Learning Styles and Problem Solving Skills of Turkish Prospective Teachers

Ilke Evin Gencel*
Canakkale Onsekiz Mart University

Abstract
Global changes in educational discourse have an impact on educational systems, so teacher education programs need to be transformed to better train teachers and to contribute to their professional development. In this process learning styles and problem solving skills should be considered as individual differences which have an impact in transformative and lifelong learning. In this context, this study aims to investigate the learning styles and problem solving skills of individuals training to become teachers. All participants (N=887) are education students at a state university in Turkey. This study revealed that the converging learning style was the most common among our sample of teacher candidates. Additionally, the learning styles of our participants did not differ in accordance with gender or academic department and the problem solving scores of all participants fell within the intermediate level range. Within this intermediate range, however, students who possessed the converging learning style tended to have higher scores on the problem solving measure than students possessing the other learning styles.

Keywords: Learning styles, problem solving skills, prospective teachers, teacher training

*** İlke Evin Gencel** is an associate professor of Curriculum and Instruction at Canakkale Onsekiz Mart University. Her research focuses on instructional design, characteristics of teacher candidates, learning styles and strategies, experiential learning studies.

Correspondence： ilkegencel@comu.edu.tr

Introduction

With regard to education, the curricula which tend to produce the most positive results are characterized by a distinct focus on development of learning strategies and problem solving skills. The aim of such curricula is to produce students who are skilled at accessing information and using that information efficiently in problem solving processes. Curricula are implemented by teachers. In this context first of all teachers and prospective teachers must be aware of their own and their students' individual differences.

Problem solving skills are important for both daily life and academic achievement (Kennedy, Tipps, & Johnson, 2004). According to Heppner, problem solving is defined as the way to overcome difficulty when faced with obstacles. In other words, problem solving equates to coping with problems. In this process, individuals dedicate their cognitive and affective processes to the achievement of end goal. It has been proven that individuals who are not be able to effectively problem solve are more prone to anxiety and insecurity as well as being less equiped to understand the problems they are faced with (Heppner & Baker, 1997; Heppner, Baumgardner, & Jakson, 1985). Kolb (1984) states that learning preferences and learning styles have different effects on individuals' capability to understand problem as well as their chosen methods for solving them. Additionally, it has been emphasized that knowledge of one's own learning style is important for being effective problem solver (Akkoyunlu, Altun, & Soylu, 2008). In this regard, the concept of learning style which focuses on individual differences in learning has been considered the most important individual pattern in self-regulation and problem solving process. The awareness of learning styles can help both in designing teaching-learning processes and in developing problem solving skills (Sywelem, Al-Harbi, & Fathema, 2012).

The significance of individual variation in terms of problem-solving skills is obvious in certain educational systems which are shaped within the framework of life-long learning. In order to construct a teaching model which produces students who can successfully solve problems by using previously acquired information, it is advisable for teachers and teacher candidates to be aware of individual differences amongst their students and in comparison to themselves. Additionally, teachers must possess strong problem solving skills. For this reason, teaching-learning processes should be designed according to the principle of constructivism and should contribute to social and self transformation (Barrot, 2013).

Appropriate teaching-learning process planning skills are directly correlated with pre-service education (Ball & Forzani, 2011; Stewart, 2011). In this context, creating a profile of teacher candidates which addresses issues of individual learning style and problem solving skills and solution generation constitutes a major contribution to educational research. Creation of such profiles would prove effective for increasing teacher candidates'awareness of their own learning styles and problem solving skills, which in turn would lead to increased success during the learning process and during their interactions with students. In this respect, the aims of this research are to determine whether learning styles and problem solving skills of teacher candidates differ in terms of gender and their departments, to find out whether there is a relationship between learning style and problem solving skills, and to develop suggestions for educational reform on the basis of these findings. In addition to this, it is supposed that the results of this research will provide guiding information for teacher trainers in modifying the teaching-learning process. Moreover, it is assumed that this study is significant from the perspective of experimental studies such as designing and practicing activities that can develop new teaching approaches based upon learning styles and problem solving skills, and gathering data from Turkey for further intercultural and comparative research.

