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## **Analysis of mathematics teachers' beliefs on mathematics instruction and teaching self-efficiencies within the scope of flow theory\***

**Abstract.** In this study, it was aimed to investigate the beliefs of mathematics teachers about mathematics instruction and their teaching self-efficacy within the scope of flow theory. Participants consists of a total of 228 mathematics teachers engaged in teaching at secondary and high school levels in Turkey; they were determined using the combinations of convenience and purposive sampling. Data from the participants were obtained using The WOrk-reLated Flow inventory (WOLF), The Ohio State Teacher Efficacy Scale (OSTES) and Mathematics Related Belief Scale (MRBS). Results revealed significant positive correlations among Constructivist Beliefs of WOLF, OSTES and MRBS. Furthermore, it was found that mathematics teachers graduated from the Education Faculty had higher MRBS Constructivist Beliefs than the ones graduated from Faculty of Arts and Sciences.

### **1. Introduction**

In most studies, especially in large scale educational researches such as TIMSS, PIRLS and PISA, the most important variables affecting students' achievement are the teachers and the qualifications that teachers have or do not have. This leaves us alone with the question 'what are the particular requirements for the qualified teacher'. Of course, this question does not have a single correct answer. In the literature, a number of variables, mainly professional and personal characteristics, beliefs, attitudes and self-efficacy of teachers have been taken into consideration in the studies based on teacher qualifications. Although many studies have been conducted on the self-efficacy concept as one of these variables, no studies have been

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found in the literature on the relationship between mathematics teachers' beliefs about teaching self-efficacy within the scope of flow theory and their beliefs about mathematics instruction. In this study, the relationship of these three variables have been analyzed.

## 2. Theoretical Background and Hypothesis

In Csikszentmihalyi, 1975, who first referred to the concept of flow as a 'state of emotion', the term was depicted as a concept that represents the joy, pleasure, and the feelings of love that people receive from their activity as a whole. In the years following the first definitions of the concept, the flow theory that addressed the activity process including the cognitive skills of the individuals expressed that the individual experiences a sense of control, gives high level of attention to his/her work, enjoys cognitive pleasure, and there is a harmony between the tasks that he/she carries out and his/her abilities (Csikszentmihalyi, 1990). Csikszentmihalyi, 1990, who argued that it is possible for the individual to reach happiness by controlling his/her inner life, stated that the individual could keep his/her inner life under control and experience the most enjoyable moments of his/her life by directing his/her attention to realistic goals and when his/her skills overlaps with the challenges that he/she face. In such a case, the individual, who is fully focused on what he/she is doing, will achieve flow experience and will realize that he/she has control over his/her action.

Flow experience is closely related to positive emotions, high concentration, intrinsic motivation and sense of control (Csikszentmihalyi, 1990). The results of the study, which showed a positive relationship between flow experience and intrinsic motivation, showed that individuals experience intrinsic motivation and thus flow experience in the activities that they carried out by free choices (Csikszentmihalyi, LeFevre, 1989). On the other hand, extrinsic motivation hampers the flow experience because it is a concern (Csikszentmihalyi, 1997). In addition, Csikszentmihalyi, 1997 stated that the individual can achieve the flow experience more easily in case of having a high motivation, specific goals, and a suitable environment for achieving these goals. On the other hand, the work-related flow which means for the individual to enjoy and like his/her work, to forget about earthly affairs while working, to be at the top of concentration, to be motivated and to devote him/herself to his/her work, is the most difficult flow type. Basically, the work-related flow defined by Bakker, 2005 can be defined as moments, experiences, where the individual achieved the highest satisfaction while working. Csikszentmihalyi, 1997 stated that work related flow is a salvation for those who are not particularly satisfied with their jobs: A grocery store employee, security officer, or even a teacher can make a difference even if he/she doesn't like, he/she can be fascinated by the job by getting rid of the routines and he/she can catch happiness. The important thing here is to get rid of the routines.

