47$), father educational level ($\beta = .38$), and mother educational level $\beta = .13$), and task value were all significant

In addition, results showed that science self-concept, task value, family involvement, father educational level, and mother educational level accounted for 18 % of variance in students' science achievement. Among these variables, family involvement ($\beta = .17$), father educational level ($\beta = -.15$), science self-concept ($\beta = -.22$), and task value ($\beta = .21$) were found to be significantly linked to science achievement (see Table 7). Family involvement, father educational level, and mother educational level also contributed to science achievement through their effect on task value.

Therefore, findings in middle school level suggested that family involvement, father educational level, and mother educational level were positively related to students' task value which is directly linked to students' science achievement. Moreover, mother educational level contributed

Table 6

Direct effects on motivational variables and science achievement for elementary school students

| Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Self-concept				.13
of Family Involvement	−.02	.07	−.26	
of Father Educational Level	−.35	.07	−5.13	
of Mother Educational Level	.08	.08	.93	
of Gender	−.06	.08	−.75	
On Task Value				.57
of Family Involvement	.30	.05	6.52	
of Father Educational Level	.64	.05	−5.13	
of Mother Educational Level	.07	.06	.93	
of Gender	−.04	.06	−.62	
On Achievement				.33
of Family Involvement	.14	.02	2.34	
of Father Educational Level	−.27	.03	−3.32	
of Mother Educational Level	.30	.03	4.22	
of Gender	.05	.03	.67	
of Self–Concept	−.25	.02	−4.20	
of Task Value	.39	.03	4.79	
On Task Value				.02
of Self-Concept	.15	.05	3.26	
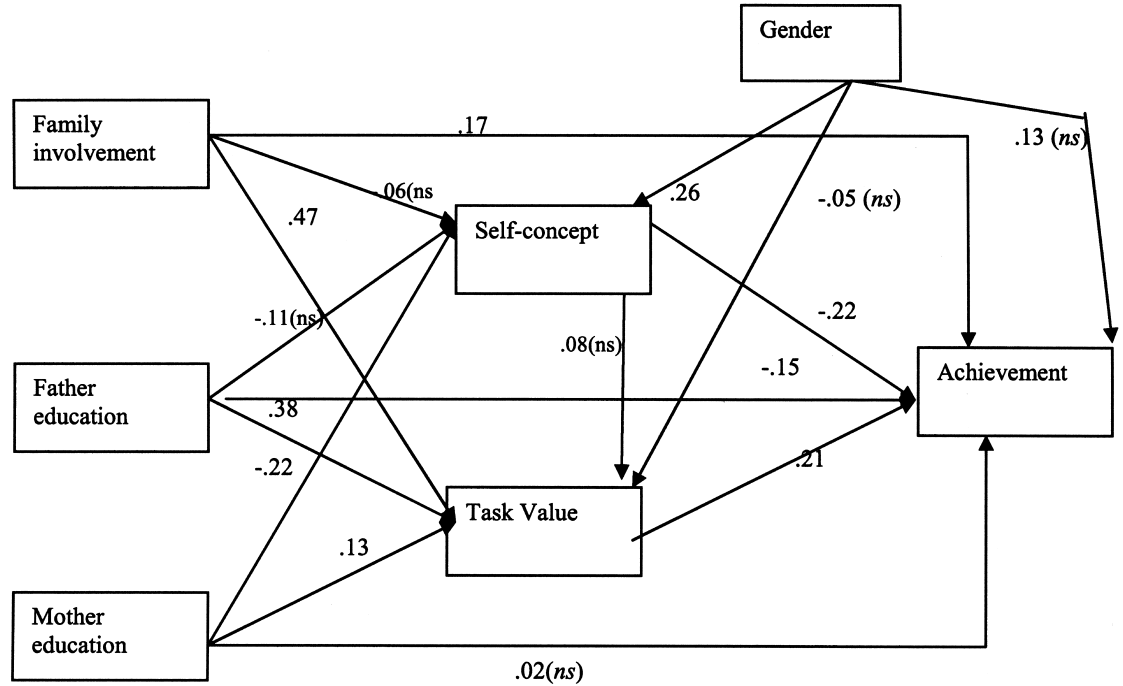
Figure 2. Path model for middle school students.