Research on learning styles has received considerable attention over the recent years. There are various taxonomies of learning styles; one of the most influential of these taxonomies is based on Kolb's experiential learning theory (Boosman, Meily, Pos, Lindeman, & Heugten,. 2012; Joycey & Kantraidou, 2011; Kolb 1984; Shultz & Shultz 2004; Sywelem et al. 2012). Although it has been criticized that the same learning characteristics are considered in different categories and that individuals are classified according to their learning characteristics, it has been emphasized that

learning styles have an effect on learning, therefore it has been recomended that the amount of research in this field be increased, and the common findings be investigated further (Apter, 2001; Coffield, Moseley, Hall, & Ecclestone, 2004; Hadfied, 2006). Gregorc (1984) defines learning styles as the personally preferred way of acquiring information which gives some clues about the individual's personal ability. It also has been said that pupils' individual characteristics can render the same methods of instruction effective for some students and ineffective for others (Dunn & Dunn, 1992, p. 5).

According to Kolb (1984), the learning process occurs through experiences. Kolb considers learning as a four step process. First, individuals gain concrete experiences as a result of their natural environment, then they observe those experiences in different ways and reflect on them. This reflexion has an effect on the building of an abstract conceptualization. As a final result of this process, individuals attain principles and make generalizations. These generalizations serve as a guide for the individual's activities and advanced level learning. This process continues as a cycle; new experiences are gained and they serve a guide for the next stage of learning (Kolb, 1984;1999; Kolb & Kolb, 2005). Thus, Kolb defines four ways of learning; concrete experience, reflective observation, abstract conceptualization and active experimentation.

The composition of these learning styles is stated as the accommodating learning style, the diverging learning style, the assimilating learning style and the converging learning style. The diverging learning style is characterized by a synthesis of concrete experience and reflective observation. Individuals who possess this learning style are able to look at concrete situations from different perspectives. Identifying problems and assessing them from different perspectives are their primary strength (Evin Gencel, 2006; Kolb & Kolb, 2005). The learning style called assimilating is the combination of abstract conceptualization and reflective observation. The previously mentioned learning styles are considered to be quite effective for organizing extensive large bodies of knowledge in a logical manner. While they are effective for planning and identifying problems, it is observed that they are insufficient for solving problems (Hein & Budny, 2000; Kolb & Kolb, 2005; Scott & Koch, 2010).

The converging learning style encompasses the learning strategies of abstract conceptualization and active experimentation. Individuals who possess this learning style are skilled at logical analysis and problem solving (Kolb, 1999; Sywelem et al. 2012; Evin Gencel, 2006). Finally, the accomodating learning style is associated with a reliace on concrete experience and active experimentation. Individuals who possess this learning style prefer to take advantage of their own experiences while solving problems (Aşkar & Akkoyunlu, 1993; Kolb, 1999; Scott & Koch, 2010).

It has been observed that the interest for research on prospective teachers' learning styles has increased in recent years. Research reveals that prospective teachers have multiple learning preferences. In the literature, there are many studies (Bahar & Sülün, 2011; Demir, 2008; Evin Gencel & Köse 2011; Gürsoy, 2008; Kazu, 2010; Merter, 2009; Özdemir & Kesten, 2012; Peker & Mirasyedioğlu, 2008; Perry & Ball, 2004; Tuna, 2008) proving that prospective teachers usually exhibit a preference for the converging and assimilating learning styles although there are also prospective teachers who possess the assimilating and accommodating learning styles (Akca, 2013; Baykara Pehlivan, 2010; Eyyam, Meneviş, & Doğruer, 2011; Merter, 2009) and learning styles of prospective teachers do not differ according to gender (Bahar & Sülün, 2011; Gürsoy, 2008; Özdemir & Kesten, 2012). Moreover, studies put forward that prospective teachers' learning styles are related to their self-efficacy (Evin Gencel & Köse, 2011; Baykara Pehlivan, 2010), academic success (Alghasham, 2012; Akca, 2013), attitudes towards technology (Dost & Saglam, 2012), critical thinking levels (Güven & Kürüm, 2008) and scientific process skills (Duran, Işık, Mıhladız, & Özdemir, 2011). In addition, there are studies affirming that educators being informed about learning styles improves the quality of the learning environment (Hadfied, 2006; Honigsfield & Schiering, 2004; Saracho, 2003; Solvie & Sungur, 2003).

