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Effects of pre-service information technologies (IT) teachers' thinking styles on their use of information and communication technology (ICT)[i]

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Thinking styles are considered as approaches and tendencies of individuals toward various problems, incidents, phenomenon and variables which they face through their thinking processes. Preservice teachers are expected to be capable of using information and communication technologies (ICT) in intra- and extra- curricular activities and be a role model to their students. In this regard, it is important to investigate the relationship between thinking styles of preservice teachers from the Department of Computer Education and Instructional Technology (CEIT) department who are expected to utilize from the ICT and their attitudes toward ICT. The present study aims to investigate thinking styles of preservice teachers from the CEIT department and their attitudes toward the ICT and the relationship between these two variables. According to the present study's results, preservice teachers at most prefer innovative and visionary "*Innovative thinking style*" which deals with indetermined indefinite works; at least prefer "*Traditionalist thinking style*" which is subject to certain codes and more realists. Whereas gender and grade level variables have no any effect on thinking style preferences; academic success level has statistically significant difference. It was observed that attitudes of participants regarding utilization from the ICT in education was rather high; gender and grade variables have no effect on their attitude toward the ICT; there is positive and proportional relationship between academic success levels and their attitude toward the ICT. Moreover, as perception levels of preservice teachers regarding innovative thinking style increases, their attitude toward the ICT enhances. On the contrary, their perception levels regarding traditionalist thinking style increases, their attitude toward the ICT is affected adversely.

Key words: Thinking styles, information and communication technologies, education technologies, computer usage in education, Computer Education and Instructional Technology (CEIT).

INTRODUCTION

Thinking style is the way in which a person uses his talents. It is considered as way of preference rather than using talent in the narrow meaning. Therefore, thinking styles cannot be classified in either as good or bad; it is

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only possible to talk about their differences (Sternberg, 1994). Thinking style is regarded as approach and tendency displayed by individuals toward various problems, incidents, phenomenon and variables which they experience as result of mental processes. Sternberg (1994) define thinking styles as expression of preference regarding how a person could use his talents in an effective way. Thinking styles are not talent or intelligence; instead they are way of usage talent or intelligence (Fer, 2005).

Thinking styles vary from one person to another. While individuals are classified in terms of this angle, it is common to assess them as high or low level of various characteristics rather than they have this or that thinking style. When individuals face a necessity to resolve a problem, or when they need to make a decision, they think different from each other and search for solutions. According to special circumstances, they use some of them at high level, or sometimes at low level.

Some studies conducted by researchers to define way of thinking applied by individuals suggest numbers of theories regarding thinking style (Holland, 1973; Renzulli and Smith, 1978). Thirteen thinking styles in 5 different dimensions determined according to the Sternberg (1997)'s Mental Personality Theory are presented in Table 1 (Stenberg, 1997).Thinking styles of individuals may vary according to their way of life and time; and they can be shaped by their current conditions (Yıldız, 2012). Moreover, thinking styles is essential personal difference variable which affects their success in academic and business lives (Dinçer and Saracaloğlu, 2011).

Integration of the information and communication technologies (ICT) with the educational activities is defined as utilization of ICT tools and equipment which makes learning process more effective and to reach teaching targets (Cartwright and Hammond, 2003). Effective factors on this process are reported as ICT tools and having access to them; competent manpower capable of using these tools, teaching program and education activities (Koçak-Usluel and Demiraslan, 2005). Beside the fact that courses in which ICT applied are more interesting and fun, outcomes of learning process is more lasting (Yiğit, 2004). One of the indispensable factors of education, teachers' qualifications play significant role in success of the education system (Korkmaz and Demir, 2012). Teaching personnel are required to utilize from new ICT effectively and productively so that they can raise competent and experienced students equipped with quality information (Turan and Çolakoğlu, 2008). Teachers who facilitate thinking process of students establish learning environments which mobilize individual thinking by catalyzing discussions and opinion exchange in these arenas hosting different opinions (Von, 1983; Çubukçu 2004).

In this regard, thinking styles preferred by teachers play significant role in CIT activities utilized in learning-teaching environment.

