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Investigating Primary School Second Grade Students' Learning Styles According to the Kolb Learning Style Model in terms of Demographic Variables

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ABSTRACT

The aim of this study is to investigate primary school second grade students' learning styles according to the Kolb Learning Style model in terms of success and class level variables. The study was carried out by the participation of 687 primary school second grade students who were chosen as a sample from the cities of Inegöl and Bursa. "Kolb Learning Style Inventory" was used as a data collection tool. The data were analyzed by frequency, percent value, arithmetic mean, standard deviation, Pearson Chi- Squire Independent and One Sample Analyze technique. As a result, the students' learning forms, components and learning styles did not show any differences according to the gender, and yet it varies according to the class and success level. Furthermore, it has been found that the students have most Diverging Learning Style and least Accommodating Learning Style.

Keywords: Learning Forms; Learning Styles; Kolb Learning Style.

INTRODUCTION

The learning concept must be clarified for a person in order to be aware of the learning capacities. Nowadays there are many learning definitions in the related literature that has been done for the issue of what is learning and how it is actualized. While Gagne defined the learning as a change which continues and does not attribute to the growth period in the person's character or ability. Bacanlı defined it as stable changes happenning in the behaviors of the organism by repetition or experience. Ausubel described learning as a sense sharing. According to the Kolb, learning is a process that comes from concrete experience to reflective observation, from abstract conceptualizing to active practice (Kolb, 1984). According to McCarthy (2000), learning is realization of new things and reaction to these innovations.

The student must know himself and his learning ways so that the learning actualizes effectively. In this sense, we are confronted with learning style concept which provides

opinion about people and requires arrangements in learning environment according to the forgone peculiarity from the students. Learning style concept emerged from the results of studies which have been done for the differences among people. Learning style involves behaviors which are distinguishable and observable or which provides understanding about every people. Learning style emerges from the features that comes from creation or inborn. Learning style is a concept which does not change for life but it chances a person's life (Kaplan & Kies, 1995). The learning style concept came into question for the first time in 1960 by Rita Dunn (Babadoğan, 1995). From that time, many studies have been done about it. Since 1980, the studies about learning style have increased whether in numbers or in quality (Babadoğan, 1995). Researchers defined the learning styles in many different ways. Keefe (1982) perceives the learning style as cognitive, perceptive and psychological behaviors that show how a person perceives environment, how he interacts and reacts. According to Dunn and Dunn (1986), learning style is used in different and specific ways while a student prepares himself for the learning something new, and learns and remembers difficult knowledge. For Edward de Bono, learning is a form order of action and elements by leaguing together and to continue this order itself coherently (Boydak, 2005). Gregorc (1984) argues that the learning style concept contains behaviors which are observable and distinctive and which gives clues about unclear individual abilities. According to Gregorc (1079), the perceptional ability has a great importance in a person's learning and occurring of the learning style. McCarty (1987) defined the learning style as a perception of the knowledge by the people and preference of using processing abilities. The expectation of the person and integrating of the experiences provide the occurring of the learning. Also the learning is defined as a process of accommodation of a person to the social and physical environment. The physical structure that directs the learning leads to the process that can be changeable for every people. People's usage of different learning styles together cause observing the circumstances, unifying this with the concepts, making hypotheses and testing them and choosing new lives (Kolb, 1984).

Kolb's Learning Style Models

The learning styles of the people are like a circle in Kolb's Learning Style Model which was developed by Kolb. This circle contains four learning stages. These are: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC) and Active Experimentation (AE). That is, the students might be able to open themselves to new experiences without prejudice (CE), might reflect and observe the life from many points (RO), put the observations into strong theories logically (AC), use these theories in the stage of problem solving and making decisions (AE). According to Kolb, the learning process has two main dimensions. First of these reaches from abstract conceptualization to concrete experience, and the second reaches from active experimentation to reflective observation. Kolb in the learning style model says that the concrete experience and abstract conceptualization explains how the person perceives the knowledge, the reflective observation and active experimentation explains how the person integrates the knowledge. Preferences in the learning way that represent every learning style are different from each other. In order these are learning by "feeling" for concrete experience, "watching" for reflective observation, "thinking" for abstract conceptualization and "doing" for active experimentation. That is, according to Kolb learning style model, a person perceives the knowledge by thinking and feeling, integrates the knowledge by watching and doing. Kolb defined the experiential learning theory as a four stage learning circle that contains the ability of Concrete Experience, Reflective Observation, Abstract Conceptualization and Active Experimentation. Only one ability do not determines the person's learning style. Every person's learning style is a component of four learning ability (Kolb, 1984).

The styles that are defined in Kolb's learning model are stated as Diverge, Assimilator, Converge and Accommodator. Assimilating and Accommodating take part in intelligence concept which is defined as a balance between the processes of accommodating of the external world (accommodate) and assimilating the external observations to the existent concepts (assimilating) of the Piaget's concepts. Diverging and Converging are main creative process that takes place in the intelligence concept. The Kolb's Learning Style Model has been shown in the Figure 1.