As is characteristic of learning styles, the approaches to and levels of problem solving skills differ greatly from individual to individual. The term "problem" is defined as the complexity faced in any situation, and the term "problem solving" as the process of overcoming that complexity. Heppner summarizes the process of problem solving in five steps. When individuals encounter a problem, they first specify a general approach for dealing with it. Then comes the second step; identifying the problem and limiting it. After brainstorming solutions to the problem, the individual chooses the best solution from among the options. In the last step, individuals assess whether the solution solves the problem or not (Cobb & Steffe, 2011). According to Heppner, individuals may also adopt the so called "Hasty Approach" in the problem solving process. For this approach they simply accept the first idea that comes to mind. Individuals who use the "Considerate Approach" first try to understand the problem completely, and think about the possible outcomes of their solution options. Individuals who adopt the "Avoidant Approach" fear that they will not be successfull in solving the problem. Individuals who use the "Evaluative Approach" consider a variety of options in the process of problem solving. Moreover, individuals who adopt the "Self Confident Approach" constantly look for new solutions. Individuals who use the "Planned Approach" gather data periodically. The Hasty and Avoidant Approaches are regarded as inferior when compared to other approaches (Heppner & Peterson, 1982; Cobb & Steffe, 2011).

There have been findings in the literature which show that prospective teachers' perception of problem solving skills is generally at medium level (Bayraktar, Güngörmüş, Gülbahçe, Şahin, & Bastık, 2011; Çapri & Gökçakan, 2008). There are findings claiming that prospective teachers' problem solving skills, their self-esteem (Gürşen Otacıoğlu, 2008; Kesgin, 2006) and critical thinking skills (Yıldırım & Yalçın, 2008) are relational. The ability to effectively problem solve makes cognitive activities more enjoyable; however, it has been stated that teacher training programmes do not execute problem solving skills efficiently (Wade, Fauske, & Audrey, 2008). Additionally, for transformative learning, prospective teachers need to know their individual learning differences, and they should have effective problem solving skills to keep pace with rapidly changing learning opportunities. According to transformative learning theory, perspective transformation is the most critical kind of knowledge (McGonigal, 2005).

Perspective transformation is described by Mezirow (1991, p.167) as " ...the process of becoming critically aware of how and why our assumptions have come to constrain the way we perceive understand, and feel about our world; changing these structures of habitual expectation to make possible a more inclusive, discriminating, and integrating perspective; and finally, making choices or otherwise acting upon these new understandings." Additionally, Moore (2005) emphasizes that in the transformative learning process learners are able to reflectively transform their attitudes, beliefs and emotional reactions which constitute their meaning scheme. The research focus in this field has shifted from learning for information to learning for transformation (Le Fevre, Fritz, & Westhuizen, 2011). For developing these abilities learners should know their individual characteristics such as their individual learning style, and they need to be a good problem solvers. Various authors have emphasized that learning styles and problem solving abilities are key factors that can influence the transformative learning process (Cranton, 2006; Magro & Polyzoi, 2009; Taylor, 2007).

The number of research studies which address the learning styles and problem solving abilities of prospective teachers much smaller than the number of research studying these two points independently. Küçükkaragöz and colleagues (2009) stated that there is no relationship between learning styles, problem solving abilities and gender, Metallidou and Platsidou (2008) stated that prospective teachers mostly employ the active experimentation learning style, and that there are negative relationships between using analogy and visualization in active experimentation and problem solving. In a study by Carmo and the colleagues (2006), it is noted that visual students have low problem solving abilities. Şirin and Güzel (2006) found that there was a positive correlation between effective problem solving skills and the tendency towards a reflective observation learning style. Conversely, these studies noted a distinct negative correlation between problem solving skills and the tendency towards an abstract conceptualization learning style. The ability to problem solve is a learnable skill. First of all; teachers should definitely be model problem solvers. Teachers who employ

effective problem solving strategies can train learners to employ such strategies as well to master (Senemoğlu, 2002).

In order to be able to produce individuals who can solve problems and who are aware of their strengths and weaknesses, teachers and prospective teachers must be knowledgeable of these characteristics. It is considered to be important to specify prospective teachers' profiles in terms of learning styles and problem solving skills, and to scope out a solution if there is any deficiency.

In this context, the objectives of the current study are to investigate whether learning styles and problem solving skills of teacher candidates differ in terms of gender and their departments, to find out whether there is a relationship between learning styles and problem solving skills. Based on the objectives of the study, the following research questions were addressed:

- What kind of a distribution do prospective teachers indicate in terms of learning styles?
- Do the learning styles of prospective teachers differ in accordance with their gender and department?
- How do prospective teachers percieve themselves in terms of their problem solving skills?
- Do the problem solving skills of prospective teachers differ in accordance with their gender and department?
- Do the problem solving skills of prospective teachers differ in accordance with their learning styles?
- Is there any relationship between prospective teachers' problem solving skills and their learning styles?