Erdemir et al. (2009) reported in their study on ICT that preservice teachers consider themselves sufficient with regard to ICT usage in teaching activities; and that whereas they are capable of preparing basic teaching materials, they experience difficulty with complex and multi-purpose materials. Similarly, Cüre and Özdener (2008) in one of their studies concluded that teachers are not knowledgeable in setup and operation of educational software adequately in teaching process. It is possible to encounter numerous results in the literature similar to this conclusion.

According to the relevant literature search results, there are vast amount of research on thinking styles and usage of information and communication technologies. There are several researches investigating the relationship between thinking styles of teachers and preservice teachers and their social skills, teaching methods, knowledge on natural sciences, their attitude toward using laboratory in terms of various variables (Duman and Çelik, 2011; Yıldız, 2012; Paliç and Rize, 2011; Balgalmış and Baloğlu, 2010; Dinçer and Saracaloğlu, 2011).

However, there is no study found, which investigate the relationship between thinking styles and usage of the ICT. In our contemporary information age, it is necessary to utilize from information and communication technologies especially in education activities effectively. Teachers who are the most essential stakeholder in the education process are the one who will integrate CIT with teaching activities. Thinking styles preferred by teachers are effective on application of CIT in teaching activities. At the same time in determination of tool, equipment and methods used in education environment, thinking styles of teachers are significant drive in choices. Accordingly, efficient thinking skills are necessary for teachers in planning process of education to acquire data and knowledge that can be used in selection of teaching techniques and materials and in their evaluation.

In this regard, it is important to investigate the relationship between thinking styles of preservice teachers who are pioneers of execution of education activities and their competency in usage of ICT. Thus, new structuring possibilities such as change in curriculum or arrangement of course content would be available in development of new thinking styles, which enable pre-service teachers to use information and communication technologies in learning and teaching activities more effectively. Amongst the departments in which teachers and preservice teachers are expected to use information technologies at highest level is undoubtedly is the Computer Education and Instructional Technologies Education (CEIT) Department. Therefore, research data was especially collected regarding preservice teachers from the CEIT department. Moreover, in order to determine whether the education given to preservice teachers from the CEIT department along the 4-year period make difference on their ICT and Thinking Styles,

Table 1. Demographic Characteristics of preservice teachers from the CEIT department

Variable	Characteristics	F	%
Gender	Male	88	47.3
	Female	98	52.7
Grade	1	41	22.0
	2	51	27.4
	3	46	24.7
	4	48	25.8
Academic success	1.8-2.41	32	17.2
	2.42-3.03	117	62.9
	3.04-3.67	37	19.9
Total		186	100

1st, 2nd, 3rd and 4th grade students from the CEIT department were included in the present research. The purpose of the present research is to investigate thinking styles, their attitudes toward the ICT and the relationship between thinking styles and their attitude toward the ICT. To this general end, following targets were set:

1. What are the thinking styles of preservice teachers from the CEIT department?
2. Is there a relationship between thinking styles of preservice teachers from the CEIT department and their demographic characteristics (gender, grade level, academic success level)?
3. What is the attitude of the preservice teachers from the CEIT department toward Information Technologies?
4. Do attitudes of the preservice teachers from the CEIT department toward the Information Technologies vary according to variable of gender, grade level and academic success level?
5. Do attitudes of the preservice teachers from the CEIT department toward the Information and Communication Technologies display significant difference with respect to their thinking styles?

METHODOLOGY

In this study which investigates whether thinking styles of the preservice teachers from the CEIT department and their usage of information and communication technologies in education exhibit difference in terms of their gender, department, age and computer usage levels, and the relationship between thinking styles and attitudes of the CEIT preservice teachers toward the ICT, descriptive screening model was utilized. In these models, the situation subject of the research is reported within its circumstances (Karasar, 2009).

Study group

Population of the research in the screening model is composed of preservice teachers from the CEIT department of Educational Sciences Faculty at the Ahi Evran University during 2014 to 2015 academic year. Whole population was included in the study as sampling group. Therefore, no any sampling method was used. Information and survey forms were distributed to 186 preservice teachers in internet environment. Distribution of the study group in terms of gender, grade, and academic success levels was summarized in Table 1.

According to the characteristics of the participant preservice teachers, in terms of gender distribution, number of male (47.3%) and female (52.7%) participants were almost equal; similarly, it was observed that grade distribution is close to each other. In terms of academic success levels, majority of the population (62.9%) remains in the score range of 2.42 to 3.03; 17.2% of population was in the score range of 1.8 to 2.41; and 19.9% was in the range of 3.04 to 3.67.

