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Achievement motivation of primary mathematics education teacher candidates according to their cognitive styles and motivation styles*

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Abstract

The aim of this study is to reveal whether there is relation between achievement motivations of teacher candidates according to their cognitive styles and motivation styles or not. This study was designed as a quantitative study due to collecting quantitative data and running statistical analyses. Both comparative and correlational survey methods were used because of the fact that it was aimed to determine cognitive styles, motivation styles and achievement motivation of the teacher candidates and to investigate the relationship between these variables. Findings revealed that achievement motivations of the teacher candidates did not differ significantly in terms of gender and cognitive styles. However, it was found that achievement motivations of the teacher candidates differed significantly in terms of their grade levels and motivation styles.

Keywords: Primary mathematics teacher candidates, Field dependent-field independent cognitive styles, Achievement motivation.

Introduction

When the studies conducted in the area of education are examined, it is seen that a special interest exists towards individual differences of students and effects of these differences on success and performances of students. Differences of gender, thinking abilities, cognitive

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styles, teaching styles, areas of intelligence, motivation styles etc. can be thought as individual differences. It is seen that there are many studies about cognitive characteristics which are among these individual differences and get special interest in the area of education (Witkin, Oltman, Raskin, & Karp, 1971; Witkin, Moore, Goodenough, & Cox, 1977; Witkin & Goodenough, 1981; Bahar & Hansell, 2000; Taşar, 2001; Aydın, 2009; Karaçam & Ateş, 2010). Cognitive styles (field dependence-field independence (Witkin & Goodenough, 1981), reflectivity-impulsivity (Kagan, 1965; as cited in Dinçer, 1993), leveling- sharpening (Klein, 1954; as cited in Dinçer, 1993)) and learning styles (Kolb, 1984; Biggs, 1987) etc. take place among these cognitive characteristics. In addition to these, some researchers (Adar, 1969; Kempa & Diaz, 1990; Al-Naeme, 1991; Hofstein & Walberg, 1995; Solomon, 1996) have also focused on motivation styles of students.

Cognitive style means the methods preferred in the process of getting information, organizing, processing and storing information in memory to use it as needed (Witkin et al., 1977). Moreover, it is also defined as the ways that individuals prefer while organizing new information with existing information, interpreting new information and adapting these interpretations to their lives (Hayes & Allinson, 1998). It refers to the ways taken while achieving a purpose rather than achieving a purpose. One of these styles is the field dependent-field independent cognitive style. As a result of studies, it has emerged that characteristic differences have existed among individuals having field dependent-field independent cognitive styles (Witkin et al., 1977; Witkin & Goodenough, 1981; Riding & Cheema, 1991; Bahar, 1999; Bahar, 2003a, Ateş & Çataloğlu, 2007; Çataloğlu & Ateş, 2013). The characteristic differences belonging to this cognitive style are seen in Table 1.

Table 1. *The characteristic differences of field dependent-independent individuals*

Field Dependent	Field Independent
• Wholistic	• Analytic
• Externally-oriented	• Internally-oriented
• Social and enterprising	• Individual
• Traditional	• Experimental
• Sensitive to others	• Not addicted to others
• Accepts thoughts as presented	• Describes concepts through analyses

(Jonassen & Grabowski, 1993)

Studies have indicated that there is a significant correlation between cognitive styles and success of individuals (Al-Naeme, 1991; Bahar & Hansell, 2000; Bahar, 2003; Ateş & Çataloğlu, 2007). Moreover, another concept thought as related to success is achievement motivation. Success motivation, taking part in social learning motivation theories and produced by Atkinson (1946, as cited in Uysal ve Koğ, 2012), is the need of individuals of "escaping from failure" and "being successful". Value attributed to success by individuals can change according to various factors as age, gender, socio-cultural environment, obtained aims in life (Wigfield, Eccles, Roeser ve Schiefele, 2009).

Since need is tension occurred in individual due to feeling inadequate physically or mentally, motivation is provided if the wish of fulfilling the need is enough to change the thought into a behaviour. According to MC Clelland's (as cited in Karalar, 2006) learned needs theory, there are three needs that motivate individuals. These are success motivation, be admitted (belonging to) and need of power. Success motivation consists of going further and taking responsibility in solving problems (Karalar, 2006, p.95).

Success of a student is directly related to achievement motivation (Umay 2002). Murray (1938) defines achievement motivation as finalizing some difficult things, overcoming some obstacles, achieving a high standard, passing self and others and increase of self-esteem (as cited in Umay, 2002). If this is a feature not inherited, it is emerged as a major indicator to ensure success that individuals determine how much achievement motivation they have. Achievement motivation is that an individual targets to reach the level of excellence and always strives to improve. Individuals having this adequacy are result-oriented and they highly motivate themselves to reach their own aims and standards, take risk and set challenging purposes to themselves, always pursue information to reduce instability and look for new ways to do something better and learn how to improve their own performance (McClelland & Koestner, 1992).

Many theories related to motivation have existed. Although many of these are different than each other, two important factors appear in these theories: need and willingness. Adar (1969), known with the studies related to student motivation, states that motivation styles of students form according to their needs. These are the needs of success, satisfying curiosity, fulfilling task, having close relationship with other people. Adar has approved that there are 4 motivation styles parallel to needs of students: successful, curious, conscious and social. Moreover, many studies related to motivation styles which were based on the classification of Adar were conducted (Kempa & Diaz, 1990; Johnstone & Al-Naeme, 1995; Bahar, 2002; 2003). In all of these studies, motivation styles were thought as an important factor for effective learning and performance of students in different education environments.

