International J. Soc. Sci. & Education
2013 Vol.3 Issue 2, ISSN: 2223-4934 E and 2227-393X Print

Investigating Second Level Primary Students' Learning Styles and Geometry Self-Efficacy In Terms of Certain Variables

By

DilekÇağırgan Gülten
Istanbul University Hasan Ali Yucel Faculty of Education
Department of Mathematics Education, Istanbul
Turkey [dilek.cgulten@gmail.com]

Abstract

The aim of the present study is to investigate relationship between students' learning style and geometry self-efficacy; and to evaluate this relationship in terms of students' gender and grade-level. The sample consists of 803 6th-, 7th- and 8th- grade students in Istanbul. Data obtained from sub-problems of the present study was analyzed by SPSS 13.0. T-test and the Pearson product moment correlation was used to analyze data gathered from "Learning Styles Scale" and Geometry Self-efficacy Scale. Results showed that female students have visual learning style at 8th grade, bodily-kinesthetic learning style at 7th grade; and they have more negative self-efficacy towards geometry at 6th grade. Results also showed that all students' visual learning style has a significant positive relation with geometry self-efficacy and use of geometry knowledge; and 8th grade students' kinesthetic learning style has a significant positive relation with geometry self-efficacy and use of geometry knowledge. At the end, results were discussed in the light of the literature.

Keywords: *Learning styles, geometry, geometry self-efficacy, gender, middle school students*

1. Introduction

The recent research into education has been observed to focus on the individual differences of students. Individuals differ in terms of learning styles, so it is of great concern to become aware of students' learning styles in education planning. James and Gardner (1995) redefine the learning style which was formerly defined by Davidson (1990) and De Bello (1990) as the individual's way of acquiring, processing and retaining knowledge as a complicated way of behaving and the conditions under which learners perceive, process, retain and recall what they aim to learn in the most efficient way. When one considers the fact that each individual has a different personality and is under the influence of environmental factors, it can be easily understood that everyone has different learning styles and learning styles differ in terms of age, gender, culture and other variables (Shaughnessy, 1998).

The way or style of learning is, in a broad sense, related to how an individual understands and recalls knowledge. The ways/preferences/styles of learning have been defined and classified in multiple ways (Cano-Garcia and Hewitt-Huges, 2000). Since an individual's learning style has three different dimensions, which are cognitive, sensitive and physiological, and theorists focus on one of them, there are different approaches in terms of the nature of learning styles and methods of identifying them (Ekici, 2003). Each individual uses different channels in their learning process. While some learn more easily and permanently with visuals (patterns, pictures, graphics etc.), some learn better with auditory and kinesthetic channels. Some individuals are good at learning individually while others are good at learning in groups. All these differences reveal individuals' learning styles (Felder, 1996). Visual, auditory and kinesthetic/tactile styles are three commonly accepted ways of learning (Şimşek, 2002; Boydak, 2001). Visual learners learn better with the help of visuals such as charts and diagrams. Auditory learners learn more efficiently through the sense of hearing while kinesthetic learners learn more efficiently when they study individually (Fleming, 1995). Individuals' preferences of perceiving knowledge, which are visual, auditory, tactile and kinesthetic, are named as "Perceptual Learning Styles (PLS)" in the literature (Uğur, 2008). These perceptual learning styles are based on the preferences of an individual who is in the process of acquiring knowledge through senses (Uğur, 2008) and overlap with the perceptual element of

the physiological dimensions of the Dunn and Dunn Learning Style model (Otrar, 2006; Şimşek, 2007). Perceptual learning styles, which are related to the environment, materials preferred by the learners and the way messages are coded, (Şimsek, 2002) influence the ways of acquiring, recalling and using knowledge (Güven, 2007).

The main goal of education is to enable individuals to grow up in line with the predetermined behaviours. The organisation of learning experiences according to learning styles can make it possible to attain the goals (Ekici, 2002; Mutlu and Aydoğdu, 2003). If students cannot learn in the way their teachers teach them, students must be told the way they learn. In other words, students must be taught the way they learn (Marshall, 1990). Teachers may not achieve learning in the desired level even when they do their best to increase the level of learning success, do preparation before the class or bring various aids to the learning environment because students in the classroom have both different learning styles and different physical qualities (Güven, 2003). Learning styles are multi-dimensional models that students use when making a variety of choices in the learning process (Eren, 2002). Knowing the fact that non-auditory students do not remember an important part of what is taught in the lessons, bodily-kinesthetic learners need to use their hands and bodies and visual learners do not take full advantage of an auditory learning environment, which is called narrative method, guides the teacher in providing lesson activities and course materials. If a lesson plan and presentation are done taking into account the fact that every student follows a different way to acquire and recall knowledge, it will consolidate learning and the permanence of what has been learnt (Güven, 2007).