Methodology

Participants

The data of this research was gathered from teacher candidates in the Faculty of Education at Canakkale Onsekiz Mart University in Turkey. The research group was composed of 887 teacher candidates. The participants were mostly female (69,4%) teacher candidates studying Early Childhood Education (ECE) (21,6%), Turkish Language Teaching (TLT) (17,9%), English Language Teaching (ELT) (11,7%), Music Education (ME) (4,7%), Japanese Language Teaching (JLT) (9,4%), physical education (PE) (2,8%), German Language Teaching (GLT) 4,1(%), Science Education (SE) (5,6%), Primary School Education (PSE) (6,4%), Art Education (AE) (4,8%), Computer and Instructional Technologies Teaching (CITE) (3,5%), Social Studies Teaching (SST) (7,3%).

Data Gathering Tools

Kolb's Learning Style Inventory (Version 3) developed by Kolb (1999) that adapted for use in Turkish by Evin Gencel (2007) consists of 12 statements about the learning preferences. The points taken from the scale are classified as "converging", "diverging", "assimilating", and "accommodating" in relation with preferences for "concrete experience", "reflective observation", "abstract conceptualization", and "active experience". The Cronbach alpha value has been found to be .76 for concrete experience, .72 for reflective observation, .81 for abstract conceptualizing, .76 for active experience, .79 for abstract conceptualizing-concrete experience, and .77 for active experience-reflective observation. The Problem Solving Inventory (PSI) developed by Heppner and Peterson (1982) adapted for use in Turkish by Şahin, Şahin and Heppner (1993) was used for the study. It is a Likert-type scale composed of 35 items ranking between 1-6 points. There are three filter items that were not graded in any way. The scale is composed of six sub-dimensions; hasty approach, considerate approach, avoidant approach, evaluative approach, self confident approach and planned approach. Reliability coefficients of the sub- dimensions are .73, .69, .74, .68, .62, .70 respectively and .79 for the whole inventory.

Data Analysis

In the data analysis process, frequency, percentage values, mean and standard deviation values were calculated, chi- square, one way analysis of variance and t- test were performed, pearson moment correlation coefficients were calculated. The homogeneity of variances were checked using the Levene test; when $p<.05$ was found, the nonparametric tests Mann Whitney-U Test and Kruskal Wallis H test were perfomed.

Findings

Table 1 represents the distribution of learning styles among the teacher candidates tested.

Table 1. *Percentage Distribution of the Participants in Accordance with Their Learning Styles*

Learning Style	**f**	**%**
Converging	493	55.6
Assimilating	178	20.1
Diverging	121	13.6
Accommodating	95	10.7
Total	887	100

Table 1 indicates that more than half of the prospective teachers (55.6%) prefer the converging learning style. This preference is followed by those of the assimilating learning style (20.1%), the diverging learning style (13.6%) and the accommodating learning style (13.6%). In order to determine whether or not the participants' learning styles differed in accordance with their gender or their departments, a chi- square test was performed. The results are provided in table 2.

Table 2. *Learning Styles and Chi-square Test Results in Accordance with Gender*

Learning Style / Gender		Accommodating	Diverging	Converging	Assimilating	Total
Female	n	71	79	345	121	616
	%	11.5	12.8	56.0	19.6	100
Male	n	24	42	148	57	271
	%	8.9	15.5	54.6	21.0	100
Total	n	95	121	493	178	887
	%	10.7	13.6	55.6	20.1	100

$X2 = 2{,}48$ $sd=3$ $p=.47$

Table 2 indicates that there is no significant difference *X2(3)=2.486, p>.05* between participants' learning styles and gender. Both male and female students (56.0%; 54.6%) stated that they generally have converging learning styles. Table 3 presents the results of the chi- square test in terms of the variable of prospective teachers' learning styles according to the department in which each individual studies.