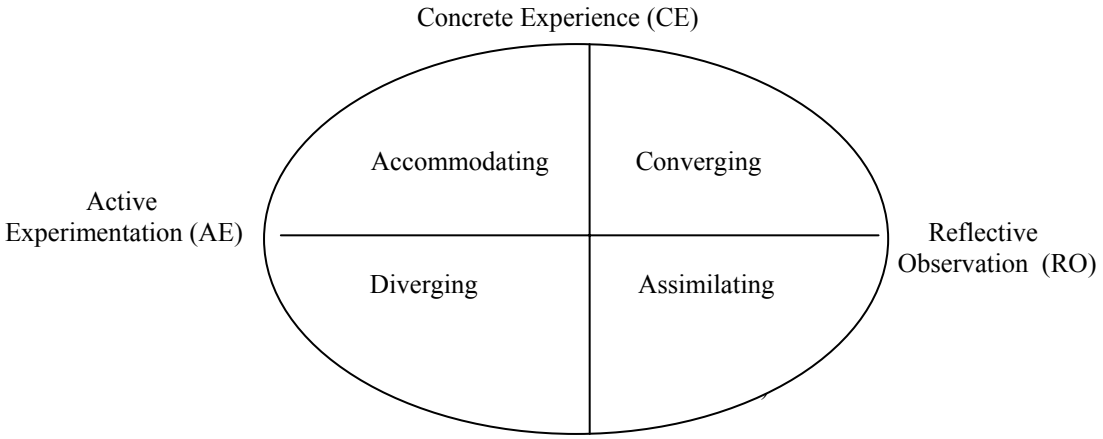

Figure 1. *Learning Styles based on Kolb's Learning Model*

The characteristics of the Assimilating, Diverging, Converging and Accommodating learning style that are in Kolb's learning style model and the people who have own these learning styles have been explained below (Aşkar & Akkoyunlu, 1993; Ekici, 2003).

Converging Learning Style includes abstract conceptualization and active experimentation learning styles. The main characteristics of the people who own this learning style are problem solving, decision making, analyzing the thoughts logically and systematic planning. Learning by doing is important for these people. These people choose jobs that need technological abilities such as medicine, engineering, economy, computer science.

Diverging Learning Style includes concrete experience and reflective observation learning styles. The most important characteristics of these people who own this learning style are thinking ability, being aware of value and concept. These people revise changing concrete situations from many points of view and organize relations meaningfully. They attend to give patient, objective, careful judge, but they do not attend to action. They take into consideration their thoughts and feelings while they form their thoughts. These people choose jobs such as socials practices, journalism, psychology, literature and art/theatre.

Assimilating Learning Style includes abstract conceptualization and reflective observation learning styles. The main characteristic of these people is creating conceptual model. They focus on abstract concept and thoughts while they learn something. These people choose jobs such as biology, education, teacher, law, sociology, librarian and mathematic.

Accommodating learning Style includes concrete and active experimentation learning style. The main characteristics of these people who own this learning style are making plan, carrying out plans and being in new experiment. People accommodate themselves easily to the changes and they are broadminded while they learn something new. They choose jobs such as salesmanship, public administration, education administration, administration and banking.

The components of four basic learning styles that are defined by Kolb is summarized below:

Concrete Experience	+	Active Experimentation = Accommodating
Concrete Experience	+	Reflective Observation = Diverging
Abstract Conceptualization	+	Reflective Observation = Assimilating
Abstract Conceptualization	+	Active Experimentation = Converging

In the academic process, the educational environment must be prepared according to a person's character for being actualize the learning. Creating such an environment will be possible when a teacher knows well the environment where he will teach and configure this environment. The teacher must take students' individual differences into consideration while he uses teaching methods. Individual differences between the students are how they perceive the events, how they react to these events and how they learn. For this reason, every student's learning style must be known and according to these learning styles the convinient environment must be prepared.

The aim of this study is to investigate the relation among gender, grade and science and technology lesson and learning style, and also to determine the learning style of 6., 7. and 8. class students in the second grade of primary school.

METHODOLOGY

In this study, survey model was used to determine the primary school second grade students' learning style and the variation of the students' learning style according to science success, gender and class grade. The survey model is a research approach that describes the existent situation as it exists (Kaptan, 1997).

a- Sample The population of this study is 6., 7. and 8. class students in state primary schools in 2006-2007 academic year in the cities of İnegöl and Bursa. The research population involves 50 primary schools. The sample constitutes 687 students from 6., 7. and 8. grade students of the four primary school second grade which were chosen by laminar sample. The schools' name and students' number are given in Table 1.