It is of great concern to evaluate individuals' learning styles in the process of learning and teaching (Hein and Budny, 2000). The fact that a student uses multiple sense organs has an effect on the quality of learning (Demirel, 2002). The more senses of students are activated in the learning process, the more efficient the education is (Küçükahmet, 2000). It is a fact that students recall knowledge for longer period, use it more efficiently and their attitudes towards the subject are more positive with the type of education in which learning styles are taken into consideration (Felder, 1996). Students can learn more easily when they get the type of education that match their preferences. In this context, the fact that students have different learning styles should be taken into account when preparing curriculums, course books, learning environments and when using methods and techniques in the process of learning and teaching (KafHasırcı, 2005). Preparing course materials which would address to different learning styles could help greater number of students to learn because in the complex and intense process of learning, the more senses of learners are addressed to, the more permanent the learning is (Dağhan and Akkoyunlu, 2011). When education is carried out with the approaches and methods which are in accordance with the learning styles, students will not fail since they will be able to learn almost every subject (Dunn 1990). According to Searsonand Dunn (2001), for every student his learning style is the best way to learn and making the necessary arrangements determining their learning styles increases success.

Self-efficacy perception, which is an important predictor of achievement in academic settings (Pajares, 1996a), was defined by Bandura (1997) as a student's beliefs about his/her skills to overcome challenges to attain the predetermined goals. According to the research conducted on the related subject, individuals with higher self-efficacy beliefs spend more efforts to achieve something and when faced with challenges, they do not give up easily and they act rather persistently and patiently (Aşkar and Umay, 2001; Gibson and Dembo, 1984; Pajares, 1996b; Ritter et al. 2001). In this context, students' self-efficacy beliefs should be worth studying thoroughly.

The study conducted on self-efficacy is generally found in the fields of psychology and education. However, since multidisciplinary studies and the necessity of dealing with problems in a multidimensional way are gradually gaining more importance today, research into self-efficacy perception is also conducted in primary mathematics education (Terzi and Mirasyedioğlu, 2009). Due to the reason that geometry is used in mathematics and in the fields other than mathematics, it has an important function in primary education because it is the first stage where students gain their first critical geometrical judgments, terms and knowledge (Develi and Orbay, 2003). Besides, geometrical knowledge

is used as a material in teaching other subjects and it is a fact that people need basic knowledge of geometry to solve simple problems in their everyday lives (Altun, 2001). Geometry is a sistematic way to describe and define the world, which includes geometry. What lies beneath the understanding of geometry is the development of spatial feeling, which is a feeling of objects around us. In this context, it is essential to identify students' self-efficacy beliefs in order to enable them to understand geometry (Cantürk-Günhan and Başer, 2007). Geometry, which is related to all sciences, is a kind of mother tongue in interpreting scientific terms. Explaining a formation with a diagram or pattern relieves of explaining it with thousands of words (Bindak, 2004).

The ensuring of individuals' supervision of their own learning process and taking responsibility for their learning is possible with the awareness of what a learning style is and including this into the learning process (Güven and Kürüm, 2006). The role of learning styles in the learning process should be taken into account since geometry, which is an important part of mathematics used in everyday life, is essential for students (Gülten and Gülten, 2004). In this context, it is essential to study the relationship between primary students' geometry self-efficacy and learning styles, which are an important variable in the process of learning. A study on the relationship between second level primary students' geometry self-efficacy and learning styles is not found in the literature. This study has been planned taking into consideration the important role that learning styles have in the learning and teaching process of geometry and the new perspective and contribution that it will bring to students and teachers.

This study aims to determine the relationship between primary students' learning styles and geometry self-efficacy and pave the way for further research by investigating their learning styles and geometry self-efficacy in terms of gender and grade-level. In line with this aim, this study tries to answer the following questions about second level primary students:

1. Do their learning styles differ in terms of their gender and grade-level?
2. Does their geometry self-efficacy differ in terms of gender and grade-level?
3. Is there a relationship between learning styles and geometry self-efficacy?

2. Method

Research Model

The research is a survey method since it is defined without any external intervention to the conditions in which primary students are found (Karasar, 2005). The research question has been explained and commented on with the help of the data collected.

Research Group

The data was collected by simple random sampling method. The research group consists of 803 6th, 7th and 8th grade primary students from the districts of middle socio-economic level in İstanbul. The number of 6th grade students involved in the research group is 370 (52,2% female and 47,8% male); the number of 7th grade students is 235 (52,3% female and 47,7% male); and the number of 8th grade students is 198 (55,6% female and 44,4% male). The distribution of the students involved in the research group is presented in Table 1 according to their gender and grade-level:

Table 1.The Number and Percentages of Students According to Their Grade-level and Gender

Gender	**6. Grade N (%)**	**7. GradeN (%)**	**8. GradeN(%)**
Female	193	123	110
	(52,2)	(52,3)	(55,6)
Male	177	112	88
	(47,8)	(47,7)	(44,4)
Total	370	235	198
	(100)	(100)	(100)

Data-Collection Tools

Learning Styles Scale: A Learning Styles Scale which was developed by Gökdağ (2004) according to the Dunn and Dunn Model of Learning-Style Preferences (DDMLSP) was used in the research. It is a five-point Likert scale tested for validity and reliability. It consists of 28 items including positive statements and is composed of three factors (auditory, visual and kinesthetic). 13 items were prepared to determine visual learning styles; 10 items were prepared to determine kinesthetic learning styles and 5 items were prepared to determine auditory learning styles. Rating was done as follows: "I completely agree" 5; "I agree" 4; "I am not sure" 3; "I disagree" 2; "I completely disagree" 1 (Eskici, 2008). While developing the Learning Styles Scale, 92 students in two schools of middle socio-economic level were asked to write an essay on the following question: "What is your favourite way of studying?" The essays and the literature were analyzed and a scale of learning styles, which consists of 70 items, was composed and presented to expert opinion (n=10). The scale was conducted on 800 students enrolled in 6th, 7th and 8th grades in several schools. In the factor analysis of the scale, the items whose factor load was over 0.40 were chosen. Cronbach's Alpha reliability coefficients for the learning style factors (visual, auditory and kinesthetic) of the scale were calculated as respectively 0,58; 0,52 ve 0,52. In the analyses, Cronbach's Alpha reliability coefficient of the scale was calculated as 0,74. In this study, however, Cronbach's Alpha reliability coefficient was determined to be 0,76.