Flow studies, especially in the field of industry, have also affected the teaching field along with other fields. For example; the studies in the field of teaching focused on areas such as music and dance education (Csikszentmihalyi, Robinson, 1990), consultant training (Whitmire, 1991), educational technologies (Konradt,

Sulz, 2001), education management (Zimbardo, 2005). The results of the research conducted by Hagoboam, 2010, one of the most comprehensive studies in the literature, are as follows; the flow of male and female teachers is similar; primary school teachers experience more work-related flow than secondary and high school teachers. In addition, it is another important result of the study that teachers have a higher average score from the enjoyment subscale regarding intrinsic motivation, enjoyment and absorption subscales.

One of the attributes that work-related flow is related is the *self-efficacy* defined by Bandura, 1997 as 'the ability of an individual to perform certain tasks using existing skills.' Bandura, 1999 states that individuals with high self-efficacy feel good and have high organizational commitment. In addition, these people are also more successful in dealing with work-related challenges. According to empirical studies, self-efficacy positively affects work motivation and work-related flow; increase the fighting power of the individual against challenges; and encourages the individual to make more effort.

Bandura, 1977 described two dimensions of self-efficacy, which are results expectations and competency expectations. According to him, the result expectations are based on the expectations of the individuals about the outcome of executing an action. Competency expectation is related to the conformance of the individual's efforts for taking an action to his/her own beliefs about own personal self-efficacy. Self-efficacy theory, which was basically based by Bandura, 1977, was adapted to many work areas. One of them is teacher self-efficacy. Although teacher self-efficacy has been reduced to different sub-dimensions by many researchers, the most cited study in the literature is the modeling of Tschannen-Moran, Woolfolk-Hoy, 2001. The authors modeled teacher self-efficacy under three headings as student engagement, instructional strategies and classroom management based on the self-efficacy expectations dimension of Bandura, 1977.

In teacher self-efficacy studies, it was found that teachers with high self-efficacy had strong beliefs and these beliefs influenced teachers' teaching processes (Stipek, Givvin, Salmon, MacGyvers, 2001; Thompson, 1992). In this respect, it can be said that beliefs are the most important determinant of teachers' attitudes and behaviours during the teaching process. On the basis of the field, a teacher's beliefs about the nature of mathematics are the basis of his/her beliefs in mathematics instruction and learning process (Pajares, 1992; Thompson, 1992; Yonemura, 1986).

The beliefs about mathematics and mathematics instruction have been the subject of many researches, since these beliefs are known to have important effects on teaching practice (Borko, Livingston, 1989; Philipp, Joram, 2007; Philipp, 2007; Thompson, 1992). For this reason, in order to make changes in the teachers' field knowledge or classroom practices, their beliefs about mathematics and its instruction should be changed first (Griffin, 1983; Senger, 1998). For this reason, teachers' beliefs should definitely be taken into consideration in the professional development works. Otherwise, the new materials, which teachers will use with their old beliefs and knowledge, will have no effect on the success of the reforms (Cohen, Ball, 1990; Price, Ball, 1997). This change in the beliefs of teachers will only be possible with a good understanding of the concept of belief. The studies conducted in this field indicate that researchers grouped teachers' beliefs about

nature of mathematics and mathematics teaching and learning in different ways (Lerman, 1983; Ernest, 1989; Thompson, 1992; Van Zoes, Jones, Thornton, 1994). However, it is known that many teachers see mathematics only as factual realities, skills and algorithms (Sowder, 2007).

The beliefs about mathematics instruction, which are thought to be closely related to mathematics beliefs, were divided into three groups as constructivist, cognitive constructivist, and traditional by Thompson, 1992. Thompson, 1991 beliefs about mathematics instruction includes three-level modeling of beliefs; what is mathematics and what it means; what is taught when instructing mathematics, what should be the roles of teachers and students; and what constitutes students' knowledge and criteria for evaluating the accuracy, certainty and acceptability of mathematical results. Lindgren, 1996 modeled beliefs in three categories: rules and routines, discussion and games, open-approach. In this context, identifying the beliefs of mathematics teachers about mathematics instruction, determining the relationship between these beliefs and teaching self-efficacy it is important in the evaluation of work-related flow, which is the reflection of both concepts on teachers' teaching performance. Based on this importance, the purpose of this study was to determine the relationship between mathematics teachers' work-related flow, their beliefs about mathematics instruction and their self-efficacy and thus contribute to the field of mathematics education. Accordingly, the study assumes that among mathematics teachers:

1. Work related flow, teaching self-efficacy and belief scores related to mathematics instruction will differ significantly in favor of male teachers [H<sub>1</sub>];
2. Constructivist belief scores related to work related flow and mathematics instruction will differ significantly in favor of Education Faculty graduated teachers; whereas traditional belief and teaching self-efficacy scores related to mathematics instruction will differ significantly in favor of the students from Faculty of Arts and Sciences [H<sub>2</sub>];
3. There will be a significant positive relationship between work-related flow scores and the scores of teaching self-efficacy [H<sub>3</sub>];
4. There will be a significant positive relationship between work related flow scores and the scores of constructivist beliefs on mathematics instruction; there will be a significant negative relationship with traditional belief scores [H<sub>4</sub>];
5. There will be a significant positive relationship between teaching self-efficacy scores and the scores of constructivist beliefs on mathematics instruction; there will be a significant negative relationship with traditional belief scores [H<sub>5</sub>].

### 3. Method

#### Sample

Participants consists of a total of 228 mathematics teachers engaged in teaching at secondary and high school levels in Turkey, they were determined using the combinations of convenience and purposive sampling. Regarding these participants, 126 were female (55.6%), 101 were male (44.4%) and teaching seniority ranged from 1 to 38 years ( $M=10.7$ ;  $SD=8.03$ ). In addition, 135 of the participants were graduated from the Education Faculty (59.2%), whereas 91 of them were from the Faculty of Arts and Sciences (40.8%); 159 (69.7%) of them completed graduate education and 68 (40.8%) post graduate education.

### 4. Instruments

#### The Work-reLated Flow inventory (WOLF)

The WOLF includes 13 Likert-type items under three sub-scales (i.e., 'Absorption, Work Enjoyment and Intrinsic Work Motivation') (Bakker, 2008). WOLF was prepared based on Csikszentmihalyi, 1990, 1997 flow theory to evaluate the flow that employees experience at work. The items are rated on a 7-point Likert scale, ranging from 'always' to 'never'. The flow experience refers to a short time period, i.e., the preceding days or weeks. 'Absorption (AB)' subscale consists of 4 positive items (1, 2, 3, 4); 'Work Enjoyment (WE)' subscale consists of 4 positive items (5, 6, 7, 8) and 'Intrinsic Work Motivation (IWM)' subscale consists of 5 positive items (9, 10, 11, 12, 13). Çakmak, Öztekin, Danişman, Uslu, Karadağ, 2015 adapted the scale into Turkish. Internal consistency of the WOLF data in the current study ranged from .85 to .88 (Table 1).

(i) Absorption: The high score obtained from this subscale is an indication that mathematics teachers lost themselves in their lessons.

Examples of items:

- (1) When I am working, I think about nothing else
- (2) I get carried away by my work

(ii) Work Enjoyment: The high score from this subscale is an indicator that mathematics teachers enjoy their lessons.

Examples of items:

- (1) My work gives me a good feeling
- (2) I do my work with a lot of enjoyment

(iii) Intrinsic Work Motivation: The high score obtained from this subscale is an indicator of the inner motivation of mathematics teachers.

Examples of items:

- (1) I would still do this work, even if I received less pay
- (2) I find that I also want to work in my free time

### Ohio State Teacher Efficacy Scale (OSTES)

OSTES includes 24 Likert-type items under five subscales (i.e., 'Guidance Self-efficacy, Behavior Management Self-efficacy, Motivation Self-efficacy, Teaching Skills Self-efficacy, Assessment and Evaluation Self-efficacy') (Tschannen-Moran, Woolfolk-Hoy, 2001). OSTES, was prepared for evaluating teachers' self-efficacy based on Bandura, 1977 efficacy theory. The items are rated on a 5-point Likert scale, ranging from 'never' to 'always'. 'Guidance Self-efficacy (GS)' subscale consists of 6 positive items (2, 5, 8, 9, 16, 22); 'Behavior Management Self-efficacy (BMS)' subscale consists of 5 positive items (3, 9, 13, 15, 21); 'Motivation Self-efficacy (MS)' subscale consists of 6 positive items (4, 6, 7, 11, 12, 24); 'Teaching Skills Self-efficacy (TSS)' subscale consists of 5 positive items (1, 14, 17, 20, 13) and 'Assessment and Evaluation Self-efficacy (AES)' subscale consists of 2 positive items (10, 18). Baloğlu, Karadağ, 2008 adapted the scale into Turkish. Internal consistency of the OSTES data in the current study ranged from .71 to .83 (Table 1).