Data collection tools

While the study utilizes from the "*Thinking Styles Scale*" in evaluation of thinking styles of preservice teachers from the CEIT department; it utilizes from the "Information and Communication Technologies Attitude Scale" to evaluate their attitude; and "Personal Information Form" to determine their demographic characteristics.

Thinking styles scale

Thinking styles scale adapted to Turkish by Sünbül (2004) is consisted of 94 articles. Items in this scale were structured based on five-scale Likert model and for each item following options were given: "Always (1)", "Frequently (2)", "Sometimes (3)", "Seldom (4)" and "Never (5)". Thinking styles scale which aims to determine thinking styles of students are composed of 13 thinking styles:

1. Functional Style: Subjective thinking, rule-based thinking, judgmental thinking.
2. Formal Style: Singularist, progressive, equivalent, irregular.
3. According to Level: Integrative thinking, detail-oriented thinking.
4. According to Scope: Introvert, Extrovert.
5. According to Tendency: Innovative and traditionalist thinking styles.

Within the scope of the present study, amongst 13 different thinking styles, effects of Introvert, Extrovert, Traditionalist and Innovative thinking styles on the ICT were investigated. Validity of the structure

Table 2. ICT Scale factor items.

Variable	Scale Items
Effect of the ICT on education and teaching	1.3.4.8.9.10.11.12.13.15.18.19.20.23.24.25.27.28.29.30
Obstacles in utilization of the ICT	2.5.6.7.14.16.17.21.22.26.31

Table 3. Descriptive Statistic Results of preservice teachers from the CEIT department with regard to their thinking style scores.

Variable	N	Minimum	Maximum	X	Sd
Introvert	186	14	35	25.55	3.88
Extrovert		8	35	26.65	4.06
Innovative		16	35	27.55	3.94
Traditionalist		13	34	22.56	3.88

(basic components) was performed through factor analysis. In selection of items included in published scale, Varimax factors analysis, item test, and item residual correlations were taken into consideration. As a result of these studies, it was confirmed that 13 dimensions of the scale and explained variance amount were sufficient; and moreover that factor loads of each item pre- and post-rotation and item-sub test and residual correlations of items were sufficient. The variance explained by 13 factors together is found as 51.03%. In the presented scale, all included article's factor load is above 0.40. Moreover, Cronbach's α reliability coefficient estimated to determine internal consistency ranges for all sub-scales between 0.70 and 0.86.

Attitude scale toward the ICT

In order to measure attitudes of preservice teachers toward the ICT, the Attitude Scale toward the ICT, which was developed and its reliability and validity analyses were conducted by Cavas et al. (2009) was utilized. The items included in the scale were assigned following options based on Likert Scale; "Strongly Agree (1)", "Agree (2)", "Not Sure (3)", "Disagree (4)" and "Strongly Disagree (5)". Data used in development process of the scale were collected from 1,071 primary school teachers distributed equally to 7 different geographical territories across Turkey. The scale is composed of two sub-factors of "Effect of the ICT on Education and Teaching" (20) and "Obstacles to utilization of the ICT" (11). Whereas the first factor was including positive expressions, the second factor was including negatives. High scores of the first factor suggest that individuals have positive attitude regarding ICT has positive effect on Education and Teaching; and high scores of the second factor suggest that individuals have negative attitude regarding obstacles of utilization of the ICT in education. While internal consistency coefficient of the first factor was estimated at .92; internal consistency coefficient of the second factor was estimated at 0.79; and internal consistency coefficient of the whole scale was estimated as0 .91 (Table 2).

Data collection and analysis

Data acquired within the research scope was run in the The Statistical Package for The Social Sciences (SPSS) Package Software and all hypotheses were tested based on 0.95 reliability level (p = 0.05). Before data analysis, within the scope of the normality test of data, in order to measure whether each dependent variable displays normal distribution, Kolmogorov-Smirnov normality test results were examined. Since Kolmogorov-Smirnov normality test analysis results indicate normal distribution for gender and grade level variables; since parametric tests does not display normal distribution for academic success level variables, non-parametric tests were used.