Geometry Self-Efficacy Scale: A geometry self-efficacy scale which was developed by Cantürk and Başer (Cantürk-Günhan and Başer, 2007) was used to determine students' self-efficacy beliefs towards geometry. This self-efficacy scale was tested before in terms of reliability and it was proved to be reliable since Cronbach's Alpha coefficient was calculated as $\alpha = 0.90$. Cronbach's Alpha coefficient was determined to be $\alpha = 0.87$ for this study. This self-efficacy scale consists of 25 items about "students' positive self-efficacy beliefs towards geometry"; "students' beliefs about the use of geometry knowledge"; "students' negative self-efficacy beliefs towards geometry". The scale is composed of three factors. They are defined as positive self-efficacy beliefs (12 items), use of geometry knowledge (6 items), and negative self-efficacy beliefs (7 items). Cronbach's Alpha reliability coefficient of these factors are respectively 0,88; 0,70 and 0,70 and these three factors explain 42% of the total variance. In the five-point Likert type scale the items were rated as follows: "1. I never agree, 2. I sometimes agree, 3. I am not sure 4. I often agree 5. I always agree". When students' self-efficacy levels were evaluated, the scores between 1 and 1,80 were determined as "the lowest"; the scores between 1,81 and 2,60 were determined as "low"; the scores between 2,61 and 3,40 were determined as "moderate"; the scores between 3,41 and 4,20 were determined as "high"; and those between 4,21 and 5,00 were determined as "the highest".

Process

Data collection process was carried out in a classroom environment during the second semester in the 2010-2011 academic year by providing the students a suitable environment and sufficient time. After the scales were checked by the researcher, the incomplete and incorrect ones were left out of the evaluation. The data gathered in accordance with the research sub-problems was analyzed by the SPSS package program. T-test was used to determine whether or not students' learning styles and geometry self-efficacy differ significantly in terms of gender and it was discussed in terms of the students' grade-levels. The relationship between their learning styles and geometry self-efficacy was determined by the Pearson product-moment correlation analysis. The significance level was taken as .05.

3. Findings

The statistical data regarding the t-test, which was performed to determine whether or not students' learning styles differ significantly in terms of gender, is presented in Table 2 and Table 3 so as to answer the first research sub-problem.

Table 2. The Results of the Independent Group t Test Performed to Determine Whether Visual Learning Style Scores Differ in Terms of Gender

	Gender	N	X	SS	Sd	t	p
6. grade	Female	193	3,83	,529	368	,927	,355
	Male	177	3,78	,522			
7. grade	Female	193	3,61	,543	233	,448	,925
	Male	177	3,61	,609			
8. grade	Female	193	3,61	,471	196	2,046	,042
	Male	177	3,46	,536			

While 6th and 7th grade students' visual learning style scores did not differ in terms of gender, those of 8th grades differed significantly in terms of gender. [t(196)=2,046; p<0.05]. The mean scores of visual learning style of the female students at 8th grade were higher than those of the male students.

Table 3. The Results of the Independent Group t-Test Performed to Determine Whether Kinesthetic Learning Style Scores Differ in Terms of Gender

	Gender	N	x	SS	Sd	t	p
6. grade	Female	193	3,65	,452	368	-132	,895
	Male	177	3,66	,531			
7. grade	Female	193	3,64	,467	233	2,569	,011
	Male	177	3,47	,572			
8. grade	Female	193	3,76	,504	196	1,848	,066
	Male	177	3,62	,559			

While the kinesthetic learning style scores of 6th and 8th grade students did not differ significantly in terms of gender, the kinesthetic learning style scores of 7th grade students differed significantly in terms of gender. [t(233)=2,569; p<0.05]. The mean scores of kinesthetic learning styles of the female students at 7th grade were higher than those of the male students at 7th grade.

According to the results of the independent group t-test performed to determine whether or not the auditory learning style scores differ in terms of gender, it was found out that the auditory learning style scores did not differ significantly at 6th grades [t(368)=-1,220; p>0.05], 7th grades [t(233)=0,440; p>0.05] and 8th grades [t(196)=,223; p>0.05].

The statistical data regarding the results of the t-test performed to determine whether or not the students' geometry self-efficacy differ significantly in terms of gender is presented in Table 4 to answer the second research sub-problem.