Table 1. *The Distribution of Schools and Students*

The name of the schools	**N**	**%**
Atatürk Primary School	192	28
Vehbi Koç Primary School	187	27
İshak Paşa Primary School	165	24
Kurşunlu Cumhuriyet Primary School	143	21
Total	687	100

The characteristic features of the 678 students who were participated in the survey were given in Table 2. 49% of primary school second grade students who are taken as a sample are girls and 51% of them are boys as it is seen in table 2. 35% of the students are in sixth grade, 40% of the students are in seventh grade and 25% of the students are in eighth grade. According to the success in science and technology lesson, 20% of the students are unsuccessfull and acceptable, 31% of the students are middle, 26% of the students are well and 23% of the students are very well. The students' pass degrees in the end of the semester were taken for students' marks. Also, because the per cent of students' science and technology marks are low and reliable in analysis results, they were given together.

Table 2. *The Distribution of Students' Features*

Differentiations	Groups	f	%
Gender	Girl	340	49
	Boy	347	51
Class grade	6th grade	244	35
	7th grade	272	40
	8th grade	171	25
Science and technology lesson mark	Bad- acceptable	136	20
	Middle	214	31
	Well	176	26
	Very well	161	23

b- Data Collection Mean Data collection mean consists of two parts. In the first part, there is background information such as gender, class and science and technology marks. In the second part, there is Kolb Learning Style Inventory. In order to determine the students' learning style, Kolb Learning Style Inventory which was translated into Turkish by Aşkar and Akkoyunlu (1993) was used. In every 12 items there are four statements in this inventory. The first one is Concrete Experience (CE), the second one is Reflective Observation (RO), the third one is Abstract Conceptualization (AC) and the fourth one is Active Experimentation (AE). It was obtained between 12-48 points for every item that were given by students for every item. After determining the CE, RO, AC and AE points of the total 12 items, the consolidated points was obtained as AE-RO and AC-CE. The consolidated points of AE-RO and AC-CE vary between -36 and +36. The positive point obtained from AC-CE shows that the learning is abstract and the negative point shows that learning is concrete. The positive point obtained from AE-RO shows that the learning is active and the negative point shows that the learning is reflective (Aşkar & Akkoyunlu, 1993).

c- Data Collection The data were collected in the first semester of 2006-2007 academic years. The application of the inventor was done in the cities of İnegöl and Bursa by the appliance of National Education Management. It was not asked for individual information of the participants for responding the data collecting mean sincerely. 786 inquiries arrived back.

d- Analysis of the Data First of all the data that were gained from the data collecting mean were analyzed, 81 inquiries which were filled incorrectly and deficiently were not included. 687 forms that were correctly filled were numerated and analyzed in computer. The data were analyzed by frequency, percent value, arithmetic mean, standard deviation, Pearson Chi- Squire Independent and One Sample Analyze technique and the data were given on tables.

FINDINGS

(a) The distribution of students' learning style

In Table 3 the reliability factors obtained from learning style and learning components were given.

Table 3. *The Reliability Factors Obtained From Students' Learning Style and Learning Components*

Learning Style and Components		Reliability Factors
Concrete Experience	CE	0,80
Reflective Observation	RO	0,73
Abstract Conceptualization	AC	0,77
Active Experimentation	AE	0,79
Abstract - Concrete	AC-CE	0,80
Active - Reflective	AE-RO	0,77

The reliability factor of Concrete Experience (CE) is 0,80, Reflective Observation (RO) is 0,73, Abstract Conceptualization (AC) is 0,77, Active Experimentation (AE) is 0,79, Abstract-Concrete (AC-CE) is 0,80 and Active-Reflective (AE-RO) is 0,77. In Kolb' inventory the reliability factor of learning style Concrete Experience (CE) is 0,82, Reflective Observation (RO) is 0,73, Abstract Conceptualization (AC) is 0,83, Active Experimentation (AE) is 0,78,and learning component Abstract-Concrete (AC-CE) is 0,88 and Active-Reflective (AE-RO) is 0,81.

Table 4. *Frequency and Percentage Distribution of Students' Learning Style*

Learning Style	f	%
Accommodating	101	14.7
Diverging	244	35.5
Converging	154	22.4
Assimilating	188	27.4
Total	687	100

According to Table 4, the students own most the Diverging learning style which is 35,5%. It is followed by Assimilating which is 27,4% and Converging which is 22,4%. The students own least the Accommodating learning style which is 14,7%.

(b) The variety of students' learning style according to gender

The variety of students' learning style according to gender was given in Table 5.

According to Table 5, CE learning style average point is 27,49 of the girls and 27,62 of the boys; RO learning style average point is 30,64 of the girls and 30,25 of the boys; AC learning style average point is 30,38 of the girls and 31, 21 of the boys; AE learning style average point is 31,49 of the girls and 30,88 of the boys.