When it was investigated whether there is a relationship between gender and grade level, different results appealed in the literature. Ligon (2006) investigated success motivation of 175 students from different grade levels in the study. As a result, the researcher stated that success motivation of the students differed significantly in terms of their development levels. Moreover, he found that same difference did not exists in terms of gender. Some other studies however, found significant differences between girls' and boys' success motivation and constructs related to success motivation (Linenbrink & Pintrich, 2002; Wigfield & Eccles; 2002).

It is investigated in some studies related to motivation styles that motivation style differentiation in terms of gender. In the study of Kempa and Diaz (1990), it appealed that 390 high school students condensed mostly on two motivation styles in terms of gender. It was stated that girls had mostly conscious motivation style whereas boys had successful motivation style. In the study of Trumper (1995) conducted in Israel, it was seen that the results of 944 students, ages of 14-17, resembled. Bahar (2002) stated that it was not possible to classify all students under only one motivation style; students could have other than one motivation style and exhibit one of them more dominantly in many cases. He also stated that gender had impact on motivation styles and boys mostly have success motivation although girls had conscious and curious one. Durmuş (2006) found in his study that most of the students educating at the Department of Mathematics had curious and conscious motivation style. In this study, it also appealed that gender differences influenced motivation style. Moreover, it was stated that boys and girls had curious and conscious motivation style, respectively.

In the light of studies mentioned above, it can be said that gender, cognitive styles, motivation styles and achievement motivation are among factors that affect success of individuals. Mathematics is one of the lessons that students are less successful. For increasing success in mathematics, it is required to research the factors that affect success of individuals. It is thought important that researching the relationship between gender, cognitive styles,

motivation styles and achievement motivation, among the factors affecting success of individuals, in terms of primary mathematics education teacher candidates. The aim of this study is to reveal whether there is relation between achievement motivations of teacher candidates according to their cognitive styles and motivation styles or not. For this aim, the following questions have been tried to be answered:

1. Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of gender?

2. Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of grade level?

3. Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of cognitive styles?

4. Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of motivation styles?

Method

The Research Design

This study was designed as a quantitative study due to collecting quantitative data and running statistical analyses. Both comparative and correlational survey methods were used because of the fact that it was aimed to determine cognitive styles, motivation styles and achievement motivation of the teacher candidates and to investigate the relationship between these variables (Fraenkel ve Wallen, 2006; Karasar, 1999, s.77-86).

The Participants

Accessible sampling method was used to determine the participants of the study. The study was conducted with 114 teacher candidates educating in the Department of Primary Mathematics Education of a state university. 46 (40.4 %) of the participants were males and 68 (59.6 %) of the participants were females. Of the participants, 36 were 1st grade, 32 were 2nd grade and 46 were 3rd grade. The study was conducted at the end of the spring semester of 2013-2014 academic years. Therefore the teacher candidates studying for PPSE (Public Personnel Selection Exam in Turkey) were not included in the study.

Data Collection Tools

In the study, three data collection tools were used. The Group Embedded Figure Test were given to the teacher candidates at first and it was aimed to reveal their cognitive styles while collecting data. Then the form A of the Motivation Styles Scale was given to the participants. The scores of success motivation of the teacher candidates were determined. Lastly, the form B of the Motivation Styles Scale were given to the teacher candidates and it was revealed that the motivation styles of them by eveluating two forms together

Group Embedded Figures Test

In the study, Turkish version of Group Embedded Figures Test, developed by Witkin, Moore, Goodenough ve Cox (1977), was used as data collection tool to determine the cognitive styles of teacher candidates. The test was translated into Turkish by Bahar (1999). The KR-20 coefficient of the test was calculated as 0.80. The test is about finding predetermined 8 shapes among mixed 20 shapes (See Figure 1).

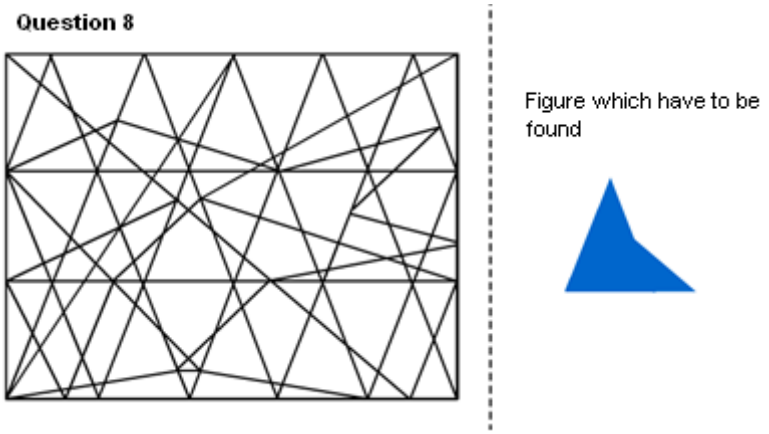

Figure 1. An example of the questions in Group Embedded Figures Test

The minimum score of the test is 0 whereas the maximum score of the test is 20. The teacher candidates were categorized as field dependent, medium and field independent according to the scores they obtained on Group Embedded Figures Test. The teacher candidates' cognitive styles were determined according to a criterion used by Case (1974), Case and Golberson (1974), Scardamalia (1977) and Alamolhodaei (1996). Teacher candidates who had a score less than $\frac{1}{4}$ standard deviation below the mean were classified as field dependent (FD < $M - \frac{1}{4}$ s), $\frac{1}{4}$ s above the mean were classified as field independent (FI > $M + \frac{1}{4}$ s) and between ($M \pm \frac{1}{4}$ s) were those who may be located between the above two styles who were labelled as field-intermediate learners (Alomolhodaei, 2002) (See Figure 2).