Table 3. *Learning Styles and Chi-square Test Results in Accordance with Department*

Learning Style / Department		Accomodating	Diverging	Converging	Assimilating	Total
ECE	n	18	30	94	50	192
	%	9.4	15.6	49.0	26.0	100
ELT	n	11	12	59	22	104
	%	10.6	11.5	56.7	21.2	100
TLT	n	19	19	93	28	159
	%	11.9	11.9	58.5	17.6	100
ME	n	5	6	23	8	42
	%	11.9	14.3	54.8	19.0	100
JLT	n	6	13	44	20	83
	%	7.2	15.7	53.0	24.1	100
PE	n	4	7	11	3	25
	%	16.0	28.0	44.0	12.0	100
GLT	n	2	1	29	4	36
	%	5.6	2.8	80.6	11.1	100
SE	n	4	6	29	11	50
	%	8.0	12.0	58.0	22.0	100
PSE	n	5	10	33	9	57
	%	8.8	17.5	57.9	15.8	100
AE	n	3	4	24	12	43
	%	7.0	9.3	55.8	27.9	100
CITE	n	7	5	17	2	31
	%	22.6	16.1	54.8	6.5	100
SST	n	11	8	37	9	65
	%	16.9	12.3	56.9	13.8	100
Total	N	95	121	493	178	887
	%	10.7	13.6	55.6	20.1	100

X2 =40.153 sd=33 p=.18

According to table 3, learning styles do not differ significantly in accordance with department *[$X^2_{(33)}$=40.153, p>.05].* Regardless of the department in which the participants study, they predominantly the converging learning style. Table 4 presents the mean points of participants' perceptions about their problem solving skills.

Table 4. *Desctiptive Statistical Results of PSI Points*

Problem Solving Approach	N	Minimum	Maximum	$\overline{X}$	S
Hasty Approach	887	9	54	33.49	7.16
Considerate Approach	887	5	30	14.18	4.06
Avoidant Approach	887	4	24	16.92	4.36
Evaluative Approach	887	3	18	8.10	3.10
Self Confident Approach	887	7	42	21.33	4.92
Planned Approach	887	4	24	10.25	3.73
General Problem Solving	887	32	192	113.81	17.09

Table 4 indicates that prospective teachers often use the hasty, considerate, avoidant, self confident, and planned approaches. The mean score provided from the overall scale shows that the prospective teachers' perception of problem solving skills is closest to the "slightly positive" (85.4-112) interval. A t- test was performed on the data to specify whether a significant difference existed between participants' PSI points and their gender. The homogenity of variances was checked with a Levene test, and when ' p' was found to be less than .05 in the Levene test, a Mann Whitney-U Test was peformed, which is nonparametric.

Table 5 presents the results of the t- test in accordance with PSI points in terms of gender.

Table 5. *t- Test Results in Accordance with PSI Points in terms of Gender*

	Gender						
	Female (N=616)		Male (N=271)		sd	t	Homogeneity
	$\overline{X}$	ss	$\overline{X}$	ss			Levene
Hasty Approach	33.68	7.02	33.04	7.46	885	1.224	2.32
Considerate Approach	14.15	4.20	14.24	3.73		-0.307	4.80*
Avoidant Approach	17.03	4.32	16.66	4.45		1.190	0.98
Evaluative Approach	7.97	3.05	8.40	3.20		-1.907*	0.35
Self Conf. Approach	21.38	4.52	21.23	5.74		0.419	3.79*
Planned Approach	10.33	3.71	10.08	3.79		0.930	0.30
General Problem Solving	114.13	16.12	113.09	19.11		0.834	6.23*

*p≤.05

According to table 5, female teacher candidates' mean points in sub-dimensions of hasty, avoidant and planned approaches are higher than those of the male teacher candidates. The difference between means is not significant. Male teacher candidates' mean points are higher than the female teacher candidates in the sub dimension Evaluative Approach and this is statistically significant *[$t_{(885)}$ = -1907; p≤.05)].* Since the results of the Levene test indicate that the variances are not homogeneous in the general point distribution of PSI and the considerate and self confident, the non parametric Mann Whitney-U Test was performed. The results are provided in table 6.

Table 6. *Mann-Whitney U Test in Accordance with the General Distribution Point of PSI*

	Female (N=616)		Male (N=271)		
	Mean of sequence	Total of sequence	Mean of sequence	Total of sequence	U
Considerate Approach	442.89	272819.50	446.53	121008.50	82783.5
Self Confident Approach	451.56	278160.00	426.82	115668.00	78812.0
Problem Solving	451.84	278330.50	426.19	115497.50	78641.5

U=82783.500; p>.05

As table 6 indicates, there is not a significant difference between female and male teacher candidates in terms of the considerate (*U=82783.500; p>.05*) and self confident (*U=78812.000, p>.05*) approaches in problem solving. A significant difference in total point of prospective teachers' problem solving skills according to gender variable in terms of statistics has not been found (*U= 78641,500, p>0,05*).