(i) Guidance Self-efficacy: The high score obtained from this subscale is an indicator of the self-efficacy of the mathematics teachers to direct the students to the teaching objectives.

Examples of items:

- (1) How much can you do to help your students think critically?
- (2) How well can you establish routines to keep activities running smoothly?

(ii) Behavior Management Self-efficacy:

The high score obtained from this subscale is an indicator of the self-efficacy of mathematics teachers in controlling students' behaviors that prevent, slow down or divert learning objectives in the teaching environment.

Examples of items:

- (1) How much can you do to control disruptive behavior in the classroom?
- (2) How much can you do to get children to follow classroom rules?

(iii) Motivation Self-efficacy: The high score obtained from this subscale is an indicator of mathematics teachers' motivation and encouragement self-efficacy to students towards learning.

Examples of items:

- (1) How much can you do to motivate students who show low interest in school work?
- (2) How much can you do to get students to believe they can do well in school work?

(iv) Teaching Skills Self-efficacy: The high score obtained from this subscale is an indicator of the self-efficacy of mathematics teachers in achieving their teaching goals by guiding learning.

Examples of items:

- (1) How much can you do to get through to the most difficult students?
- (2) How much can you do to improve the understanding of a student who is failing?

(v) **Assessment and Evaluation Self-efficacy:** The high score obtained from this subscale is an indicator of the self-efficacy of mathematics teachers in determining the level of attaining of the learning objectives with different methods.

Examples of items:

- (1) How much can you gauge student comprehension of what you have taught?
- (2) How much can you use a variety of assessment strategies?

### **Mathematics Related Belief Scale (MRBS)**

The MRBS includes 32 Likert-type items under three sub-scales (i.e., 'Constructivist Beliefs and Traditional Beliefs') (Kayan, 2011). MRBS was built considering the combination of a literature review on the beliefs about mathematics and mathematics instruction conducted by Haser, 2006 and the survey developed by Haser, Dogan, 2009. The items are rated on a 5-point Likert scale, ranging from 'Strongly Disagree' to 'Strongly Agree'. 'Constructivist Beliefs (CB)' subscale consists of 23 positive items (1, 2, 5, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32) and 'Traditional Beliefs (TB)' subscale consists of 9 positive items (3, 4, 6, 7, 8, 9, 10, 21, 23). Internal consistency of the MRBS data in the current study ranged from .75 to .92 (Table 1).

(i) **Constructivist Beliefs:** The high score obtained from this subscale is an indicator of mathematics teachers' constructivist beliefs about mathematics.

Examples of items:

- (1) Purpose of teaching mathematics is developing students' reasoning by researching mathematical concepts
- (2) The teacher should let the students use many learning games while mathematics teaching.

(ii) **Traditional Beliefs:** The high score from this subscale is an indicator of mathematics teachers' traditional beliefs about mathematics.

Examples of items:

- (1) Students should solve many problems to learn mathematics
- (2) Teacher's role is to demonstrate the procedures as mathematical knowledge.

## 5. Procedure

After the permission to use the WOLF, OSTES and MRBS was obtained, a research package including the demographic questions and the items of the WOLF, OSTES and MRBS was assembled. Math teachers were contacted during their classes and informed about the study. The participants signed consent forms, and it took approximately 30 minutes. The gender and the faculty of graduation of the participants were compared in terms of research variables by independent t-test and the relationships between variables were analyzed by Pearson product-moment correlation coefficient.