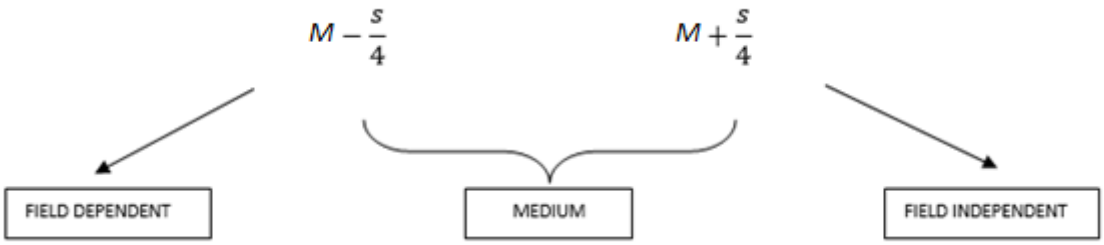

Figure 2. The formula used to determine the cognitive style categories of the teacher candidates

According to this formula, the teacher candidates whose scores were below 9.68 were categorized as "field dependent", the teacher candidates whose scores were above 11.71 were categorized as "field independent" and the teacher candidates whose scores were between these scores were categorized as "medium" (See Table 2).

Table 2. *The cognitive style categories of the teacher candidates*

Cognitive Style	f	%
Field Dependent	37	32.5
Medium	26	22.8
Field Independent	51	44.7
Total	114	100.0

The Motivation Styles Scale

A scale modified from the studies of Adar (1969) was used to determine the motivation styles of the teacher candidates. Reliability and validity studies of this version of the scale was carried out by Al-Naeme (1991) and Lyall and Johnstone (1999) and this version of the scale was used in current studies. This scale was also used in Turkey by Bahar (2002, 2003). The scale consists of expressions including girls' and boys' ideas about the process of teaching-learning. The ideas of four people was given as thought bubble for each factor and the teacher candidates were asked to choose the most appropriate one. For example;

Buğra: I enjoy hearing things that can be applied to everyday life.

Sena: It is important for me to be among ones who are the most hardworking of the class.

Ali: In class discussions, I do not declare my ideas that I am not very sure.

Elif: Support of my friends is very important for me when we have an exam

The scale consisted of form A and B. In the A form, the questions were given as 4 lines. In each line, the ideas of people given above were given as thought bubbles. They were asked to write the most appropriate name among the people having 4 ideas at the end of each line. In the B form, ideas of teacher candidates having motivation styles about classroom work, laboratory work, discovery learning and social life were gathered. The aim of giving the scale in two forms is that classifying the teacher candidates according to their motivation styles with the help of the results of the form A and supporting this result with the results of the form B. The study was hold by choosing teacher candidates having same motivation styles for both of the forms.

The motivation style of the participant is determined as "curious" if s/he chooses the views of Burak; "successful" if s/he chooses the views of Sena; "conscious" if s/he chooses the views of Ali; "social" if s/he chooses the views of Elif. It was appeared that none of the participants choose social motivation style (See Table 3).

Table 3. *Motivation styles of the teacher candidates*

Motivation Style	f	%
Curious	42	36.8
Successful	31	27.2
Conscious	41	36.0
Social	0	0.00
Total	114	100.0

The Achievement Motivation Scale

The scale which was developed by Umay (2004) and whose Croanbach Alfa coefficient was 0.75, was used to determine the achievement motivation of the teacher candidates. The scale consisting of 14 items, is a 5-point Likert-type scale. In the scale, positive items as "1. While studying, I prefer to study things struggling me.", "5. I believe that I can be successful if I study enough." and negative items as "4. I am disappointed if I cannot find solution of a question.", "6. The idea of being unsuccessful scares me." appear. The minimum score of the scale is 0 whereas the maximum score of the scale is 98. For this study, reliability study was done and

Croanbach Alpha coefficients was found as α=0.82. Therefore, it was considered that test measurement was reliable.

Data Analysis

Obtained data was transformed to a statistical program and statistical analyses were run. Frequencies and percentages were used to determine the cognitive styles and achievement motivation of the teacher candidates. Correlation coefficient was calculated to reveal whether correlation existed between two variables or not. Independent samples t-test and one-way ANOVA were used to investigate differences in terms of gender and grade level, respectively.

Results

In this part, results obtained from data collected by data collection tools through the study take place. At first, general statistical analyses related to "The Achievement Motivation Scale" was given. Then it was given that findings obtained from all data by being organized according to the order of sub-problems.

Descriptive Results Related to the Achievement Motivation Scale

In this study aiming to investigate achievement motivation of the teacher candidates educating at the Department of Primary Education, "The Achievement Motivation Scale" developed by Umay (2002) was used. There are 14 items in the scale. Means and standard deviations of each item of the scale are seen at the Table 4.