Table 4.The Results of the Independent Group t-Test Performed to Determine Whether Geometry Self-Efficacy Differs in Terms of Gender

	Gender	N	x	SS	Sd	t	p
6. grad	**Female**	193	95,20	14,771	368	2,134	,033
	Male	**177**	92,10	13,065			
7. grad	**Female**	123	89,84	16,681	233	,814	,416
	Male	**112**	88,01	17,730			
8.grade	**Female**	110	82,84	17,186	196	,610	,543
	Male	**88**	81,47	13,568			

While the geometry self-efficacy of 7th and 8th grade students did not differ significantly, that of 6th grade students differed significantly in terms of gender. [$t_{(368)}$=2,134; p<0.05]. When the mean scores of the female students (x=95,20) and male students (x=92,10) at 6th grade were compared, geometry self-efficacy beliefs of the female students were higher (p<,01). According to the results of the independent group t-test performed to determine whether or not geometry self-efficacy sub-factor scores differ in terms of gender regarding the second sub-problem, the geometry self-efficacy sub-factor scores of 7th and 8th grade students did not differ significantly in terms of gender. However, geometry self-efficacy sub-factor scores of 6th grade students differed significantly in terms of gender. When the sub-factors were studied, it was observed that the sub-factors of positive self-efficacy beliefs and use of geometry knowledge did not differ significantly in terms of gender. When the scores of negative self-efficacy beliefs were studied, it was seen that the mean scores of the female students (x=23,860) were higher than those of the male students (x=20,649) [t(368)=4,469; p<0.05]. Similarly, when the sub-factor of use of geometry knowledge was studied, it was seen that the mean scores of the female students were lower than those of the male students. Therefore, it is possible to mention that the female students with negative self-efficacy beliefs at 6th grade have lower scores when compared to the male students in terms of use of geometry knowledge. The statistical data regarding this finding is given in Table 5.

Table 5.The Results of the Independent Group t-Test Performed to Determine Whether the Sub-factor Scores of 6th Grade Students' Geometry Self-Efficacy Differ in Terms of Gender

	Gender	N	x	SS	Sd	t	p
Positive Self-Efficacy Beliefs	**Female**	193	48,554	8,637	368	,359	,720
	Male	177	48,248	7,677			
Negative Self-Efficacy Beliefs	**Female**	193	23,860	6,774	368	4,469	,000
	Male	177	20,649	7,038			
Use of Geometry Knowledge	**Female**	193	22,740	4,551	368	-,892	,373
	Male	177	23,141	4,040			

The findings regarding whether or not there is a relationship between second level primary students' learning styles and geometry self-efficacy in terms of grade-level are presented in Table 6, Table 7 and Table 8 to answer the third research sub-problem.

Table 6.The results of the Pearson Product-Moment Correlation Analysis Performed to Determine the Relationship Among 6th Grade Students' Positive Self-Efficacy Beliefs, Negative Self-Efficacy Beliefs, Use of Geometry Knowledge and Learning Styles.

	Visual Learning Style	Auditory Learning Style	Kinesthetic Learning Style	Positive Self-Efficacy Beliefs	Negative Self-Efficacy Beliefs	Use of Geometry Knowledge
Visual Learning Style	X=3,813 SS=,525 N=370	,306**	,550**	,406**	-,130*	,436**
Auditory Learning Style	p<.01	X=3,364 SS=,727 N=370	,389**	,180**	-,237**	,227**
Kinesthetic Learning Style	p<.01	p<.01	X=3,659 SS=,491 N=370	,240**	-,188**	,343**
Positive Self-Efficacy Beliefs	p<.01	p<.01	p<.01	X=48,408 SS=8,183 N=370	,125*	,700**
Negative Self-Efficacy Beliefs	p<.05	p<.01	p<.01	p<.05	X=22,324 SS=7,077 N=370	-,058
Use of Geometry Knowledge	p<.01	p<.01	p<.01	p<.01	p>.05	X=22,932 SS=4,313 N=370

As presented in Table 6, according to the results of the Pearson product-moment correlation analysis performed to determine the relationship between the sub-factor scores of Learning Styles Scale and Geometry Self-Efficacy Scale, a significantly positive relationship was identified between 6th grade students' visual, auditory and kinesthetic learning style scores and the sub-factor scores of positive self-efficacy and use of geometry knowledge while a significantly negative relationship was identified between 6th grade students' visual, auditory and kinesthetic learning style scores and the sub-factor scores of negative geometry self-efficacy. Accordingly, it can be concluded that students with visual, auditory and kinesthetic learning styles at 6th grade have positive self-efficacy beliefs and can use their geometry knowledge; however, they lack negative self-efficacy.

Table 7. The results of the Pearson Product-Moment Correlation Analysis Performed to Determine the Relationship Among 7th Grade Students' Positive Self-Efficacy Beliefs, Negative Self-Efficacy Beliefs, Use of Geometry Knowledge and Learning Styles.