## 6. Findings

The study described the participants' work-related flow, self-efficacy and beliefs about mathematics instruction (Table 1). Work related flow scores of the participants were quite high ( $M=5.37$ ,  $SD=0.96$ ); regarding the subscales, the highest score was observed for 'Work Enjoyment and Intrinsic' ( $M=5.78$ ,  $SD=1.12$ ), which indicates enjoying teaching. In the study, the teacher self-efficacy that the participants achieved the highest average score was 'Guidance Self-efficacy' ( $M=4.07$ ,  $SD=0.45$ ), whereas the subscale with lowest average score was 'Behavior Management Self-efficacy' ( $M=3.87$ ,  $SD=0.48$ ). In addition, it was seen that participants adopted 'Constructivist Beliefs' ( $M=4.48$ ,  $SD=0.41$ ) in mathematics instruction.

The subscales of WOLF, OSTES and MRBS were analyzed by *independent t-test* method in terms of gender variable (Table 1). The results showed that male participants felt themselves more competent than female participants in both overall and all subscale scores of OSTES ( $p<.01$ ). In contrast, there was no significant difference between the average scores of males and females in the subscales of both WOLF and MRBS. According to these results, Hypothesis 1 created at the beginning of the research was rejected except for the findings of OSTES.

**Table 1.** WOLF, OSTES and MRBS Sub-scale means, standard deviations, internal consistency coefficients, and t-test results according to gender

Sub-scales	Alpha	M	SD	Female		Male		t
				M	SD	M	SD	
<b>The Work-reLated Flow inventory (WOLF)</b>								
WOLF total	.91	5.37	0.96	5.33	0.91	5.41	1.03	-.56
AB	.88	5.19	1.13	5.18	1.06	5.17	1.21	.08
WEI	.85	5.78	1.12	5.71	1.11	5.85	1.14	-.88
WM	.86	5.19	1.11	5.15	1.08	5.24	1.15	-.62
<b>Ohio State Teacher Efficacy Scale (OSTES)</b>								
OSTES total	.87	3.96	0.45	3.88	0.42	4.05	0.46	-2.80**
GS	.83	4.07	0.45	4.01	0.44	4.15	0.45	-2.33*
BMS	.78	3.87	0.48	3.78	0.45	3.99	0.50	-3.45**
MS	.80	3.87	0.48	3.82	0.47	3.94	0.48	-1.97*
TSS	.75	3.90	0.57	3.81	0.52	3.99	0.61	-2.41*
AES	.71	3.97	0.58	3.88	0.56	4.06	0.59	-2.38*
<b>Mathematics Related Belief Scale (MRBS)</b>								
CB	.92	4.48	0.41	4.49	0.41	4.47	0.41	.32
TB	.75	2.97	0.64	2.96	0.59	2.99	0.69	-.30

\* $p < .5$ ; \*\* $p < .01$ ,  $df = 225$

**AB:** Absorption; **WEI:** Work Enjoyment and Intrinsic; **WM:** Work Motivation  
**GS:** Guidance Self-efficacy, **BMS:** Behavior Management Self-efficacy, **MS:** Motivation Self-efficacy, **TSS:** Teaching Skills Self-efficacy, **AES:** Assessment and Evaluation Self-efficacy', **CB:** Constructivist Beliefs; **TB:** Traditional Beliefs

The subscales of WOLF, OSTES and MRBS were analyzed by independent t-test method in terms of faculty of graduation (Education & Arts and Sciences) variable (Table 2). The results showed that participants who are graduated from Faculty of Arts and Sciences felt themselves more competent than Education Faculty graduated participants in both overall and all subscale scores of OSTES ( $p < .01$ ). MRBS's CB subscale scores of Education Faculty graduated participants ( $M=4.53$ ,  $SD=0.37$ ) is significantly higher than graduates of Faculty of Arts and Sciences scores ( $M=4.41$ ,  $SD=0.46$ ) ( $p < .01$ ). On the other hand, MRBS's TB subscale scores of Arts and Sciences Faculty graduated participants ( $M=3.08$ ,  $SD=0.67$ ) is significantly higher than Education Faculty graduated participants' ( $M=2.97$ ,  $SD=0.62$ ) ( $p < .01$ ). However, no significant difference was observed between the average scores of Education Faculty and Arts and Sciences Faculty graduates regarding WOLF's average scores in overall and sub-scales. According to these results, Hypothesis 2 created at the beginning of the research was supported except for the findings of WOLF.