Table 4. *Achievement motivation of the participants*

	Quest.1	Quest.2	Quest.3	Quest.4	Quest.5	Quest.6	Quest.7	
M	4,60	5,30	4,84	4,65	6,14	4,35	4,44	
df	1,57	1,52	1,77	1,62	1,53	1,79	1,68	
	Quest.8	Quest.9	Quest.10	Quest.11	Quest.12	Quest.13	Quest.14	Total
M	5,32	5,76	5,75	4,52	4,10	4,17	6,22	70,15
df	1,37	1,38	1,54	1,65	1,65	1,68	1,56	10,65

When Table 4 is examined, it is seen that the means of the items 12 and 13 are lower than the means of other items. When these items were examined, it was appeared that these were the items intended to reveal whether external authority has effect on achievement motivation as "When I am successful, my teachers appreciate me" and "I believe that my teachers like me".

It was also found that the means of the items 5 and 14 were higher than the means of other items. When these items were examined, it was emerged that these were the items mostly related to intrinsic part of success as "I believe that I can be successful if I study enough" and "I feel happy when I overcome hard works".

Achievement Motivation of the Teacher Candidates in terms of Gender

The first research question of the study is as "Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of gender". Means and standard deviations of the scores of the teacher candidates obtained from "The Achievement Motivation Scale" were calculated to test this research question (See Table 5).

Table 5. *The scores of "The Achievement Motivation Scale" according to gender*

Gender	*n*	*M*	*df*	*t*
Female	68	70.40	10.27	-.301
Male	46	69.78	11.30	

When Table 5 is examined, it is seen that mean scores of the males (69.78) are lower than that of the females (70.40). Independent samples t-test was used to find whether there was a significant difference between the scores of the teacher candidates obtained from "The Achievement Motivation Scale" in terms of gender or not. It was found that there was not a statistically significant difference.

Achievement Motivation of the Teacher Candidates in terms of Grade Level

The second research question of the study is as "Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of grade level". Means and standard deviations of the scores of the teacher candidates obtained from "The Achievement Motivation Scale" were calculated to test this research question (See Table 6).

Tablo 6. *The scores of "The Achievement Motivation Scale" according to grade level*

Grade Level	*n*	*M*	*df*
1	36	73.30	13.17
2	32	65.84	9.27
3	46	70.65	8.32
Total	114	70.15	10.65

When Table 6 is examined, it is seen that the mean (73.30) of the 1st grade teacher candidates is the highest and the mean (65.84) of the 2nd grade teacher candidates is the lowest. The mean of 3rd grade teacher candidates is 70.65. The mean of all grade levels was found as 70.15. Moreover, it is seen that standard deviations decrease when grade levels of the teacher candidates increase.

One-way ANOVA was used to find whether there was a significant difference between the scores of the teacher candidates obtained from "The Achievement Motivation Scale" in terms of grade level or not. The results of one-way ANOVA were given in Table 7.

Table 7. *The results of one-way ANOVA related to scores of "The Achievement Motivation Scale" according to grade level*

	Sum of squares	*df*	Mean Square	*F*
Between groups	969.811	2	484.906	4.540*
Within groups	11856.654	111	106.817	
Total	12826.465	113		

* $p<.05$

When Table 7 is examined, it is seen that achievement motivation of the teacher candidates differ significantly in terms of grade level ($F_{(2\text{-}113)} = 4.540$, $p < .05$). In other words, achievement motivation of the teacher candidates differ significantly related to their grade levels. According to the result of Eta-square, it can be said that the size of the difference is moderate (h2=.08). The homogeneity of variances between groups was tested to determine which of the grade level/s cause(s) this difference and it was found that variance between groups was not homogeneous. Therefore, Tamhane's T2 test, one of the post-hoc tests which is used when variances are not homogeneous, was used to determine the grade level/s causing the difference. The results of Tamhane's T2 were given in Table 8.

Table 8. *The results related to Tamhane's T2 Test*

Grade Levels(I)	Grade Levels (J)	Difference of means (I-J)	Standard Error	*p*
1	2	7.49	2.51	.004*
	3	2.68	2.30	.246
2	3	-4.81	2.38	.046*

According to Table 7, it was found that there was a statistically significant difference between the achievement motivation of the 2nd grade teacher candidates and other teacher candidates. However, it was not found that a statistically significant difference between the 1st and 3rd teacher candidates.

Achievement Motivation of the Teacher Candidates in terms of their Cognitive Styles

The third research question of the study is as "Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of their cognitive styles". Means and standard deviations of the scores of the teacher candidates obtained from "The Achievement Motivation Scale" were calculated to test this research question (See Table 9).

Table 9. *The scores of "The Achievement Motivation Scale" according to cognitive styles*

Grade Levels	*n*	*M*	*df*
Field Dependent	37	69.57	12.47
Medium	26	68.81	11.15
Field Independent	51	71.25	8.94

When Table 9 is examined, it is seen that the field independent teacher candidates have the highest score (71.25) and the medium teacher candidates have the lowest score (68.81). It was also found that the score of the field dependent teacher candidates was 69.57. Moreover, it was seen that the standard deviation of the achievement motivation scores of the field independent teacher candidates were lower than that of the teacher candidates having other cognitive styles.