Table 5. *The Tukey Test Findings of Students' Learning Style and Components According to Gender* (p=.05)

Learning Styles and Components	Gender	N	X	s	t	*p*
CE	Girl	340	27,49	7,63	-0,22	0,81
	Boy	347	27,62	7,73		
RO	Girl	340	30,64	6,75	0,82	0,41
	Boy	347	30,25	5,37		
AC	Girl	340	30,38	6,45	-1,66	0,09
	Boy	347	31,21	6,63		
AE	Girl	340	31,49	7,64	1,04	0,29
	Boy	347	30,88	7,51		
AC-CE	Girl	340	2,89	11,73	-0,75	0,45
	Boy	347	3,59	12,58		
AE-RO	Girl	340	0,85	12,08	0,25	0,79
	Boy	347	0,62	11,02		

The average point of AC-CE learning component is 2,89 for girls and 3,59 for boys; the average point of AE-RO learning component is 0,85 for girls and 0,62 for boys. When the results are analyzed it is seen that the average points are close to each other. The average points that were obtained from components are also low. The reason for this is that the points of students' learning style are close to each other. According to t test analysis that has been done to determine whether there is meaningful variance among students' mark averages it is seen that there is not any meaningful variance according to gender.

In Table 6, the distribution of the students' learning style according to gender was analyzed. 15,9% of boy students have Accommodating learning style, 32,9% of boy students have Diverging learning style, 22,1% of boy students have Converging and 29,1% of boy students have Assimilating learning style. 13,5% of girl students have Accommodating learning style, 32,0% of girl students have Diverging learning style, 22,8% of girl students have Converging learning style and 25,6% of girl students have Assimilating learning style. Accordingly it is seen that boys and girls have most Diverging and Assimilating learning style and they have least Converging and Accommodating learning style. According to Chi-Square independent test Pearson Chi-Square value was 2,67. Accordingly between students' learning style and their gender there are not any relations (p>0,05).

Table 6. *The Distribution of Students' Learning Style According to Gender (p=.05)*

			Learning Style				Total
			Accommodating	Diverging	Converging	Assimilating	
Gender	Boy	St.Numbers	54	112	75	99	340
		% Gender	15,9	32,9	22,1	29,1	100
		% Total	7,9	16,3	10,9	16,4	49,5
	Girl	St.Numbers	47	132	79	89	347
		% Gender	13,5	32,0	22,8	25,6	100
		% Total	6.8	19.2	11.5	13.0	50.5
Total		St. Numbers	101	244	154	188	687
		% Gender	14.7	35.5	22.4	27.4	100
		% Total	14.7	35.5	22.4	27.4	100

(c) The variety of students' learning style according to their success level

In table 7 the distribution of students' learning style and components according to success in science and technology lesson was given. According to this table the highest average for the students whose mark is "well done" is Concrete Conceptualization (X=31,73) and Reflective Observation (X=31,70) learning style. The lowest average for the students whose mark is "well done" is Concrete Experience (X=25,80) learning style.

Table 7. *The Distribution of Students' Learning Style and Components According To Success in Science and Technology Lesson*

Learning Style and Components	Success Level	N	$\overline{X}$	s
CE	Bad	136	29,44	7,32
	Middle	214	28,46	7,17
	Well	176	26,61	8,29
	Very well	161	25,80	7,46
RO	Bad	136	29,85	5,13
	Middle	214	29,76	5,80
	Well	176	31,44	6,79
	Very Well	161	30,77	6,27
AC	Bad	136	30,55	5,80
	Middle	214	30,09	6,13
	Well	176	31,01	7,27
	Very Well	161	31,73	6,79
AE	Bad	136	30,18	7,80
	Middle	214	31,64	7,30
	Well	176	30,93	8,02
	Very Well	161	31,70	7,20

Table 7. Continued..

AC_CE	Bad	136	1,11	11,46
	Middle	214	1,63	11,33
	Well	176	4,39	13,25
	Very Well	161	5,93	12,02
AE-RO	Bad	136	0,33	11,46
	Middle	214	1,88	11,15
	Well	176	-0,51	12,42
	Very Well	161	0,93	11,10

When the students' RO and AC-CE marks averages are examined it is seen that when the students' marks increase they are patient and careful during learning, apprehend the events' essence, observe the events carefully before make any decision, consider different viewpoints and have abstract learning style. In table 8, One-Way ANOVA analysis results that were done in order to determine whether the learning style points and the averages of consolidated points differentiate meaningfully according to success level variable were given. When they are examined it is seen that there are meaningful variation among "bad and very well", "bad and middle" and "middle and very well" marks and Concrete Experience learning style; among "middle and very well" marks and reflective observation learning style and among "bad and very well" and "middle and very well" marks and Concrete-Abstract consolidated points (p>0,05). When we take the averages of CE points into consideration it seen that when the students' decreases (very well, middle, bad) they solve their problems by their feelings, learning is pleasure when they learn among people and when they dramatize and they prefer less approach which is systematic, scientific and intellectual.