In determination of thinking styles of preservice teachers and their attitudes toward the ICT, descriptive statistics of frequency (f), percentage (%), average (X) and standard deviation (Sd) values were used. In order to evaluate the relationship between demographic characteristics (gender, grade level, academic success level), thinking styles and attitude of preservice teachers toward the ICT, t-test, one-way Anova test and Kruskal Wallis tests were utilized. In order to determine whether attitudes of preservice teachers toward the ICT displays difference with regard to their thinking styles, Pearson r correlation tests was utilized. Statistical significance of difference and relationships were investigated at p<.05 level. Moreover, for ICT's effect on education and teaching in the attitude scale toward the ICT, 20 to 35 score range was considered "very low", 37to 53 range "low"; 54 to 69 range "medium"; 70 to 85 range "high"; 86 to 100 range was considered as "very high". On the other hand, for obstacles to use the ICT in educational activities, the same score ranges were used but in reverse way.

FINDINGS AND DISCUSSION

Findings obtained as a result of the present research were enumerated below:

What are the thinking styles of preservice teachers from the CEIT department?

In determination of thinking styles of preservice teachers from the CEIT department, statistical results related with average scores received from sub-dimensions of thinking style scales of introvert, extrovert, traditionalist and innovative were exhibited in Table 3.

According to Table 3, it was observed that preservice teachers from the CEIT department adopt innovative and visionary innovative thinking style ($\bar{X} = 27.55$), which deals with indetermined indefinite works; extrovert

thinking style ($\bar{X} = 26.65$), which likes works necessitating cooperation; introvert thinking style ($\bar{X} = 25.55$), which likes less social interaction; and traditionalist thinking style ($\bar{X} = 22.56$), which likes working alone, conforming to rules and being realistic, respectively. As it can be comprehended from the Table 3, preservice teachers from the CEIT department displayed the highest average score with "innovative thinking style"; and the lowest average score displayed with "traditionalist thinking style". Based on this finding, it is possible to conclude that preservice teachers prefer to participate in activities which necessitate innovation, vision, and productivity in education activities; and on the other hand they do not like to follow rigid rules and they abstain from conventional works.

Is there relationship between thinking styles of the preservice teachers from the CEIT department and their demographic characteristics (gender, grade and academic success level)?

a. Whether thinking styles of preservice teachers from the CEIT department display significant difference according to gender?

T-test analysis results conducted for independent groups to determine whether thinking styles of preservice teachers from the CEIT department display statistically significant difference according to their gender were exhibited in Table 4.

Based on Table 4, it can be concluded that thinking styles preferred by preservice teachers from the CEIT department do not exhibit significant difference according to the gender variable. When thinking style average scores of preservice teachers are considered, the highest scores were displayed by the innovative (27.94) and extrovert (27.08) thinking styles, the lowest average scores were displayed by traditionalist thinking style adopted by male respondents. These results suggest that thinking styles of preservice teachers from the CEIT department do not change according to their gender. While this finding is confirmed by the research results reported by Çubukçu (2004), Duman and Çelik (2011), Saracaloğlu et al. (2008) and Düzgün (2011) they contradict with results reported by Dinçer and Saracaloğlu (2011), Balgalmış and Baloğlu (2010) and Sünbül (2004). Yıldızlar (2010) reached to a conclusion in the study under title of "Thinking Styles of Different Preservice Teachers from Various Cultures" that male preservice teachers in Turkey prefer more introvert thinking style in comparison to female preservice teachers.

b. Whether thinking styles of preservice teachers from the CEIT department display significant difference according to their grade level?

Results of the one-way variance analysis conducted for independent groups to determine whether thinking styles of preservice teachers from the CEIT department display statistically significant difference according to their grade levels were presented in Table 5.

Table 5 suggests that there is no significant difference between thinking styles of preservice teachers from the CEIT department and their grade levels. According to thinking style average scores of preservice teachers, it is seen that 4th grade Preservice teachers who prefer "innovative thinking style" (28.33) have the highest average score; the 4th graders who prefer "traditionalist thinking style" (21.92) have the lowest average score. Based on these results, it is possible to conclude that thinking styles preferred by preservice teachers from the CEIT department do not vary according to their grade variable. Dinçer and Saracaloğlu (2011) report a significant difference with only introvert thinking style with respect to the grade variable. Moreover, the researchers stated that 4th grade students prefer internal thinking style more frequently compared to the 1st graders. Similarly, Buluş (2006) reports statistically significant difference among introvert, extrovert and conservative thinking styles according to grade levels.

c. Whether thinking styles of preservice teachers from the CEIT department display significant difference according to their academic success level?