A One Way Analysis of Variance was performed on the data to specify whether participants' P.S.I points differ in terms of their departments. The results are presented in table 7. The homogeneity of variances was checked with a Levene Test, and when the F value was significant, the source of the difference was identified with a Scheffe test. When the result was p<.05 in the Levene test, the nonparametric Kruskal Wallis H test was performed. The difference between the hasty (*F=2.06; p<.05*), considerate (*F=3.99; p<.05*), avoidant (*F=5.24; p<.05*), evaluative (*F=3.94; p<.05*), self confident (*F=3.59; p<.05*), and planned approach (*F=5.22; p<.05*) in accordance with students' departments is significant. However, the total point of PSI does not indicate a significant difference in terms of students' departments (F=1.49; p>.05).

Since the Levene test indicated that the distribution of the group was nonhomogeneous in the avoidant approach, the nonparametric Kruskal Wallis H test was performed. To examine the source of the difference, the Mann Whitney U test was performed by forming dichotomous groups. The results are presented in Table 7.

Table 7. *The Result of Kruskal Wallis H Test About Nonhomogenic Sub-dimension in Accordance with the Department*

P.S.I.	Department	Mean of seq.	sd	X^2	Difference
	1. ECE	355.15			
	2. ELT	459.46			
	3. TLT	472.16			
	4.ME	388.35			
	5.JLT	518.30			1-2; 1-3; 1-5; 1-7; 1-9; 1-10; 1-12; 2-11; 3-11; 4-5; 4-7; 4-10; 5-8; 5-11; 9-11; 11-12
Avoidant	6.PE	424.12			
Approach	7.GLT	567.18	11	57.26*	
	8.SE	398.39			
	9.PSE	483.35			
	10.AE	535.73			
	11. CITE	346.81			
	12.SST	479.59			

*p<.01

The difference in the mean of sequence of the group is significant (*X2 (11)=57,26; p<.05*).

One Way Analysis of Variance was performed to identifiy whether participants' problem solving skills differ in accordance with their learning styles. The results are provided in Table 8.

Table 8. *The Results of One Way Analysis of Variance in Accordance with PSI in Terms of Learning Styles*

P.S.I.	Learning Style	N	$\overline{X}$	S	F	Difference	Levene
	1.Accommodating	95	32.81	7.49	10.17*	2-4	0.93
Hasty	2. Diverging	121	31.50	6.38			
Approach	3.Converging	493	32.37	7.15			
	4.Assimilating	178	34.61	6.97			
	1.Accommodating	95	15.42	4.52	6.94*	1-3; 2-3	1.11
Considerate	2. Diverging	121	14.96	3.77			
Approach	3.Converging	493	13.07	4.04			
	4.Assimilating	178	14.30	3.82			
	1.Accommodating	95	15.87	4.85	10.34*	3-4	2.06
Avoidant	2. Diverging	121	16.00	4.50			
Approach	3.Converging	493	16.12	4.09			
	4.Assimilating	178	17.63	4.36			
	1.Accommodating	95	9.10	3.55	3.76*	1-3	1.92
Evaluative	2. Diverging	121	8.00	3.05			
Approach	3.Converging	493	7.91	2.99			
	4.Assimilating	178	8.00	3.11			
	1.Accommodating	95	22.24	4.99	1.88		1.07
Self	2. Diverging	121	21.77	5.89			
Confident	3.Converging	493	21.06	4.80			
Approach	4.Assimilating	178	21.29	4.43			
Planned	1.Accommodating	95	10.92	3.95	2.80*	1-3	2.46*
Approach	2. Diverging	121	10.52	4.11			

	3.Converging	493	9.90	3.68			
	4.Assimilating	178	10.57	3.42			
General Problem Solving	1.Accommodating	95	112.95	18.54	2.82*	3-2; 3-4	1.28
	2. Diverging	121	116.14	20.15			
	3.Converging	493	111.16	15.54			
	4.Assimilating	178	114.53	16.52			

*p<.01

According to Table 9, there is a significant difference in prospective teachers' problem solving skills in accordance with their learning styles. Points of problem solving skills for the students who demonstrated a preference for the converging learning style are significantly higher than the points of the students who exhibited the diverging and assimilating learning styles. The hasty and avoidant approaches are mostly used by the participants who exhibit an assimilating learning style, while considerate, evaluative, self confident and planned approaches are used mostly by the students who have a converging learning style.