to science achievement through its effect on self-concept. Moreover, a significant gender difference with respect to science self-concept was found. Middle school boys appeared to hold more positive-self-concept than girls

In order to provide a validity evidence for the findings, the middle school students sample was divided into two halves. Following the path analysis conducted with the first half of the sample, the previously obtained models were

Table 7

Direct effects on motivational variables and science achievement for middle school students

Effect	Standardized Coefficients	Standard Errors of the Estimates	t	R^2
On Self-concept				.05
of Family Involvement	−.06	.11	−.91	
of Father Educational Level	−.11	.06	−1.70	
of Mother Educational Level	−.22	.08	−2.60	
of Gender	.26	.08	3.14	
On Task Value				.50
of Family Involvement	.47	.06	10.33	
of Father Educational Level	.38	.03	8.23	
of Mother Educational Level	.13	.04	2.18	
of Gender	−.05	.04	.79	
On Achievement				.18
of Family Involvement	.17	.06	2.45	
of Father Educational Level	−.15	.03	−2.23	
of Mother Educational Level	.02	.04	.29	
of Gender	.13	.04	1.65	
of Self-Concept	−.22	.03	−3.87	
of Task Value	.21	.05	2.68	
On Task Value				.01
of Self-Concept	.08	.03	1.70	

proved in the second half of the sample. For the first and second halves of the sample, the fit indices and sig of the path coefficients were the same as those obtained for the total sample. For instance, self-concept and father educational level was found to be negatively associated with achievement. In addition, a negative relation was found between mother educational level and self-concept.

Discussion

In the present study we first investigated the grade level and gender effect on perceived academic self-concept, task value, and family involvement. Two-way MANOVA results revealed that there was a significant mean difference between elementary and middle school students with respect to all of these dependent variables. Elementary school students appeared to have more positive capacity beliefs, more intrinsic interest in academic work, and to perceive more family involvement in their schooling compared to middle school students. The decline found in students' motivation was in congruence with the findings in the literature (Anderman & Midgley, 1997; Eccles et al., 1993; Wigfield et al., 1997). The research in the field of academic motivation suggested that the mismatch between students' abilities and instructional strategies used in the classrooms can be the reason for the decline in students' motivation (Pintrich & Schunk, 2002). In fact, according to person-to-environment fit perspective if students' needs match with their maturity levels and classroom structure, they can perform optimally (Eccles et al., 1993). Although this issue was not investigated in the present study, and therefore not supported by our findings, it is predicted that if middle school students who are developmentally mature enough to use variety of cognitive and metacognitive strategies are provided with opportunities to use their capabilities and exercise control over their learning, they can participate in the academic work with a higher levels of motivational, cognitive, and behavioral engagement. Otherwise, their motivation can decline. In addition, Bronson (2000) proposed that middle school students compared to elementary school students are more likely to be aware of them selves and compare their performance against normatively set standards. Moreover, they are more likely to be interested in peer relationships rather than family. Therefore, in order to maintain positive self-concept and task value beliefs among middle school students, classroom environments that encourage them to interact cooperatively and positively with peers and help them realize their own progress and accomplishments can be created. Otherwise, when competition is emphasized students self-concept and interest may reduce (Pintrich & Schunk, 2002). However, Turkish educational system is highly competitive and examination oriented. Middle school students have to enter nationwide exams and show better performance relative to others to be able to attend better high schools. Since elementary and middle education (Grades 1 trough 8)

is compulsory for all students in Turkey, and therefore, students do not need to enter normative exams in elementary school years, the competitive and exam oriented nature of the educational system and its consequences become more pronounced in middle school years. For this reason, the decline in student motivation across grade levels is an expected outcome for Turkish students.