Table 8. *Variance Analysis Results of Students' Learning Styles and Components According to Science and Technology Lesson Success Level*

Learning Style and Components	**Source of variance**	**Total of Square**	**sd**	**Mean of square**	**F**	***p***	**Meaningful variation** (*p*=.05)
CE	Between groups	1311.186	3	437.062	7,62	.000	Bad-Middle Bad-Very well Middle-Very well
	Within groups	39155.935	683	57.329			
	Total	40467.121	686				
RO	Between groups	338.610	3	112.870	3,06	0,02	Middle-Well
	Within groups	25137.305	683	36.804			
	Total	25475.916	686				
AC	Between groups	262.208	3	87.403	2,04	0,10	-
	Within groups	29213.043	683	42.772			
	Total	29475.252	686				
AE	Between groups	236.787	3	78.929	1,37	0,24	-
	Within groups	39171.991	683	57.353			
	Total	39408.777	686				
AC-CE	Between groups	2573.327	3	857.776	5,91	.000	Bad-Very well Middle-Very well
	Within groups	99013.590	683	144.969			
	Total	101586.917	686				
AE-RO	Between groups	583.946	3	194.649	1,46	0,22	-
	Within groups	90996.415	683	133.230			
	Total	91580.361	686				

In table 9, students' learning style according to success level were given. When the table is examined it seen that 136 students have bad marks, 214 students have middle marks, 176 students have well marks and 161 students have very well marks. According to Chi-Square independent test Pearson Chi-Square value was 7,24. Accordingly there is relation between students' learning style and success level (p 0,05).

Table 9. *The Distribution of Students' Earning Style According to Success Level*

			Learning Style				Total
			Accommodating	Diverging	Converging	Assimilating	
Success Level	Bad	St. Numbers	16	64	26	30	136
		% Success	11,8	47,1	19,1	22,1	100,0
		% Total	2.3	9,3	3,8	4,4	19,8
	Middle	St. Numbers	46	73	39	56	214
		% Success	21,5	34,1	18,2	26,2	100.0
		% Total	6,7	10,6	5,7	8,2	31,1
	Well	St. Numbers	21	59	40	56	176
		% Success	11,9	33,5	22,7	31,8	100,0
		% Total	3,1	8,6	5,8	8,2	25,6
	Very Well	St. Numbers	18	48	49	46	161
		% Success	11,2	29,8	30,4	28,6	100,0
		% Total	2,6	7,0	7,1	6,7	23,4
Total		St. Numbers	101	244	154	188	687
		% Success	14,7	35,5	22,4	27,4	100,0
		% Total	14,7	35,5	22,4	27,4	100,0

According to Table 9 47,1% of the students whose marks are bad have abilities such as being patient, making observation, making careful and objective judgments, taking into consideration their feelings and ideas while shaping their ideas instead of looking the concrete situation from different way and acting and they own Diverging learning style. 34,1% of the students whose marks are middle, 33,5% of the students whose marks are well and 29,8% of the students whose marks are very well adopt these peculiarities less. Accordingly, while the students' marks increase they adopt Diverging learning style less. According to table 9, 30,4% of the students whose marks are very well, 22,7% of the students whose marks are well, 18,2% of the students whose marks are middle and 19,1% of the students whose marks are bad adopt Converging learning style. With reference to this we can say that while the students' success increases they are more successful in solving problems, making decisions, analyzing the ideas logically and making plans systematically. Also, 31,8% of the students whose marks are well, 28,6% of the students whose marks are very well, 26,2% of the students whose marks are middle and 22,1% of the students whose marks are bad adopt Assimilating learning style. The students whose successes are high are pleased with induction method, logical and analytical thought and interested in abstract concepts and ideas.

(d) The students' learning style according to class degree

The students' learning style and components according to class degree were given in table 10. The highest averages for sixth grade students (X=31,31) and seventh grade students (X=31,56) are in Active Experimentation (AE) learning style, for eighth grade students are in Abstract Conceptualization (AC) (X=31,42) and Reflective Observation (RO) (X=31,41) learning style. The lowest averages are in Concrete Experience (CE) for sixth grade students (X=28,62), seventh grade students (X=27,11) and eighth grade students (X=26,75).

Table 10. *The Distribution of the Students' Learning Style and Components According to Class Degree*

Learning Style and Components	Class degree	N	$\overline{X}$	s
CE	6	244	28,62	7,71
	7	272	27,11	6,92
	8	171	26,75	8,59
RO	6	244	29,67	5,77
	7	272	30,53	5,00
	8	171	31,41	7,76
AC	6	244	30,39	7,00
	7	272	30,79	4,97
	8	171	31,42	7,94
AE	6	244	31,31	7,58
	7	272	31,56	6,27
	8	171	30,40	9,27
AC-CE	6	244	1,77	12,62
	7	272	3,67	10,24
	8	171	4,66	14,02
AE-RO	6	244	1,64	11,15
	7	272	1,02	9,42
	8	171	-1,01	14,66

In table 11, One-Way ANOVA analysis results that were done in order to determine whether the learning style points and the averages of consolidated points vary meaningfully according to class grade were given.