Since acquired data during the study was distributed normally with respect to academic success level variable, non-parametric test was conducted. In order to determine whether thinking style of preservice teachers from the CEIT department display statistically significant difference according to their academic success levels, results of the Kurskal Wallis analysis conducted for independent groups were summarized in Table 6.

When thinking style average scores of preservice teachers with respect to their academic success levels are considered, it can be observed that the highest average score of 111.36 was obtained by the preservice teachers with traditionalist thinking style whose academic success score in the range of 3.04 to 3.67. The lowest average score of 73.02 was obtained by the preservice teachers with innovative thinking style whose academic success score in the range of 1.8 to 2.41. According to the Kruskal Wallis Test Results, which was conducted to determine whether there is significant difference between thinking styles of preservice teachers and their academic success scores, there is no significant difference between academic success scores of preservice teachers and introvert (p=0.996) and extrovert (p=0.07) thinking style scores.

On the contrary, there is a significant difference was found between academic success scores and innovative (p=0.013) and traditionalist (p=0.01) thinking style scores. In other words, while introvert and extrovert thinking styles of preservice teachers from the CEIT department do not

Table 4. t-test analysis results of preservice teachers from the CEIT department according to their thinking style average scores with regard to their gender.

Thinking style	Gender	N	X	S	t	p
Introvert	Male	88	25.89	4.07	1.11	0.27
	Female	98	25.26	3.70		
Extrovert	Male	88	27.08	4.08	1.39	0.17
	Female	98	26.26	4.03		
Innovative	Male	88	27.94	4.03	1.30	0.20
	Female	98	27.19	3.85		
Traditionalist	Male	88	22.43	4.18	-0.44	0.66
	Female	98	22.68	3.61		

Table 5. One-way variance analysis results of preservice teachers according to their Thinking style average scores with regard to the grade levels.

Thinking style	Grade	N	X	S	T	p
Introvert	1	41	25.44	3.74	0.05	0.98
	2	51	25.45	3.82		
	3	46	25.72	3.97		
	4	48	25.60	4.09		
Extrovert	1	41	26.71	4.27	0.11	0.95
	2	51	26.49	3.61		
	3	46	26.91	3.60		
	4	48	26.50	4.81		
Innovative	1	41	27.76	4.20	1.15	0.33
	2	51	27.04	4.42		
	3	46	27.11	3.27		
	4	48	28.33	3.74		
Traditionalist	1	41	23.00	3.54	0.72	0.54
	2	51	22.53	4.38		
	3	46	22.89	3.71		
	4	48	21.92	3.77		

Table 6. Kruskal Wallis Test Results Regarding Thinking Styles Average Scores of Preservice Teachers According to Their Academic Success

Academic Success Level	N	Average Distribution			
		Introvert	Extrovert	Innovative	Traditionalist
1.8-2.41	32	94.02	74.48	73.02	104.94
2.42-3.03	117	93.55	98.19	101.36	84.72
3.04-3.67	37	92.89	95.11	86.35	111.36
Kr. Wallis Chi-Sq. (χ2)		0.008	5.33	8.64	9.22
Z		2	2	2	2
p		1.00	0.07	0.01	0.01

*p<=0.05.

Table 7. Descriptive statistic results regarding attitude of preservice teachers toward the ICT.

Variable	Minimum	Maximum	X	Sd
Effect of ICT on education and teaching	186 32	100	83.03	9.74
Obstacles before utilization of the ICT	11	50	23.96	6.01

Table 8. t-test Analysis Results of Preservice Teachers Regarding ICT Average Scores According to Their Gender

	Gender	N	X	S	t	p
Effect of the ICT on Education and Teach	Male	88	82.68	11.79	-0.46	0.64
	Female	98	83.35	7.48		
Obstacles before Utilization of the ICT	Male	88	23.73	6.85	-0.50	0.62
	Female	98	24.17	5.17		

differ according to their academic success sores, innovative and traditionalist thinking styles differ according to their academic success scores. Whereas Dinçer and Saracaloğlu (2011) reach a conclusion that there is a negative relationship between global and conservative thinking styles preferred by preservice teachers and their academic success levels; no significant relationship was determined with between thinking styles and academic success levels. Similarly, Buluş (2005) reported a relationship only between preservice teachers who prefer anarchical and conservative thinking style and their academic success scores. In other research conducted by Lam (2000), a conclusion which suggests a positive relationship between global thinking style and academic success has been drawn.