Concerning gender differences, the present study revealed that there was a significant difference between boys and girls with respect to family involvement in favor of girls. Supporting this finding, Sui-Chu and Willms (1996) reported that parents devote more time to discuss about schooling with girls than boys. Moreover, results of the multivariate of analysis in the present study revealed that gender effect on science self-concept and task value was non-significant. However, considerable research examining the gender effect on motivational variables, more specifically, on perceptions of competence revealed that boys feel more confident in domains stereotyped as being more masculine such as mathematics while girls feel more confident in domains stereotyped as being more feminine such as English. For example, recently, Watt (2004) found in a longitudinal study spanning Grades 7 to 11 that perceived ability, expectancy for success, intrinsic value, and utility value perceptions were more positive for boys in mathematics and for girls in English. Therefore, in this study, we expected to find a gender difference in favor of boys but this expectation was not supported. Only the path analysis results in middle school level revealed a gender difference with respect to perceived self-concept (see Figure 2). Further studies integrating qualitative approaches to research designs are suggested to be conducted to examine cultural, familial, and school influences on student motivation with respect to gender.

In the current study, we second investigated the relationship among parents' educational level, perceived family involvement, academic science self-concept, task value, gender and science achievement in elementary and middle school levels. Results revealed that family involvement was positively linked to students' perceived science task value in elementary school years, Family involvement was also found to positively contribute to students' achievement in science directly and indirectly through its effect on perceived science task value. Therefore, it appeared that students whose parents find time to talk with them, have higher expectations, and have confidence in their children's ability tend to have more interest in science. These students are also more likely to succeed in the science courses at higher levels.

In elementary school years, father educational level was also found to be positively related to perceived science task value Father educational level contributed to science achievement directly and indirectly through its effect on both perceived science self-concept and task value. However' the relationships between father educational level and science self-concept and science achievement were negative.

Similarly, a negative association was found between science self-concept and achievement. However, based on the related literature and theory, it was predicted that self-concept and achievement was positively related to each other. Similarly, positive relationships were expected between parents' educational level and self-concept and achievement. Only the relationship between mother educational level and achievement was found to be positive. The findings contrary to those in the literature and the theoretical expectations can be partly explained by Turkish educational system. Turkish educational system is highly competitive and test oriented. In Turkey, students enter countrywide exams to be able find opportunity to attend highly recognized high schools and universities. For this reason, getting better scores relative to others on the exams is one of the main goals of both students and their families. Moreover, since students' performance in the school contributes to their scores obtained on the countrywide exams, they have to get higher grades compared to others also on the teacher-made classroom exams.. In order to get satisfactory scores on the exams, most of the students in Turkey attend private courses and receive tutorials. Since graduating from top schools and universities can help students get better jobs and become more optimistic about their futures, especially educated parents spend great deal of money on private tutorials. Educated parents want their children to maintain their life-standards in the future. Such competitive environments and the concern about children's future life-standards can create a pressure on students and result in low levels of self-concept and impede educational performance. Therefore, although students have necessary ability to perform well, due to the parents' expectations and competitive learning environment, they can undermine their capabilities. Accordingly, students with lower levels of perceived self-concept can achieve at higher levels.

In addition, as expected, a positive relationship was found between perceived task value and achievement. At this point, it is important to note that on the questionnaire measuring students task value beliefs there were items like "for my future, it is useful to study science courses". Such statements are related to utility value and are mainly associated with extrinsic motivation. Considering Turkish educational context, therefore, it is not surprising that such statements are positively associated with achievement, family involvement, and father educational level.