	Visual Learning Style	Auditory Learning Style	Kinesthetic Learning Style	Positive Self-Efficacy Beliefs	Negative Self-Efficacy Beliefs	Use of Geometry Knowledge
Visual Learning Style	X=3,613 SS=,574 N=235	,337**	,548**	,452**	-,030*	,485**
Auditory Learning Style	p<.01	X=3,366 SS=,708 N=235	,374**	-,025**	-,178**	,083**
Kinesthetic Learning Style	p<.01	p<.01	X=3,566 SS=,526 N=235	,268**	,061**	,293**
Positive Self-Efficacy Beliefs	p<.01	p>.05	p<.01	X=44,221 SS=10,022 N=235	,278*	,730**
Negative Self-Efficacy Beliefs	p>.05	p<.01	p<.05	p>.05	X=23,766 SS=6,786 N=235	,072
Use of Geometry Knowledge	p<.01	p>.05	p<.05	p<.01	P<.05	X=20,987 SS=5,293 N=235

As presented in Table 7, according to the results of the Pearson product-moment correlation analysis performed to determine the relationship between the sub-factor scores of Learning Styles Scale and Geometry Self-Efficacy Scale, a significantly positive relationship was identified between 7th grade students' visual learning style scores and the sub-factor scores of positive self-efficacy and use of geometry knowledge while a significantly negative relationship was identified between 7th grade students' auditory learning style scores and negative geometry self-efficacy scores. A significantly positive relationship was identified between the students' kinesthetic learning style scores and the sub-factor scores of positive self-efficacy, negative self-efficacy, and use of geometry knowledge.

Table 8. The results of the Pearson Product-Moment Correlation Analysis Performed to Determine the Relationship Among 8th Grade Students' Positive Self-Efficacy Beliefs, Negative Self-Efficacy Beliefs, Use of Geometry Knowledge and Learning Styles.

	Visual Learning Style	Auditory Learning Style	Kinesthetic Learning Style	Positive Self-Efficacy Beliefs	Negative Self-Efficacy Beliefs	Use of Geometry Knowledge
Visual Learning Style	X=3,550 SS=,505 N=198	,415**	,570**	,428**	-,137	,404**
Auditory Learning Style	p<.01	X=3,585 SS=,739 N=198	,455**	,088	-,263**	,087**
Kinesthetic Learning Style	p<.01	p<.01	X=3,700 SS=,533 N=198	,227**	-,180*	,165*
Positive Self-Efficacy Beliefs	p<.01	p>.05	p<.01	X=40,702 SS=10,434 N=198	-,024	,776**
Negative Self-Efficacy Beliefs	p>.05	p<.01	p>.05	p<.01	X=22,363 SS=6,151 N=198	-,144*
Use of Geometry Knowledge	p<.01	p>.05	p<.01	p<.01	p>.05	X=19,171 SS=5,182 N=198

As presented in Table 8, according to the results of the Pearson product-moment correlation analysis performed to determine the relationship between the sub-factor scores of Learning Styles Scale and Geometry Self-Efficacy Scale,a significantly positive relationship was identified between 8th grade students' visual learning style scores and the sub-factor scores of positive self-efficacy and use of geometry knowledge while a significantly negative relationship was identified between 8th grade students' auditory learning style scores and negative geometry self-efficacy scores. A significantly positive relationship was identified between the students' kinesthetic learning style scores and the sub-factor scores of positive self-efficacy and use of geometry knowledge.

4. Conclusion and Discussion

It was found out that female students' mean scores of visual learning styles at 8th grade and mean scores of kinesthetic learning styles at 7th grade were higher than those of male students. There was no significant difference in auditory learning styles. This finding, which suggests that female students use visual and kinesthetic learning styles more than male students do, overlaps with the result of the research conducted by Eskici (2008). The literature consists of studies which demonstrate that gender has a determining role in learning styles (Heffler, 2001; Yong and McIntyre, 1992; Tekez, 2004; Otrar, 2006)

and studies which demonstrate that gender has no effect on learning styles (Azizoğlu and Çetin, 2009; Jones, Reichard and Mokhtari, 2003; Gökdağ, 2004). The reason for the seeming inconsistency between the results is that there is not a single theoretical explanation for learning styles in the literature and there are a number of survey tools designed in relation to the theories (Yağışan and Sünbül, 2009).

The geometry self-efficacy sub-factor scores of 7th and 8th grade students did not differ significantly in terms of gender regarding the second sub-problem. On the other hand, when the scores of 6th grade students' negative self-efficacy beliefs were studied, the mean scores of the female students were higher than those of male students. However, the mean scores of the female students were lower than those of the male students in terms of the sub-factor of use of geometry knowledge. Besides, 6th grade female students with negative self-efficacy beliefs were observed to have lower scores than male students in terms of use of geometry knowledge. According to this finding, it can be stated that the effect of grade-level on self-efficacy is not so evident and the female students' performance stems from the stereotype that mathematics is a male field.

Although the research results in the literature suggest that students' self-efficacy beliefs in academic settings may differ in terms of gender and grade-level, the research findings are not consistent. In the literature it is observed that there are often studies on the self-efficacy regarding mathematical success and mathematical problem-solving and studies on the effects of self-efficacy belief (Özkan, 2010). It is also observed that there are only a few studies on self-efficacy in Turkey (Günhan and Baser, 2007; Cantürk-Günhan, 2006; Erdoğan, Baloğlu and Kesici, 2009; Çağlayan, 2010). In this context, doing further research on geometry self-efficacy taking into consideration the variables of gender and grade-level is thought to shed light on this finding. Therefore, further research into students' geometry self-efficacy in terms of gender and grade-level and discussion on whether or not the findings overlap with the findings of the present study can be suggested.