**Table 2.** WOLF, OSTES and MRBS Sub-scale t-test results according to gender

Sub-scales	<i>Education Faculty</i>		<i>Arts and Sciences Faculty</i>		<i>t</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<b>The Work-reLated Flow inventory (WOLF)</b>					
WOLF total	5.34	0.92	5.41	1.02	-.51
AB	5.17	1.08	5.19	1.20	-.12
WEI	5.74	1.08	5.83	1.18	-.61
WM	5.16	1.09	5.26	1.13	-.65
<b>Ohio State Teacher Efficacy Scale (OSTES)</b>					
OSTES total	3.89	0.46	4.05	0.40	-2.54*
GS	4.02	0.46	4.13	0.42	-1.81*
BMS	3.81	0.50	3.97	0.45	-2.47*
MS	3.81	0.50	3.95	0.43	-2.13*
TSS	3.82	0.58	4.00	0.54	-2.42*
AES	3.86	0.59	4.12	0.54	-3.32*
<b>Mathematics Related Belief Scale (MRBS)</b>					
CB	4.53	0.37	4.41	0.46	2.14*
TB	2.97	0.62	3.08	0.67	-1.99*

\* $p < .5$ ;  $df = 224$

**AB:** Absorption; **WEI:** Work Enjoyment and Intrinsic; **WM:** Work Motivation  
**GS:** Guidance Self-efficacy, **BMS:** Behavior Management Self-efficacy, **MS:** Motivation Self-efficacy, **TSS:** Teaching Skills Self-efficacy, **AES:** Assessment and Evaluation Self-efficacy', **CB:** Constructivist Beliefs; **TB:** Traditional Beliefs

The relationships between WOLF's, OSTES's and MRBS' sub-scales were analyzed by Pearson-moment Correlation Coefficient (Table 3). The results showed that WOLF's overall and sub-scales scores are positively correlated with OSTES' overall and subscales; therefore Hypothesis 3 was supported. In addition, the results indicated that WOLF's overall and sub-scales scores had a positive significant correlation with MRBS's CB sub-scale, but no significant correlation with TB was observed; therefore Hypothesis 4 was supported except for the findings of TB. Moreover, the results showed that OSTES' overall and subscales had a positive significant correlation with MRBS's CB sub-scale but no significant correlation with TB was observed; therefore Hypothesis 5 was supported except for the findings of TB.

**Table 3.** WOLF, OSTES and MRBS Sub-Scales Correlation Matrix

Sub-scales	1	2	3	4	5	6	7	8	9	10	11	12
<b>The WOrk-reLated Flow inventory (WOLF)</b>												
1-WOLF total	-											
2-AB	.78**	-										
3-WEI	.90**	.57**	-									
4-WM	.89**	.49**	.75**	-								
<b>Ohio State Teacher Efficacy Scale (OSTES)</b>												
5-OSTES total	.40**	.36**	.38**	.30**	-							
6-GS	.38**	.34**	.36**	.30**	.90**	-						
7-BMS	.37**	.31**	.35**	.28**	.92**	.79**	-					
8-MS	.38**	.36**	.36**	.26**	.90**	.76**	.79**	-				
9-TSS	.30**	.28**	.27**	.23**	.91**	.77**	.82**	.76**	-			
10-AES	.39**	.33**	.38**	.31**	.79**	.68**	.72**	.68**	.68**	-		
<b>Mathematics Related Belief Scale (MRBS)</b>												
11-CB	.27**	.22**	.21**	.26**	.27**	.32**	.28**	.19**	.19**	.24**	-	
12-TB	.06	.02	.07	.07	.04	-.02	.06	.09	.03	.06	.00	-

\* $p < .05$ , \*\* $p < .01$

**AB:** Absorption; **WEI:** Work Enjoyment and Intrinsic; **WM:** Work Motivation  
**GS:** Guidance Self-efficacy, **BMS:** Behavior Management Self-efficacy, **MS:** Motivation Self-efficacy, **TSS:** Teaching Skills Self-efficacy, **AES:** Assessment and Evaluation Self-efficacy', **CB:** Constructivist Beliefs; **TB:** Traditional Beliefs