Table 11. *The Variance Analysis Results of Students' Learning Style and Components According to Class Grade*

Learning Style and Components	The source of variance	Square total	sd	Square Means	F	*p*	Meaningful variation
CE	Between groups	439.890	2	219.945	3,75	0,02	6-8
	Within groups	40027.231	684	58.519			
	Total	40467.121	686				
RO	Between groups	307.271	2	153.635	4,17	0,01	6-7 6-8
	Within groups	25168.645	684	36.796			
	Total	25475.916	686				
AC	Between groups	106.283	2	53.141	1,23	0,29	-
	Within groups	29368.969	684	42.937			
	Total	29475.252	686				
AE	Between groups	147.616	2	73.808	1,28	0,27	-
	Within groups	39261.161	684	57.399			
	Total	39408.777	686				
AC-CE	Between groups	925.891	2	462.945	3,14	0,04	6-8
	Within groups	100661.026	684	147.165			
	Total	101586.917	686				
AE-RO	Between groups	746.640	2	373.320	2,81	0,06	-
	Within groups	90833.721	684	132.798			
	Total	91580.361	686				

According to variance results in table 11, there are meaningful difference among Concrete Experience (CE), Reflective Observation (RO) learning style and Abstract-

Concrete (A-C) consolidated points of the sixth and eighth grade students (p 0,05). When the average points of CE are taken into consideration and we can say that sixth grade students solve their problems according to their feelings and they choose systematic, scientific and intellectual method less when they are compared with eighth grade students. When the students' RO and AC-CE points are analyzed eighth grade students comprehend the core of the events during the learning, observe carefully before making any decision and have abstract learning style according to sixth grade students. While the students' grade increases they prefer to learn by observing and thinking instead of feeling according to the results.

In table 12, the distribution of students' learning style and class grade are given. When the table is analyzed the distribution of 244 sixth grade, 272 seven grade and 171 sixth grade students' learning style according to class grade is seen. 17,2% of the sixth grade students have Accommodating, 39,3% of them have Diverging, 20,5% of them have Converging and 23,0% of them have Assimilating learning style; 12,9% of the seventh grade students have Accommodating, 34,6% of them Diverging, 22,4% of them Converging and 30,1% of them have Assimilating learning style; 14,0% of the eighth grade students have Accommodating, 31,6 of them have Diverging, 25,1% of them Converging and 29,2% of them have Assimilating learning style. According to Chi-Square independent test Pearson Chi-Square value was 7,24. Accordingly there is relation between students' learning style and class grade (p<0,05).

Table 12. *The Distribution of Students' Learning Style According to Class Grade*

			Learning Styles				Total
			Accommodating	Diverging	Converging	Assimilating	
Class grade	6	St. numbers	42	96	50	56	244
		% Class	17,2	39,3	20,5	23,0	100,0
		% Total	6,1	14,0	7,3	8,2	35,5
	7	St. numbers	35	94	61	82	272
		% Class	12,9	34,6	22,4	30,1	100,0
		% Total	5,1	13,7	8,9	11,9	39,6
	8	St. numbers	24	54	43	50	171
		% Class	14,0	31,6	25,1	29,2	100,0
		% Total	3,5	7,9	6,3	7,3	24,9
Total		St. numbers	101	244	154	188	687
		% Class	14,7	35,5	22,4	27,4	100,0
		% Total	14,7	35,5	22,4	27,4	100,0

CONCLUSION and DISCUSSION

In this study, students' learning style were analyzed according to demographic variances and the results were discussed in this part.

The values that were obtained from reliability study for inventory were compared with Learning Style Inventory reliability factors that were developed by Kolb. As a result, it is determined that the inventory is fairly reliable. Also, these results are compatible with Cronbach-alfa reliability factors that were obtained by Aşkar and Akkoyunlu (1993), Ergür (1998), Demirbaş (2001) and Güven (2003). Consequently, the learning style inventory that was applied for students is fairly reliable.

The students prefer mostly Active Experimentation learning style and they prefer less Concrete Experience learning style. In another words, students learn by "doing" rather than by "feeling".

When the students' learning style is analyzed it is seen that they own mostly Diverging learning style and they own less Accommodating learning style. In Peker and

Aydın's (2003) study, it is also stated that Anatolia and Science High School students have most Diverging learning style and they have less Accommodating learning style. The students who have Diverging learning style consider their own feelings and thoughts while they give shape to their thoughts. They have ability in looking from different points to concrete situations and organize the relations. They want from their teachers to have motivating role. In Hasırcı (2006), Özsoy and oth.(2004) and Başıbüyük (2004) research it is also stated that students have less Accommodating learning style. Students who have Accommodating learning style want from their teachers to provide opportunity to them to discover the knowledge themselves. If such situations are not provided for students who have Accommodating learning style, they may have learning problems.