According to the findings obtained in line with the third research sub-problem, a significantly positive relationship was identified among all the participant students' visual learning styles and 8th grade students' kinesthetic learning styles and the sub-factors of positive self-efficacy beliefs and use of geometry knowledge, which are sub-dimensions of the geometry self-efficacy scale. On the other hand, a significantly negative relationship was identified between 6th grade students' scores of visual, auditory, and kinesthetic learning styles and 7th and 8th grade students' scores of auditory learning styles and negative geometry self-efficacy. There exist no research findings in Turkey regarding the above-mentioned problem. However, the findings obtained from this research demonstrate that there is an evident relationship between learning styles and geometry self-efficacy belief.

Students with auditory learning style learn best by listening while students with visual learning style learn best by seeing. Students with kinesthetic learning style learn by using a combination of learning styles. When knowledge is given, they may need to see and listen at the same time (Erden and Altun, 2006). In order for them to learn, the learning techniques which are called learning by doing and living should be adopted. They learn much better when they experience, touch and use their hands (Boydak, 2001). This information supports the positive and negative relationship between the participant students' learning style scores and the sub-dimensions of the geometry self-efficacy scale.

As a result, a positive relationship was identified between the sub-dimensions of positive self-efficacy beliefs and use of geometry knowledge that belong to the geometry self-efficacy scale of the participant students with visual learning style. This finding was interpreted as linked to the fact that the contents of the geometry lesson are visual. Another finding is that there is a significantly negative relationship between 7th and 8th grade students' auditory learning style scores and negative geometry self-efficacy scores. On the other hand, there is a significantly positive relationship between their kinesthetic learning style scores and the sub-factor scores of positive self-efficacy and use of geometry knowledge. However, it is noteworthy that a positive relationship has been identified between 7th grade students' kinesthetic

learning style scores and the sub-factor scores of negative self-efficacy. It can be stated that students with kinesthetic learning style are not paid attention to when geometry is taught in the lesson. Moreover, students with visual, auditory, and kinesthetic learning styles at 6th grade do no have negative self-efficacy towards geometry. As stated by Boydak (2001) students are forced to become auditory and particularly visual. When students are allowed to learn using their strengths, tactile/kinesthetic students can learn as well as visual and auditory students because learning styles are individuals' innate characteristics, and no one learning style is superior to another. It is also necessary to give a proper education which will enable students to compose geometrical concepts by themselves rather than giving them directly to the students (Fidan and Türnüklü, 2010). Therefore, it can be concluded that when education is given taking into account learning styles in the process of learning geometry, it will influence the students' use of geometry knowledge and positive and negative geometry self-efficacy beliefs.

5. Suggestions

According to the research findings, further research into learning styles and geometry self-efficacy in terms of gender and grade-level can be suggested to be carried out in second level primary education. Thus, whether or not students' geometry self-efficacy and learning styles overlap with the findings of the present research and how important the present situation is can be revealed. Further extensive research might undertake to identify the relationship between learning styles and geometry self-efficacy in terms of the variables of gender and grade-level as well as socio-economic and socio-cultural environments, learning and teaching environments.

The preparation of learning experiences which will provide new perspectives of looking at events for the students who adopt different styles of learning will enable them to attain the desired academic performance. Within this context, the relationship between learning styles and geometry self-efficacy can be studied by doing research which will support the results with observation and using as many determinants as possible.

This data can also be used in order to conduct similar researches in different cities, compare the results and make a generalisation.

References:

Altun, M. (2001).*İlköğretimIkinciKademede(6., 7. ve 8. Sınıflarda) MatematikÖğretimi.*İstanbul: Alfa Basım YayınDağıtım.

Aşkar, P. veUmay, A. (2001).İlköğretimmatematiköğretmenliğiöğrencilerininbilgisayarla ilgiliöz-yeterlikalgısı.*HacettepeÜniversitesiEğitimFakültesiDergisi (H.U. Journal of Education), 21*, 1–8.

Azizoğlu, N. veÇetin, G. (2009).6 ve 7.Sınıföğrencilerininöğrenmestilleri, fen dersine yöneliktutumlarive motivasyonlariarasindakiilişki.*KastamonuEğitimDergisi, 17*(1), 171–182.

Bandura, A. (1997). *Self efficacy: The Exercise of Control.* New York: W.H. Freeman and Company.

Bindak, R. (2004). Geometritutumöl çeğigüvenirlikgeçerlikçalişmasivebiruygulama. Yayınlanmam ışdoktoratezi, DicleÜniversitesi Fen BilimleriEnstitüsü, Diyarbakır.

Boydak, A. (2001). *ÖğrenmeStilleri.* İstanbul: BeyazYayınları.

Cano-Garcia, F. ve Hewitt-Huges, E. (2000). Learning and thinking styles: an analysis of their inter1. relationship and influence on academic achievement, *Educational Psychology*, *20*(4), 413-431.

Cantürk-Günhan, B. (2006). İlköğretim II.kademedematematikdersindeproblemedayalı öğrenmeninuygulanabilirliğiüzerinebiraraştırma. Yayınlanmamışdoktoratezi, DokuzEylülÜniversitesi Eğitim Bilimleri Enstitüsü, İzmir.