One-way ANOVA was used to find whether there was a significant difference between the scores of the teacher candidates obtained from "The Achievement Motivation Scale" in terms of cognitive styles or not. The results of one-way ANOVA were given in Table 10.

Table 10. *The results of one-way ANOVA related to scores of "The Achievement Motivation Scale" according to cognitive styles*

	Sum of Squares	*df*	Mean Square	*F*
Between groups	121.660	2	60.830	
Within groups	12704.806	111	114.858	.531
Total	12826.465	113		

When Table 10 is examined, it is seen that achievement motivations of the teacher candidates do not differ significantly in terms of cognitive styles ($F_{(2\text{-}113)}$ =.531, p> .05).

Achievement Motivation of the Teacher Candidates in terms of their Motivation Styles

The fourth research question of the study is as "Is there a significant difference between achievement motivations of the primary mathematics education teacher candidates in terms of their motivation styles". Means and standard deviations of the scores of the teacher candidates obtained from "The Achievement Motivation Scale" were calculated to test this research question (See Table 11).

Table 11. *The scores of "The Achievement Motivation Scale" according to motivation styles*

Grade Levels	*n*	*M*	*df*
Curious	42	59.74	7.55
Successful	31	69.74	1.18
Conscious	41	81.12	4.87
Social	0	0	0

When Table 11 is examined, it is seen that the teacher candidates having "conscious" motivation style have the highest score (81.12) and the teacher candidates having "curious" motivation style have the lowest score (59.74). It was also found that the score of the teacher candidates having "successful" motivation style was 69.74. Moreover, it was appeared that the standard deviation of the scores of these teacher candidates related to "The Achievement Motivation Scale" was quite low (1.18).

One-way ANOVA was used to find whether there was a significant difference between the scores of the teacher candidates obtained from "The Achievement Motivation Scale" in terms of motivation styles or not. The results of one-way ANOVA were given in Table 12.

Table 12. *The results of one-way ANOVA related to scores of "The Achievement Motivation Scale" according to motivation styles*

	Sum of quares	*df*	Mean square	*F*
Between groups	9494.020	2	4747.010	158.118
Within groups	3332,445	111	30.022	**
Total	12826,465	113		

** p<.01

When Table 12 is examined, it is seen that achievement motivations of the teacher candidates differ significantly in terms of motivation styles (F(2-113) =158.118; p< .01). In other words, achievement motivation of the teacher candidates differ significantly related to their motivation styles. According to the result of Eta-square, it can be said that the size of the difference is moderate (h2=.074). The homogeneity of variances between groups was tested to determine which of the grade level/s cause(s) this difference and it was found that variance between groups was not homogeneous. Therefore, Tamhane's T2 test, one of the post-hoc tests which is used when variances are not homogeneous, was used to determine the grade level/s causing the difference. The results of Tamhane's T2 were given in Table 13.

Table 13. *The results related to Tamhane's T2 Test*

Grade Levels(I)	Grade Levels (J)	Difference of means (I-J)	Standard Error	*p*
Curious	Successful	-10.00	1.29	.000**
	Conscious	-21.38	1.20	.000**
Successful	Conscious	-11.38	1.30	.000**

** $p < .01$

As it is seen in Table 13, it was found that there was a significant difference between achievement motivations of all motivation styles.

Conclusion and Discussion

In this study, it was investigated that how achievement motivation of the teacher candidates has changed according to their cognitive styles and motivation styles. Therefore, the results of the study were categorized under four titles.

Achievement Motivation of the Teacher Candidates in terms of Gender

The findings of the study revealed that there was not a statistically significant difference between achievement motivations of the teacher candidates in terms of gender. It is seen in the literature that some studies stated that motivational structures of students differed in terms of gender (Linnenbrink & Pintrich, 2002; Wigfield & Eccles, 2002; Houtte, 2004) whereas some studies found that there was not a significant difference between these structures in terms of gender (Cokley, Bernard, Cunningham, & Motoike, 2004; Ligon, 2006; Ateş, Yıldız, Yıldız, 2012; İşigüzel, 2013). When these studies were examined, females were found to be more motivational than males. In this study, it was found that achievement motivation of the females was higher than that of the males. However, this difference was not found to be significant. Parsons et al. (1982) found in their study that perception of mathematical abilities and achievement motivation did not differ in terms of gender. This result of the study contradicts with the results of this study.

Achievement Motivation of the Teacher Candidates in terms of Grade Level

In the light of the findings, it was found that there was a statistically significant difference between achievement motivations of the teacher candidates in terms their grade levels. This difference was significant between 2nd grade teacher candidates and 1st and 3rd grade teacher candidates especially. Findings revealed that the difference was in favour of 1st and 3rd grade teacher candidates. Umay (2002) investigated the change of achievement motivation according to years and the factors effecting this change. As a result, it was found

that the levels of achievement motivation of the students increased from year to year. In this study, a result different from the study of Umay (2002) appeared. This difference may stem from the fact that Umay (2002) conducted a longitudinal study with same teacher candidates whereas this study was conducted with different teacher candidates at different grade levels in same year. In a study conducted before the mathematics curriculum was revised, Göç (2010) investigated whether achievement motivation of 6th, 7th and 8th graders differed or not, and found that achievement motivation of 6th graders was higher than that of 7th and 8th graders. It was found that achievement motivation of the students was higher at the beginning of primary school[1] than other years. This results reveals that an increase may exist in success motivation with cognitive development.