On the other hand, concerning middle school students, family involvement, father educational level, and mother educational level were found to be positively associated with perceived science task value which was also positively linked to science achievement. Moreover, while the direct contribution of family involvement to science achievement was positive, that of father educational level was negative. Additionally, negative relationships were found between mother educational level, achievement and science concept. Indeed, the main difference between the findings in elementary and middle school levels was that although mother

educational level was not significantly related to perceived science self-concept and task value in elementary school level, it was significantly related to these two variables in middle school level. Therefore, it appeared that contribution of mother educational level to motivational variables became more pronounced in middle school level. These findings can again be explained by competitive nature of Turkish educational system and students' and parents' perception of education as only means of maintaining good life standards and better future. Indeed, in middle school years, stress created by the nationwide exams held to select students highly recognized high schools become more apparent. Thus, contribution of parents' related variables can be more obvious.

In sum, results of the present study did not fully support the findings in the literature. For example, Juang and Silbereisen (2002) demonstrated that more parental involvement, warmth, and school aspirations and academic discussions with parents are significantly related to more positive academic self-concept. Supporting this finding, Hung (2007) reported that students' capability beliefs are significantly linked to their classroom learning environment perceptions, parents' aspirations, and parents' involvement. However, in the present study, the relationship between family involvement and self-concept was found to be non-significant in both elementary and middle school level. Moreover, a negative relationship was found between self-concept and achievement in addition, father educational level was negatively linked to achievement. Expectancy-value theory suggests that student' beliefs about their academic capabilities, their expectations, and values are affected by parents' and/or teachers' beliefs and behaviors as well as how students' perceive and interpret these beliefs and behaviors (Eccles & Wigfield, 2002; Pintrich & Schunk, 2002; Wigfield et al., 2005). Accordingly, the present study contributes to related literature revealing the importance of cultural context in the interpretations of the findings. More specifically, the current study demonstrated that some of the theoretically and empirically established relationships may not be observed in a similar way in all contexts.

However, the present study has some limitations to consider in any attempt to generalize the findings. Firstly, participants of the study were students in urban elementary and middle public schools. Data from other school districts and from other school types can yield different results. The results may not be reliable if generalized beyond students enrolled in a similar situation and similar school culture and context. Secondly, the present study just relied on self-report data and did not include variables like students' attitudes toward school, previous achievement, motives, affect, classroom climate, peer comparison and families' real involvement. Therefore, it is suggested that in future studies qualitative research methods are integrated into research design to eliminate drawbacks of relying just on self-report instruments which may not completely reflect actual self-concept, task value beliefs or parental involvement. Moreover, in order to get an in depth

understanding of students' motivation and achievement in science in different grade levels, classroom environment perceptions, some important students characteristics (e.g., attitudes), and peer influence together with family related variables can be examined. Finally, in the present study, course grades were used as achievement scores. The study should be replicated with standardized science achievement tests.

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APPENDIX

Pearson correlation coefficients among family environment variables, motivational variables, and gender for elementary and middle school students

	1	2	3	4	5	6	7
Elementary School Students							
1. Gender	1	−.09	−.11	−.19(**)	−.19(**)	−.06	−.10
2. Sef-concept		1	.46(**)	.48(**)	.58(**)	.25(**)	.21(**)
3. Task Value			1	.41(**)	.31(**)	.14(*)	.17(**)
3. Family Involvement				1	.32(**)	.28(**)	.31(**)
4. Achievement					1	.26(**)	.25(**)
5. Father Education						1	.59(**)
6. Mother Education							1
Middle School Students							
1. Gender	1	−.02	−.074	−.18(**)	−.08	−.06	.05
2. Sef-concept		1	.59(**)	.28(**)	.48(**)	.29(**)	.22(**)
3. Task Value			1	.31(**)	.26(**)	.23(**)	.16(**)
3. Family Involvement				1	.06	.20(**)	.16(**)
4. Achievement					1	.24(**)	.27(**)
5. Father Education						1	.62(**)
6. Mother Education							1

** p < .01.