The distribution of students' learning style and components according to gender was determined and examined whether there is variance according to gender. The highest learning style average for girls is in Active Experimentation (AE) and it is Abstract Conceptualization (AC) for boys. There is not any variance when the differentiation situation of students' learning style and components according to gender are examined. It can be said that the students' preference in learning styles and activities in learning environment have not got any effect in favor of girls or boys. In Arslan and Babadoğan's (2005) research it is also stated that there is not any relation between gender and learning style. Also, the distribution between students' learning style and gender is examined and it is tried to determine whether there is variance according to gender. Girl and boy students have most Diverging learning style and they have less Accommodating learning style. According to analysis results, it is not found any relation between learning and gender. Accordingly, boys and girls adopt features such as looking to the events from different points, observing, being creative and being social; they adopt less the features such as taking risk, being broadminded, making plan and crying out the decisions. Such results were found also by Uzuntiryaki and oth. (2004), Fer (2003), Kabadayı (2004) and Shaw and Marlow (1999).

The distribution of students' learning style and components according to success level was determined and it was found that learning style and components varied according to success level. The highest averages of students whose marks are "bad" are Concrete Experience (CE) and Reflecting Observation (RO) learning style. The lowest averages of students whose marks are "Very well" are Concrete Experience (CE) learning style. When the results are examined it can be said that when the students' marks drop off (very well, middle, bad) they prefer to solve their problems by their institutions and enjoy learning by dramatizing and being interact with people and less prefer approaches which are systematic, scientific and intellectual. In Arslan and Babadoğan's (2005) research the relation among science and technology lesson and Concrete Experience, Abstract Conceptualization and Active Experimentation learning style was also found. Also, when the students' lesson marks increase they it is observed that they are more patient and careful during learning, comprehend the core of the events, make careful observation before decide, consider different points view and adopt abstract learning style. The students who use more logical adequacy, know how to learn and analyze the situations that the need are more successful. Also in Güven'(2003) study the successful students' AC-CE averages are highest than the students whose successes are in middle level. Accordingly it can be said that students who are successful adopt abstract learning style.

The distribution of students' learning style and components according to class degree was determined and it was found that learning style and components varied according to class degree. The highest averages for sixth grade students and seventh grade students are in Active Experimentation (AE) learning style, for eighth grade students are in Abstract Conceptualization (AC) and Reflective Observation (RO) learning style. The

lowest averages are in Concrete Experience (CE) for sixth grade students, seventh grade students and eighth grade students. According to variance results, there is meaningful difference among Concrete Experience (CE), Reflective Observation (RO) learning style and Abstract- Concrete (A-C) consolidated points of the sixth and eighth grade students. Accordingly, we can say that sixth grade students solve their problems according to their feelings and they choose systematic, scientific and intellectual method less when they are compared with eighth grade students. When the students' RO and AC-CE points are analyzed eighth grade students comprehend the core of the events during the learning, observe carefully before making any decision and have abstract learning style according to sixth grade students. While the students' grade increases they prefer to learn by observing and thinking instead of feeling according to the results. Also, it is found that there is relation between learning styles and class grade. While the students' grade increases they prefer most Converging learning style which has peculiarities such as solving problems, making decisions, putting the ideas into practice, analyzing the ideas and making systematic plan. However, while the students' grade increases they prefer less Diverging learning style which has peculiarities such as making observation and dreaming instead of looking to the concrete situations from different points, taking their feelings into consideration and tacking action. The reason of this is that the students are in rapid emotional and intellectual changing process because of their ages. Because of this changes can be seen in the students' learning preference and activities during the process. That it can be stated that while the students' age grows they prefer most abstract learning; they are sensible to social events and adopt systematic practices.

The students whose marks are bad have abilities such as being patient, making observation, making careful and objective judgments, taking into consideration their feelings and ideas while shaping their ideas instead of looking the concrete situation from different way and acting and they own Diverging learning style in respect of students whose marks are middle, well and very well. Also, while the students' marks increase they adopt most Diverging learning style. That is, the students whose successes are high are successful in solving problems, making decisions, analyzing the ideas logically and making systematic plan. Also, while the students' success gets high they adopt more Assimilating learning style. The students whose successes are high are pleased with induction method, logical and analytical thought and interested in abstract concepts and ideas. Mathews (1996) found that the students had different leaning styles and from these the students with Converging learning style were more successful than students with Diverging learning style. Also the relation between learning style and success was found in Kvan and Yunyan (2005), Kenneth and others (2005), Kılıç (2004), Gülten and Gülten (2004), Bilgin and Durmuş (2003), Demirbaş and Demirkan (2003), Ergür (1998), Lynch and others (1998), Pyryt and others, (1995), Hadfield and others, (1992), Dunn and others, (1990) studies.