It is seen that 1st grade teacher candidates had the highest achievement motivation and they were followed by 3rd and 2nd grade teacher candidates, respectively. Many factors affecting achievement motivation of individuals exist. Among these factors; effectiveness of teacher, friends, ideas of one about school, perception of one about self, past successes and failures, importance that one give to success and manners of parents towards their children and school can be thought as important factors (Ülgen, 1994). The higher level of achievement motivation of 1st grade teacher candidates may be due to the fact that being successful at LYS and getting the chance of being a student of primary mathematics education which has been gotten interest in nowadays, since motivation levels of individuals also increase when they are successful. Moreover, 1st grade teacher candidates get courses of "General Mathematics", "Geometry" and "Abstract Mathematics" which can be thought as continuation of the course of mathematics in high school. In addition to these, they also get pedagogical and requisite "Yüksek Öğretim Kurumu-YÖK" (Higher Education Council-HEC) courses. It can be thought that being also successful at these courses may affect their achievement motivation.

When the teacher candidates become 2nd grade students, they get more mathematics courses. Getting courses as "Calculus I and II" and "Linear Algebra I and II" which can be thought more difficult than the courses of 1st grade, and "Physics I and II" which are also thought as difficult by students and getting only 3 pedagogical courses may cause decrease of achievement motivation of the teacher candidates. When the results of the study were examined, it was found that achievement motivation of 3rd grade teacher candidates were higher than that of 2nd grade teacher candidates. The reason for this result may be fact that 3rd grade teacher candidates get more pedagogical courses together with mathematics courses as "Calculus III" and "Differential Equations". Moreover, getting the courses of "Methods of Mathematics Teaching I and II" which are among the most important courses to be a mathematics teacher, may also be another reason.

Achievement Motivation of the Teacher Candidates in terms of Cognitive Styles

In the light of the findings, it was appealed that there was not a statistically significant difference between achievement motivations of the teacher candidates in terms their cognitive styles. It was stated in some studies that academic success of individuals having field independent cognitive style were better than that of individuals having field dependent cognitive style (Bahar & Hansell, 2000;.Karaçam & Ateş, 2010). Moreover, it was indicated in the literature that field independent individuals have intrinsic motivation (Fritz, 1994; Lyons-Lawrence, 1994; Reiff, 1996) whereas field dependent ones have extrinsic motivation (Liu & Reed, 1994; Lyons-Lawrence, 1994; Riding & Cheema, 1991). In this study, it was also found

[1] Since this study was conducted before the mathematics curriculum was revised, primary education started with 6th graders, not 5th graders.

that achievement motivation of the field independent teacher candidates was higher than achievement motivation of the field dependent and medium teacher candidates. Moreover standard deviations of field independent ones were lower than that of others. This result shows that the scores of achievement motivation of the teacher candidates having field independent cognitive style were clustered close to together. However, it was found that the scores of the field dependent and medium teacher candidates did not disperse like the scores of the field independent ones.

Achievement Motivation of the Teacher Candidates in terms of Motivation Styles

In the light of findings of the study, the motivation styles of the teacher candidates were determined at first. It was found that none of the teacher candidates preferred "social" motivation style. Moreover, it appeared that nearly same number of the teacher candidates had "Curious", "Successful" and "Conscious" motivation styles. Bahar (2002) found in his study examining the motivation styles of teacher candidates educating at the Department of Primary Education that the number of teacher candidates having curious and social motivation styles were more than number of ones having successful and conscious motivation styles. In his study however, it was found that the numbers of the teacher candidates having successful and conscious motivation styles were nearly same. The reason of this difference may be the fact that participants of two studies were educating at different departments. Moreover, it appealed that there were any teacher candidates having social motivation style in this study. This result was thought as interesting because of the fact that the job of teaching requires socialization.

Findings of the study revealed that achievement motivations of the teacher candidates differ significantly in terms of motivation styles. It was found that the scores of achievement motivation according to motivation styles were 59.74, 69.74 and 81.12 for "Curious", "Successful" and "Conscious", respectively. In the study of Yaman and Umay (2008), conducted to investigate motivation styles and achievement motivation of 3rd grade primary mathematics education, primary science education and preschool education teacher candidates, it was found that "Curious" was the motivation style that got the highest score with 70.58 and "Social" was the motivation style that got the lowest score with 67.61. The reason of the contradiction of the results of Yaman and Umay (2008) and this study may be the fact that the former was conducted with teacher candidates in different departments whereas the latter was conducted with primary mathematics education teacher candidates.

Suggestions

As a result of this study, it was found that the differences between the motivations of the teacher candidates having different cognitive and motivation styles. It can be investigated why these individual differences affect achievement motivation of the teacher candidates by interviewing with them. The reason of the decrease of achievement motivation at 2nd grade can be investigated by especially having interviews with 1st and 2nd grade teacher candidates. It can be investigated whether individual differences other than cognitive styles and motivation styles also affect achievement motivation or not. In addition to this, it can also be investigated whether cognitive styles and motivation styles have effect on success and attitudes of students or not.