In order to determine whether or not there exists a relationship between learning styles and problem solving skills Pearson Moment Correlation coefficients were calculated. The results are presented in Table 9.

Table 9. *The Result of Pearson Moment Correlation between Participants' PSI Points and LSI*

	C.E.	R.O.	A.C.	A.E.	P.S.I.
C.E.	1.00				
R.O.	-.125**	1.00			
A.C.	-.173**	-.177**	1.00		
A.E.	-.218**	-.279**	-.89*	1.00	
P.S.I.	-.012	-.131*	-.111*	-.118*	1.00

**p<.01; * p<.05

As Table 9 indicates, it has been identified that there is a strong negative correlation between the problem solving skills on the one hand and reflective observation(r=-.131), abstract conceptualization (r=-.111) and active experimentation (r=-.118) on the other hand. In other words, as students' reflective observation, abstract conceptualization, and active experimentation points increase the problem solving inventory points decrease.

Discussion

In this research, it has been identified that prospective teachers most often exhibit a converging learning style, and it is followed by the preferences for assimilating, diverging and accommodating learning styles in that order. In accordance with these findings, Bahar and Sülün (2011), Demir (2008), Ergür (1998), Garvey and collegues (1984) also identified that the students in

their sample groups demonstrate a preference for the converging learning style. The findings of Ergür (1998) and, Bahar and Sülün (2011) about the distribution of prospective teachers' learning styles overlaps with this research in terms of the order of frequency for the various learning styles, converging being the most frequent followed by, assimilating, diverging and accomodating respectively. Küçükkaragöz and collegues (2009) stated that teacher candidates specializing in the higher grades generally exhibit the converging learning style. Furthermore, Perry and Ball (2004), and Evin Gencel and Köse (2011) demonstrated that students studying in Maths and Science have converging learning style in general. However, there are a number of studies discovered a predominant preference for the assimilating learning style among their participants (Atay, İbiş, & Kartal, 2009; Çaycı & Ünal, 2007; Gürsoy, 2008; Hasırcı, 2006; Peker & Mirasyedioğlu, 2008; Tuna, 2008). However, excluding the studies of Atay, İbiş and Kartal (2009)'s, the converging learning style occupies the second position in the frequency sequence of all other studies. In this respect, the findings are not parallel, but they are not in total contradiction as the most common learning style used remains the converging learning style. In the teaching-learning process, implementing Kolb's experiential learning theory which provides appropriate options for students who have different learning preferences, can be useful for boosting the efficiency of the process.

In accordance with the literature (Atay et al. 2009; Bahar & Sülün, 2011; Demir, 2008; Gürsoy, 2008; Kılıç & Karadeniz, 2004; Köse, 2010; Küçükkaragöz, Deniş, Ersoy, & Karataş, 2009; Mutlu, 2008), it has been clarified that teacher candidates' learning styles do not differ in accordance with gender. Experiential learning theory is based on the assumption that learning styles occurs as a result of experience, more than as a result of genetic features. Additionally, the fact that there is no difference in terms of gender can be related to both genders' having similar experiences.

It has been identified that there is not a significant difference between teacher candidates' learning styles and their departments. It has been specified that no matter in which department the teacher candidates study, they show a predominant preference for the converging learning style. In congruence with these research findings, there are a number of studies which indicate that learning styles do not differ in accordance with participants' departments in the literature (Demir, 2008; Gürsoy, 2008; Mutlu, 2008). It has been found that teacher candidates' perception of problem solving is in the lower limit of the "quite negative" interval and close to the "slightly positive" interval. This finding can be interpreted as teacher candidates perceiving themselves as "mediocre level problem solver". Additionally, teacher candidates state that they "often" use the hasty approach, the considerate approach, the avoidant approach, the self confident approach and planned approach, while they "generally" use the evaluative approach in problem solving process. The frequent use of both the hasty and the avoidant approach can be charaterized as having negatice effect on the problem solving process. The findings in the literature generally agree with those of this study.