Cantürk-Günhan, B. veBaşer, N. (2007).Geometriyeyöneliköz-yeterlikölçeğinin geliştirilmesi.*Hacettepe "ÜniversitesiEğitimFakültesiDergisi, 33*, 68-76.

Çağlayan, S.Ö. (2010). Lise 1.SınıföğrencilerininGeometriDersineYönelikÖzyeterlik AlgısıVeTutumununGeometriDersiAkademikBaşarısınıYordamaGücü,Yayınlanmamışyükseklisanst ezi.YıldızTeknikÜniversitesiSosyalBilimler Enstitüsü, İstanbul.

Dağhan, G. VeAkkoyunlu, B. (2011). Maggie Mcvay Lynch öğrenmestillerienvanterinin türkçe'yeuyarlanmaçalişmasi.*HacettepeÜniversitesiEğitimFakültesiDergisi (H. U. Journal of Education)* 40: 117-126.

Davidson, G.V., (1990). Matching learning styles with teaching styles: is it a useful concept in instruction?, *Performance and Instruction*, 29(4), 36-38.\

De Bello, T.C. (1990). Comparison of Eleven Major Learning Style Models: Variables, Appropriate Populations, Validity of İnstrumentation and The Research Behind Them. International Journal of Reading, Writing and Learning Disabilities, 6:3, 203-222.

Demirel, Ö. (2002). ÖğretmeSanatı (3.Baskı). Ankara: Pegem A Yayınları.

Develi, H. M. veOrbay, K. (2003).İlköğretimdeniçinvenasılbirgeometrioğretimi.*Milli EğitimDergisi, Kış*, 157.

Dunn, R., (1990). Rita Dunn answers questions on learning styles. *Educational Leadership, 48*(2), 15–19.

Ekici, G., (2002). Öğrenmestilinedayalıbiyolojiöğretimininanalizi.*EğitimveBilim*, 27(126), 43–52.

Ekici, G. (2003). Uzaktaneğitimortamlarininseçimindeöğrencilerinöğrenmestillerinin önemi, *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 24*, 48-55.

Erden, M. veAltun, S. (2006). ÖgrenmeStilleri. İstanbul: MorpaKültürYayınları.

Erdoğan, A. Baloğlu, M. veKesici, S. (2009). Geometrivematematikdersbaşarıdüzeyleri ilegeometriöz-yeterlikinançlarındacinsiyetfarklılıkları.XVIII. UlusalEğitim BilimleriKurultayındasunulanbildiri (1-3 Ekim, İzmir).

Eren, A. (2002). Fen, sosyalveeğitimbilimialanlarindaöğrenimgörenüniversite öğrencilerininöğrenme biçimleriarasin dakifarkliliğinincelenmesi.Yayımlanmamış yükseklisanstezi. AbantİzzetBaysalÜniversitesi, Sosyal BilimlerEnstitüsü, Eğitimve Program Geliştirmeve Öğretimi A.B.D.

Eskici, M. (2008).Öğrencilerinöğrenmestilleriileakademikbaşarilarivecinsiyetleri arasindakiilişki. Yayımlanmamışyükseklisanstezi. TrakyaÜniversitesi, Sosyal BilimlerEnstitüsü.

Felder, R.M. (1996). Matters of Style. *ASEE Prism, 6* (4), 18-23.

Fidan, Y. &Türnüklü, E. (2010). İlköğretim 5. sınıföğrencileriningeome trikdüşünme düzeylerininbazideğişkenleraçisindanincelenmesi. *PamukkaleÜniversitesiEğitimFakültesiDergisi, 27*, 185-197.

Flemıng, N. D. (1995). I'm Different; Not Dumb. Models of Presentation (VARK) in The Tertiary Classrooom. Proceedings of The 1995 Annual Conference of The Higher Education and Research Development Society of Australasia (HERDSA). Zemler, A (Ed.). HERDSA, 18, 308-311.

Gibson, S. veDembo, M., H. (1984). Teacher efficacy: A construct validation. *Journal of Educational Psychology, 76*(4), 568-582.

Gökdağ,M., (2004). Sosyalbilgileröğretimindeişbirlikliöğrenme, öğrenmestilleri, akademikbaş arivecinsiyetilişkileri, Yayınlanmamışdoktoratezi.DokuzEylül ÜniversitesiEğitimBilimlerEnstitüsü, İzmir

Gülten, D.Ç. veGülten, İ. (2004).Lise 2.sinif öğrencileriningeometridersinotlariile öğrenmestilleriarasindakiilişkiüzerinebiraraştirma.*EğitimAraştırmalarıDergisi (EJER), 4*(16), 74-87.

Güven, B. (2003). İlköğretim 5.sinifsosyalbilgilerdersindealanbağımlılık-alanbağımsızlık bilişselstil boyutlarinauygunolarakhazirlananöğretimetkinliklerininakademik basarıvetutumlarüzerindekietkisi, Yayınlanmamışdoktoratezi, Anadolu Üniversitesi, SosyalBilimlerEnstitüsü, Eskişehir.

Güven, M. VeKürüm, D. (2006), ÖğrenmeStilleriveEleştirelDüşünmeArasındakiİlişkiye GenelBirBakış. *SosyalBilimlerDergisi*, 2006/1.