Materials can be prepared for students and teacher candidates having different cognitive styles and motivation styles and courses can be organized according to these. It can be mentioned to teacher candidates through their education that the important effects of cognitive styles and motivation styles on performances of students. Different teaching-

learning situations can be achieved and it can be investigated whether these situations affect achievement motivation, cognitive styles and motivation styles of students or not. This study may be conducted with teachers or teacher candidates other than primary mathematics teachers.

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References

Adar, L. (1969). *A Theoretical Framework for the Study of Motivation in Education*, Hebrew University, Jerusalem.

Alamolhodaei, H. (1996). *A study in higher education calculus and students' learning styles*. (Ph.d. thesis), University of Glasgow.

Alamolhodaei, H. (2002). Students' Cognitive Style and Mathematical Word Problem Solving. Journal of the Korea Society of Mathematical Education Series D: *Research in Mathematical Education. Vol. 6*, No. 2, 171–182

Al-Naeme, F.F. (1991). *The Influence of Various Learning Styles on Practical Problem Solving in Chemistry in Scottish Secondary School*, (Ph.D. Thesis), University of Glasgow.

Ateş, S., & Çataloğlu, E. (2007). The effects of students' cognitive styles on conceptual understandings and problem solving skills in introductory mechanics. *Research in Science and Technological Education, 25*, 167-178.

Ateş, H., Yıldız, B., & Yıldız, H. (2012). Herzberg'in çift faktör kuramı kamu okullarında çalışan öğretmenlerin motivasyon algılarını açıklayabilir mi?: Ampirik bir araştırma, *Bilgi Ekonomisi ve Yönetimi Dergisi, 7* (2).

Aydın, F. (2009). *Teknolojinin Doğasına Yönelik Fen Bilgisi Öğretmen Adaylarının Görüşlerinin ve Kavramlarının Gelişimi ve Öğretimde İkilemlerin Etkililiği*. (Ph.d. Thesis), Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.

Bahar, M. & Hansell, M.H. (2000). The relationship between some psychological factors and their effect on the performance of grid questions and word association tests. *Educational Psychology, 20*(3), 349-364.

Bahar, M. (1999). *Investigation of Biology Students' Cognitive Structure Through Word Association Tests, Mind Maps and Structural Communication Grids*, (Ph.d. Thesis), University of Glasgow.

Bahar, M. (2002). "A Diagnostic Study of Biology Students' Motivational Styles". *Gazi University Journal of Gazi Educational Faculty. 22* (2), 23-34

Bahar, M. (2003a). The effect of instructional methods on the performance of the students having different cognitive styles. *Hacettepe University The Journal of Education, 24*, 26-32.

Bahar, M. (2003b). "The Effects of Motivational Styles on Group Work and Discussion-Based Seminars". *Scandinavian Journal of Educational Research. 47*(4).

Bahar, M. & Hansell, M. H. (2000). The relationship between some psychological factors and their effect on the performance of grid questions and word association tests. *Educational psychology, 20*(3), 349-364.

Biggs, J.B. (1987). *Student Approaches to Learning and Studying*, Plenum, New York.

Çakan, M. (2005). Bilişsel stiller ile yabancı dil başarısı arasındaki ilişki: 8. sınıf Fransızca örneği. *İlköğretim-online* [Online]: http://ilkogretim-online. org. tr, 53-61.

Case, R. (1974): Structures and strictures, some functional limitations on the course of cognitive growth. *Cognitive Psychology. 6*, 544–574.

Case, R. & Globerson, T. (1974): Field-independence and central computing space. Child Development 45, 772–778.Çataloglu, E. & Ates, S. (2013). The effects of cognitive styles on naïve impetus theory application of pre-service science Teachers, *International Journal of Science and Mathematics Education, 2*.

Cokley, K. O., Bernard, N., Cunningham, D., & Motoike, J. (2001). A psychometric investigation of the academic motivation scale using a United States sample, *Measurement and Evaluation in Counseling and Development, 34*, 109-119.

Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *The Educational Psychologist, 26*, 325-346.

Dinçer, Z. (1993). *Sosyo-Ekonomik Düzeyin Bilişsel Stiller Üzerindeki Etkisi*, (Master Thesis), Ankara Üniversitesi, Sosyal Bilimler Enstitüsü

Durmuş, S. (2006). Matematik Bölümü Öğrencilerinin Motivasyon Stillerinin Tespiti. *AİBÜ Eğitim Fakültesi Dergisi, 6* (1), 1-11.

Erden, M., & Altun, S. (2005). *Öğrenme Stilleri*, İstanbul: Mopa Yayınevi.

Fraenkel, J. R., & Wallen, N. E. (2006). *How to Design and Evaluate Research in Education*. Newyork:McGraw-Hill.

Fritz, R. L. (1994). Teaching and learning at the application level. *Journal of Vocational and Technical Education, 11*, 1, 4-13.

Göç, T. (2010). *İlköğretim öğrencilerinin matematik dersine yönelik tutumları ve başarı güdüsü düzeyleri*, (Master Thesis), Dokuz Eylul University.

Hayes, J., & Allinson, C.W. (1998). Cognitive style and the theory and practice of individual and collective learning in organizations. *Human Relations, 51*, 847-871.

Hofstein, A. & Walberg, H.J. (1995). Instructional Strategies, in: B.J. Fraser & H.J.Walberg (Eds) *Improving Science Education*, University of Chicago Press, Chicago.

Houtte, M. V. (2004). Why boys achieve less at school than girls: The difference between boys' and girls' academic culture. *Educational Studies, 30* (2), p. 159-173.