It has been identified that there is no difference in teacher candidates' general problem solving skills in accordance with their gender and there is a significant difference in the sub-dimension of the evaluative approach regarding female students. The significant finding that female students use the evaluative approach more than male students which is characterized as having a positive effect on the problem solving process, overlaps with the findings of Aksan (2006) and Ferah (2000). In this respect, more quantitative and qualitative research findings are needed in this field.

In this study, teacher candidates' perceptions of their general problem solving skills do not differ in accordance with their departments; however, there are some differences in terms of sub-dimensions. It has been found that the hasty approach, which is regarded as a negative characteristic in problem solving, is used by German Language Teaching, Turkish Language Teaching, and Social Sciences Teaching students most frequently and that it is used by Music Education and Early Childhood Education students least frequently. Furtherrmore, it has been specified that the avoidant approach is used by German Language Teaching, Primary School Education and English Language Teaching students most frequently, and that it is used by Early Childhood Education and CITE students least frequently. The fact that students of Early Childhood Education are more patient in the problem solving process may originate from the fact that they deal with young children. On the other

hand, the students of English Language Teaching department use the considerate and evaluative approaches more. Physical Education department students use the planned approach most widely. This may originated from the fact that they take part in individual and team sport activities.

In this study, it has been found out that the students that exhibit the converging learning style percieve problem solving skills in a more positive way than other students. It has been stated that the decision making and problem solving abilities (Kolb, 1984; 1999) of individuals with the converging learning style are more advanced. The perception of problem solving skills of teacher candidates with the diverging learning style is at a low level. Individuals who use that learning style prefer observing rather than putting a plan into action (Kolb, 1999). In this respect, the findings overlap with the features of learning styles.

The findings indicate that the teacher candidates who employ the reflective observation, abstract conceptualization and active experimentation learning styles percieve themselves as sufficient problem solvers. In the reflective observation learning style, individuals reflect on their ideas about an issue, question how the realities have come into existence and make decisions accordingly. Needless to say, these abilities are effective in the problem solving process. On the other hand, in the abstract conceptualization learning style, individuals look for logical reasons behind concepts and cases, and develop rules and theories. These kind of activities also contribute to problem solving ability in a positive way. The Active experimentation learning style involves the ability to adapt ideas and rules for new situations.

Conclusions and Implications

In this study, it has been found out that there is a relationship between teacher candidates' problem solving skills and their learning styles in accordance with their own perceptions. Moreover, examining the relationships between these variables through quantitative and longitudinal studies may make great contributions to the field. These findings should be used for developing transformative teacher education programs which offer students an education that goes beyond mere knowledge acquisition.

It has been identified that participants most often exhibit the converging learning style. The preference for this style is followed by those of the assimilating, diverging and accommodating learning styles respectively. In other words teacher candidates exhibit different learning characteristics. In the teacher training process, the strengths and weaknesses of each learning style should be taken into consideration. Individuals that have multiple learning preferences should be provided with tools to help them effectively manipulate their learning preferences for each learning environment.

While it has been expected that problem solving skills of teacher candidates are advanced in the 21st century, it has been identified in our study that the problem solving skills of our participants were actually at the intermediate level. Implementations for improving problem solving skills should be used in teacher education programs. Firstly, theoretical information should be given through informative meetings and seminars about problem solving. Teacher candidates' abilities should be developed through case study methods, brainstorming technique, problem solving methods and problem-based learning models which focus on specific topic. Descriptive studies aimed at figuinge out the common problem solving skills associated with teacher trainers as well as experimental studies for developing their problem solving skills may contribute to the field.

The perception of the problem solving skills of the teacher candidates who exhibit the assimilating and accommodating learning styles is at a low level. Aside for this it has been ascertained that the hasty and avoidant attitudes, which are accepted as negative features are employed more frequently. In the teaching-learning process, activities for developing problem solving skills should be carried out through homogeneous and heterogeneous small group work. Such activities will help in overcoming the aforementioned deficiencies exhibited by prospective teachers. In this respect,

experimental studies can be planned which aim at determining the effect of education based on Kolb's experiential learning cycle. Finally, the researcher hopes that these findings will inspire further research and discussion on the most effective ways to educate prospective teachers in terms of problem solving skills and and it is assumed that the findings will make a contribution to the field by providing data for future intercultural and comparative research related to the subject matter.

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