3. What are the attitudes of preservice teachers from the CEIT department toward the information technologies?

In Table 7, findings regarding attitudes of preservice teachers from the CEIT department toward the ICT were summarized. According to Table 7, when attitude of preservice teachers from the CEIT department toward the ICT are considered, it can be observed that average scores of the effect of the ICT on education and teaching was rather high (83.03). On the contrary, average scores regarding obstacles preventing utilization of the ICT are at very low level (23.96). Accordingly, it is possible to state that attitudes of preservice teachers from the CEIT department toward the ICT were at very high level. In the study of Korkmaz and Demir (2012) conducted on teachers from various branches, it was reported as well that teachers' attitudes toward obstacles before utilization of the ICT were at high level. Çetin et al. (2012) reported in their study that although preservice teachers do not find themselves insufficient regarding usage of technology, they stated that they do not have knowledge on using technology at sufficient level. Similarly, Çuhadar and Yücel (2010), in their study in which qualitative data concerning usage of ICT by preservice foreign language teachers for teaching purposes was used, stated that 82% of preservice teachers consider themselves sufficient regarding usage of the ICT.

4. Is there any relationship between attitudes of preservice teachers from the CEIT department toward the ICT and their demographic characteristics (gender, grade and academic success level)?

a. Whether attitudes of preservice teachers from the CEIT department toward the ICT display significant difference according to gender?

Table 8 summarizes findings concerning whether attitudes of preservice teachers from the CEIT department toward the ICT differ according to their gender. It can be observed from Table 8 that attitudes of preservice teachers toward effect of the ICT on education and teaching (t=-.464. p>.005) and toward obstacles before usage of the ICT (t=-.504. p>.005) do not differ significantly according to gender variables. At this point, it is possible to conclude that gender is not a significant determinant on attitudes of preservice teachers from the CEIT department toward the ICT. Similarly, Korkmaz and Demir (2012) report that gender has no any effect on attitudes of teachers toward both effect of ICT on education and teaching and obstacles before utilization of ICT. On the contrary, Çetin et al. (2012) stated that technology competency average scores of male preservice teachers were higher compared to female preservice teachers. Along the same way, Çuhadar and Yücel (2010) reported that genders of foreign language preservice teachers were effective on their attitudes toward the ICT.

b. Do attitudes of preservice teachers from the CEIT department toward the ICT display difference according to their grade levels?

Results of the one-way variance analysis conducted to

Table 9. One-way variance analysis results regarding ICT average scores of preservice teachers according to their grade levels.

Thinking style	Grade	N	X	S	T	p
Effect of the ICT on education and teaching	1	41	81.83	5.97	1.40	0.25
	2	51	82.29	13.04		
	3	46	82.37	7.44		
	4	48	85.48	10.03		
Obstacles before utilization of the ICT	1	41	24.24	5.09	1.10	0.35
	2	51	24.20	6.99		
	3	46	24.80	5.11		
	4	48	22.67	6.38		

determine whether attitudes of preservice teachers from the CEIT department toward the ICT display statistically significance difference according to their grade levels were summarized in Table 9. Based on the Table 9, it is understood that attitudes of the preservice teachers from the CEIT department toward the ICT do not display significant difference according to their grade levels. Additionally, when average scores of preservice teachers regarding effect of the ICT on education and teaching are considered, it was observed that they have increased from the 1st grade to the 4th grade every year. This finding can be interpreted as the education received by preservice teachers from the CEIT department has positive effect on their attitude toward the ICT. However, it has been observed that average scores of preservice teachers regarding obstacles before utilization of the ICT have increased annually starting from the 1st grade. Thus, it is possible to conclude that grade levels of preservice teachers from the CEIT department have minor positive effect on their attitude toward obstacles before utilization of the ICT. Özarslan et al. (2013) and Çetin et al. (2012) have reported similar results regarding grade levels of preservice teachers.

c. Do attitudes of preservice teachers from the CEIT department toward the ICT display difference according to their academic success levels?