İşigüzel, B. (2013). Determine the motivation level of the preservice german teachers towards the german language, *International Periodical For The Languages, Literature and History of Turkish or Turkic, 8* (12).

Johnstone, A.H. & Al-Naeme, F. (1995). Filling a Curriculum Gap in Chemistry. International *Journal of Science Education, 17*(2), 219-232.

Jonassen, D. H. and Grabowski, B. L. (1993). *Handbook of individual differences learning and instruction*: Routledge.

Karalar, R. (2006). *Tüketici Davranışları*, Anadolu Üniversitesi Yayınları, Yayın No. 1688, Açıköğretim Fakültesi Yayın No. 874. (Editör R. Karalar), Eskişehir,

Karasar, N. (2005). *Bilimsel Araştırma Yöntemleri*. Ankara: Nobel Yayınları.

Karaçam, S. & Ateş, S. (2010). Ölçme Tekniğinin Farklı Bilişsel Stillerdeki Öğrencilerin Hareket Konusundaki Kavramsal Bilgi Düzeylerine Etkisi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 10*(1), 21-30.

Kempa, R. F. & Martin-Diaz, M. (1990). Motivating Traits and Preferences for Different Instructional Modes in Science*. International Journal of Science Education, 12*(2), 195-203.

Kolb, D. A. (1984). *Experiential Learning. Experience as the Source of Learning and Development*, Prentice Hall, Eaglewood Cliffs, NJ.

Ligon, N. Y. (2006). Assessing the achievement motivation across grades and gender. *Dissertation Abstracts International Section A: Humanities and Social Sciences, 67*(6-A), p.2052.

Linnenbrink, E. A. & Pintrich, P. R. (2002). Motivation as an enabler for academic success. *School Psychology Review, 31*, 313-327.

Liu, M., & Reed, W. M. (1994). The relationship between the learning strategies and learning Styles in hypermedia environment. *Computers in Human Behavior, 10*, 4, 419-434

Lyall, R.K. & Johnstone, A.H. (1999). Communication: computer programs which respond to learning styles. *University Chemistry Education, 3*(2), 68.

Lyons - Lawrence, C.L. (1994). Effects of Learning Style on Performance in Using Computer Based Instruction in Office Systems. *Delta Pi Epsilon journal, 36*(3), 166-175.

McClelland, D. C. & Koestner, R. (1992). *The Achievement Motive. in: Motivation and Personality: Handbook of Thematic Content Analysis*. Edited by Charles P. Smith. Cambridge University press.

Parsons, J. E., Adler, T., & Kaczala, C. M. (1982). Socialization of achievement attitudes and beliefs: Parental influences. *Child Development, 53*, 310-321.

Reiff, J. C. (1996). At-risk middle level or field dependent learners, *Clearing House, 69*, 4, 231-234.

Riding, RJ. & Cheema I., (1991), Cognitive Styles - An Overview and Integration, *Educational Psychology, 11*, 3&4, 193-215.

Scardamalia, M. (1977): Information processing capacity and the problem of Horizontal Decalage: A demonstration using combinatorial reasoning tasks. *Child Development 48*(1), 28–37.

Solomon, J. (1996). Group Discussions in the Classroom. *School Science Review, 72*(261), 29.

Taşar, M. F. (2001). *A Case Study of a Novice College Student's Alternative Framework and Learning of Force and Motion*. (Phd. Thesis), The Pennsylvania State University.

Trumper, R. (1995). "Students' motivational traits in science: A cross-age study", *British Educational Research Journal, 21*(4), 505.

Umay, A. (2002). Matematik Öğretmen Adaylarının Başarı Güdüsü Düzeyleri, Değişimi ve değişimi Etkileyen Faktörler. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 22*,148-155

Uysal Koğ, O. (2012). *Görselleştirme Yaklaşımı ile Yapılan Matematik Öğretiminin Öğrencilerin Bilişsel ve Duyuşsal Gelişimi Üzerindeki Etkisi*, Yayınlanmamış Doktora Tezi, Dokuz Eylül Üniversitesi Eğitim Bilimleri Enstitüsü.

Ülgen, G., (1994). *Eğitim Psikolojisi Kavramlar, İlkeler, Yöntemler, Kuramlar ve Uygulamalar*, Lazer Ofset Matbaa Tesisleri San. Ve Tic. Ltd. Şti., Ankara.

Witkin, H.A. & Goodenough, D.R. (1981). *Cognitive Styles: Essence and Origins Field Dependence and Field Independence*, New York University Press, New York.

Witkin, H. A., Oltman, P. K., Raskin, E., & Karp, S. A. (1971). *A manual for the embedded figures tests*. Palo Alto, CA: Consulting Psychology Press.

Witkin, H. A., Moore, C. A., Goodenough, D. R. & Cox, P. W. (1977). Field-dependent and field-independent cognitive styles and their educational implications. *Review of Educational Research, 47*(1), 1-64.

Wigfield, A., & Eccles, J. S. (2002). *Development of achievement motivation*. San Diego, CA: Academic Press.

Wigfield, A., Eccles, J.S., Roeser, R.W., & Schiefele, U. (2009). Development of Achievement Motivation. In W. Damon & R.M. Lerner (Eds.), *Developmental Psychology: An Advanced Coursebook*. New York: Wiley.

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