## 7. Discussion and Conclusion

In this study, it was focused on the relationship between mathematics teachers' work-related flow, beliefs about mathematics instruction and teaching self-efficacy. Findings showed a positive correlation between work related flow and teaching self-efficacy. The findings also indicated a positive correlation between work related flow and teaching self-efficacy and constructivist beliefs dimension of mathematics instruction belief. In the literature, there are studies that have found a relationship between teachers' beliefs about both mathematics and mathematics instruction and their self-efficacy (İşıkşal, 2005). Woolfolk, Hoy, 1990 identified a partial consistency between teachers' beliefs about classroom practices and their self-efficacy beliefs. According to the authors, self-efficacy is an important predictor of learning and teacher behavior beliefs (Henson, 2001). Again, in a similar study, Kagan, Smith, 1988 found a relationship between teachers' beliefs and their in-class practices and self-efficacy. In addition, the qualities included in flow theory namely, (i) a clear objective, (ii) equal and high-level skills and challenges, (iii) focused attention, (iv) control, (v) loss of self-consciousness, (vi) feedback, (vii) change in the perception of time; and (viii) the autotelic experience qualifications (Csik-

szentmihalyi, 1990; Novak, Hoffman, Yung, 2000) are mainly related to the belief systems. In order to achieve certain goals, the individual should be able to organize his/her behaviors and to be aware of his/her personal qualities, in other words, to have a sense of self-efficacy (Bandura, 1988). It is possible for the individual who is aware of his/her personal qualities to focus his/her attention and energy on the determined targets, to fulfill his/her responsibilities with autotelic experience that he/she has. Therefore, individuals who are fighter in terms of their personal characteristics and who prioritize ensuring intrinsic motivation in their activities are likely to experience a flow experience. Therefore, there is an important relationship between being aware of personal characteristics and self-efficacy and flow experience (Basom, Frase, 2004). These new findings have not been reported in the previous literature and can provide insight for both practitioners and researchers.

Study findings showed that mathematics teachers experienced high levels of flow. Flow theory suggests that individuals who place more importance on intrinsic rewards rather than external awards are more likely to experience flow experiences (Csikszentmihalyi, 1990). At the same time, the high teacher self-efficacy obtained in this study also confirms this finding. Individuals who fight against challenges, having a sense of responsibility and high self-efficacy experience more flow (Salanova, Schaufeli, Martinez, Bresó, 2009).

The results showed that mathematics teachers felt competent, nonetheless their behavior management self-efficacy was low. In addition, male teachers feel more competent than female teachers. Regarding the studies in the literature, the self-efficacy of teachers did not differ according to gender in some studies (Gençtürk, 2008; Doering, Scharber, Miller, Veletsianos, 2009), whereas, a difference in terms of gender was identified in some others (Lewandowski, 2005; Ordóñez Feliciano, 2009; Yavuz, 2009). Therefore, one of the clearest findings of this study is the analysis of gender differences in terms of teacher self-efficacy is a very complex task.

Handal, 2003 stated that the studies generally show that teacher candidates and students have traditional beliefs. In addition, the findings showed that constructivist beliefs were dominant among teachers; constructivist beliefs of those who graduated from the Education Faculty were higher than the graduates of the Faculty of Arts and Sciences. These two findings can be explained as follows: since 2005 Turkey, where the study was carried out, has switched to the constructivist learning approach in all educational levels. The low seniority of the participants indicates that they were carrying out teaching activities with constructivist learning approach since the entry into the profession. In Turkey, mathematics teachers are either graduated from the Education Faculty or graduated from the Faculty of Arts and Sciences and attended to the formation program. Education faculties last four years with predominant mathematics and teaching field education courses. However, formation programs are short-term courses. In the researches of Eryilmaz, 2005 and Haser, 2006, it was found that teaching programs (Education Faculty) influenced teacher candidates' beliefs about mathematics, mathematics instruction and learning. At the same time, researches based on belief revealed that the educational experiences encountered since their primary school years have been effective in the formation of teachers' mathematical beliefs (Carter, Norwood, 1997; Ka-

gan, 1992a,1992b; Kane, Sandretto, Heath, 2002; Lasley, 1980; Thompson, 1992; Pajares, 1992; Richardson, 1996). According to the evaluation of the results with literature, it can be said that the results met the pre-study assumptions.

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