By knowing the preferred learning style of the students in the learning process effective learning can be actualized. Thus, effective and productive learning process can be provided for every student. The students will attend to learning process effectively and this will bring success.

SUGGESTIONS

Some suggestions have been given below according to the results of the study.

To the students;

- It can be useful for students to be informed about learning style and the learning style they have.

To the teachers and teacher candidates;

- Science and technology teachers must be informed about learning styles and teaching methods that are based on these learning styles in service training course.
- While the teaching arrangements are done, the variance of the students' learning style according to class and success level can be taken into consideration.

To the education system;

- Families must be informed about learning styles and the attitude towards students learning style can be provided by the cooperation of school and parents.
- The effect of students learning styles and conformity to the students' success can be examined by determining the science and technology teachers' learning styles.

REFERENCES

Arslan, B. & Babadoğan, C., (2005). The Relationship between Gender, Age, Academic Achievement and Learning Styles of Seventh and Eighth Class Level Students. *Education Research Journal*, 21, 35-48.

Aşkar, P. & Akkoyunlu, B., (1993). Kolb Learning Style Inventory, *Education and Science*, 87, 37-47.

Babadoğan, C., (1994). The Relationhip between Learning Style and Strategies 1. Educational Science Congress (*1. Eğitim Bilimleri Kongresi Bildirileri)*, Adana: Çukurova Üniversitesi, 3, 1056- 1065.

Bacanlı, H., (2003).*Educational Psychology*, İstanbul:Alkım Press.

Başıbüyük, A., (2004). The Learning Styles of Math Teachers Give Attention Mccarthy Model. *Milli Eğitim Dergisi*, 163, ss.,

Bilgin, İ. & Durmuş, S., (2003). The Relational Study on the Relationship between Learning Styles and Student Achievement *Kuram ve Uygulamada Eğitim Bilimleri*, 3(2), 381-400.

Boydak, A., (2001).*Learning Styles*, İstanbul: Beyaz Pres.

Demirbaş, Ö. O., (2001). *The Relation of Learning Styles and Performance Scores of the Students in Interior Architecture Education*. Unpublished PhD Thesis, Bilkent University, The Institute of Economics and Social Sciences.

Demirbaş, Ö. O. & Demirkan, H., (2003) Focus on Architectural Design Process through Learning Styles. *Design Studies*, 24(5), 437-456.

Dunn, K. & Dunn, R., (1986). The Look of Learning Styles. *Early Years*, 16(7), 49-53.

Dunn, R., Sklar, R. I., Beaudry, J. S. & Bruno, J., (1990). Effect of Matching and Mismatching Minority Developmental College Students' Hemispheric Preferences on Mathematics Scores. *Journal of Educational Research*, 83(5), 283-288.

Ekici, G., (2003). *The Plan Sample About Learning Styles On Biology Teaching*, Ankara: Gazi Bookstore.

Ergür, D. O., (1998). A Relational Study on Learning Styles about College Students and College Teachers. Doctoral Thesis, Hacettepe University Social Sciences Institute.

Fer, S., (2003). The Learning Activities among Learning Styles of Math, Phycics, Chemistry *Çağdaş Eğitim Dergisi*, 28 (304), 33-43.

Gregorc, A. F., (1984). Style as a Symptom: A Phenomenological Perspective. *Theory into Practice,* 23(1), 51-55.

Gregorc, A. F., (1979). *"Learning/ teaching styles: their nature and effects." in student learning styles: Diagnosing and prescribing program.,* Reston. V.A: National Association of Secondary School Principals.

Gülten, D. ve Gülten, İ., (2004).A Relational Study on Learning Styles of 10. Grade Students and Geometry Course Materials. *Education and Science,* 16, 74-87.

Güven, G. A., (2003). A Study on Learning Styles of Teacher Candidates of Physics Education, Master thesis, Marmara University

Güven, M., (2004). *A Relation between Learning Styles and Learning Strategies*. Doctoral Thesis, Educational Sciences, Anadolu University.

Hadfield, O.D. & Martın, J.V. & Wooden, S., (1992). Mathematics Anxiety and Learning Style of the Navajo Middle School. *School Science and Mathematics*,92(4), 171-176.

Hasırcı, Ö. K., (2006). Sınıf Öğretmenliği Öğrencilerinin Öğrenme Stilleri: Çukurova Üniversitesi Örneği. *Eğitimde Kuram ve Uygulamada Eğitim Bilimleri*, 2(1), 15-25.

Kaplan, E. J. & Kies, D. A.,(1995). Teaching Styles and Learning Styles: Which Came First?. *Journal of Instuctional Psychology,* 22, 1, 9.

Kabadayı, A., (2004). A Relational Study on: Cognitive Learning Styles and Gender of Primary School Students: Konya Sample. *Ondokuz Mayıs University Journal of Education Faculty*, 18, 1-16.