Güven, Z.Z. (2007). Öğrenmestillerinedayalietkinliklerinöğrencilerindinlemebecerisi erişileri, ingilizce dersineyöneliktutumlariveöğrenilenlerinkaliciliğinaetkisi.Yayınlanmamışdoktoratezi. Selçuk Üniversitesi, SosyalBilimlerEnstitüsü, Konya.

Heffler, B. (2001). Individual Learning Style and the Learning Style Inventory.*Educational Studies. 27*(3): 307 316.

Hein, T.L. veBudny, D.D. (2000).Styles and Types in Science and Engineering Education. Paper Presented International Conference on Engineering and Computer Education, Sao Paulo, Brazil.

James, W.B. ve Gardner, D.L. (1995).Learning Styles: Implications for Distance Learning, *New Directions for Adult and Continuing Education, 67*, 19-32.

Jones, C., Reichard, C. and Mokhtari, K. (2003). 'Are students' learning styles discipline specific?, *Community College Journal of Research and Practice, 27*(5), 363–375.

KafHasırcı, Ö. (2005). İlköğretim 3.sinifhayatbilgisidersindegörselöğrenmestiline gore düzenlenenöğretiminöğrencilerinakademikbaşarivekaliciliğinaetkisi. Yayınlanmamışdoktoratezi, ÇukurovaÜniversitesiSosyalBilimlerEnstitüsü.

Karasar, N. (2005). BilimselAraştırmaYöntemi (15. bs). Ankara: Nobel YayınDağıtım.

Küçükahmet, L. (2000). ÖğretimdePlanlamaveDeğerlendirme (11.Baskı). Ankara: Nobel YayınDağıtımLtd.Şti.

Marshall, C. (1990). The power of the learning styles philosophy. *Educational Leadership, 48*(2), 62.

Mutlu, M. veAydoğdu, M., 2003.Fen bilgisieğitimindekolb'unyaşantisalöğrenme yaklaşimi.*PamukkaleÜniversitesiEğitimFakültesiDergisi, 1*(13), 15–29.

Otrar, M. (2006).Öğrenmestilleriileyetenekler, akademikbaşarive ÖSS başarısıarasındaki ilişki.Yayınlanmamışdoktoratezi. Marmara ÜniversitesiEğitimBilimleriEnstitüsü, İstanbul.

Özkan, E. (2010). Geometriöz-yeterliği, cinsiyet, sinifseviyesi, anne-baba eğitimdurumuve geometribaşarisiarasindakiiliksiler, Yayınlanmamışyükseklisanstezi.Abantİzzet Baysal Üniversitesi Sosyal BilimlerEnstitüsü, Bolu.

Pajares, F. (1996a). "Self efficacy beliefs and mathematical problem solving of gifted students". *Contemporary Educational Psychology, 21*, 325-344.

Pajares, F. (1996b). Self-efficacy beliefs in academic settings.*Review of Educational Research, 66*(4), 543-578.

Ritter, J., Boone, W. veRubba, P. (2001). Development of an instrument to assess prospective elementary teacher selfefficacy beliefs about equitable science teaching and learning. *Journal of Science Teacher Education, 12*(3), 175-198.

Searson, R., & Dunn, R. (2001).The Learning-Style Teaching Model.*Science and Children*. *38* (5) 22-26.

Shaughnessy, M.F. (1998). An interview with Rita Dunn about learning styles, 5. *The Clearing House, 73*(1), 141-145.

Şimşek, N. (2002).BİG 16 ÖğrenmeBiçemleriEnvanteri.*EğitimBilimleriveUygulama. 1* (1), 33-47.

Şimşek, Ö. (2007). Marmara ÖğrenmeStilleriÖlçeği'ninGeliştirilmesive 9-11 Yaş ÇocuklarınınÖğrenmeStillerininİncelenmesi. Yayınlanmamışdoktoratezi. Marmara Üniversitesi Eğitim Bilimleri Enstitüsü, İstanbul.

Tekez, S.(2004). Genelliseögrencilerininögrenme stilleri.yükseklisanstezi. Eskisehir Anadolu Üniversitesi Egitim BilimleriEnstitüsü.

Terzi, M. veMirasyedioğlu, Ş. (2009). İlköğretimMatematikÖğretmenAdaylarının MatematiğeYönelikÖzyeterlikAlgılarınınBazıDeğişkenlerAçısındanİncelenmesi. *TübavBilimDergisi, 2*(2): 257- 265.

Uğur, N. (2008). Algısalöğrenmestilleriaçisindanilköğretim 4.sinifsosyalbilgilerders kitaplarininveöğretmenuygulamalarinincelenmesi. Yayınlanmamışyükseklisans tezi. Çukurova Üniversitesi Sosyal Bilimler Enstitüsü, Adana.

Yağışan, N. veSünbül, A. M. (2009).GüzelSanatlarEğitimiBölümüÖğrencilerinin ÖğrenmeTercihleri.8.UlusalMüzikEğitimiSempozyumundaSunulanBildiri, 23-25 Eylül, Samsun.

Yong, F. L.; McIntyre, J. D. , (1992). A comparative study of the Learning Style preferences of students with learning disabilities and students who are gifted. *Journal of Learning Disabilities. 25*(2): 24-132.