Data acquired during the study was not normally distributed with respect to academic success level variable. Therefore, it was found appropriate to conduct non-parametric tests. In order to determine whether attitudes of preservice teachers from the CEIT department toward the ICT display statistically significant difference according to their academic success levels, results of the Kurskal Wallis analysis, conducted for independent groups, were summarized in Table 10.

According to Table 10, it can be deducted that academic success levels of preservice teachers from the CEIT department do not make statistically significant difference on attitudes of preservice teachers toward effect of the ICT on education and teaching. However, preservice teachers academic whose success level is in the range of 1.8 to 2.41 have rather low average score (73.92) compared to the ones with higher academic success level (97.48 and 97.84). This result indicates that there is positive and proportional relationship between preservice teachers' academic success levels and their attitude toward the effect of the ICT on education and teaching (Table 11).

Moreover, it can be understood from Table 10 that academic success levels of preservice teachers from the CEIT department has statistically significant difference on their attitude toward obstacles before utilization of the ICT. Average score (119.06) of preservice teachers within the academic success range of 1.8 to 2.41 with regard to obstacles before utilization of ICT was found significantly higher compared to other preservice teachers with higher academic success level (85.59; 96.41). This can be interpreted as attitude of preservice teachers toward obstacles before utilization of the ICT changes according to their academic success levels. This result is supported by Kurfallı (2008)'s study which reports a significant relationship between teachers' education level and their information technology usage frequency.

5. Whether attitudes of preservice teachers from the CEIT department toward the ICT displays significant difference according to their thinking styles?

Table 12 summarizes analysis results regarding the relationship between thinking styles of preservice teachers and their attitude toward the ICT. According to Table 12, it can be seen that there is positive and moderate level of significant relationship between "innovative thinking style" and attitudes of preservice teachers from the CEIT department toward effect of the ICT on education and teaching ($r=0.378$. $p<0.01$). Accordingly, as innovative thinking style attitude scores of preservice teachers increase, their tendency to use the ICT in education activities increases as well. In some studies which investigate the relationship between the ICT and various attitudes, similar results were reported.

Korkmaz and Demir (2012) concluded that as self-

Table 10. Kruskal Wallis test results regarding ICT average scores of preservice teachers according to their academic success levels.

Academic success level	N	Average distribution	
		Effect of the ICT on education and teaching	Obstacles before utilization of the ICT
1.8-2.41	32	73.92	119.06
2.42-3.03	117	97.48	85.59
3.04-3.67	37	97.84	96.41
Kr. Wallis Chi-Sq. (χ2)		5.44	10.39
Z		2	2
p		0.07	0.01

*p<=0.05.

Table 11. Pearson correlation coefficient and relationship levels (Büyüköztürk, 2009).

Absolute value range (r)	Relationship level
0.00 – 0.30	Low
0.31 – 0.70	Medium
0.71 – 1.00	High

Table 12. The relationship between thinking styles of preservice teachers and their attitude toward the ICT.

Thinking styles		Introvert	Extrovert	İnnovative	Traditionalist
Effect of ICT on education and teaching	r	0.10	0.13	0.38**	0.00
	p	0.17	0.09	0.00	0.98
	N	186	186	186	186
Obstacles before utilization of the ICT	r	-0.03	-0.14	-0.32**	0.26**
	p	0.67	0.05	0.000	0.00
	N	186	186	186	186

sufficiency perceptions of teachers who participate in in-service training activities organized by the Turkish Ministry of National Education (MEB), their attitude toward the effect of the ICT on education increases as well. Cüre and Özdener (2008), who focused on the relationship between teachers' success in ICT application and their attitude toward the ICT, reported high level of positive and significant relationship. Similarly, Tuti (2005) found proportional relationship between computer self-sufficiency perceptions of teachers and their attitude toward the ICT.

A moderately significant and negative relationship was found between attitudes of preservice teachers from the CEIT department toward the ICT usage and innovative thinking style (r=-0.315. p<0.01). This finding supports the aforesaid results as well. As preservice teachers' innovative thinking style attitude score increases, on the contrary, their attitude toward usage of the ICT decreases. There is low level of positive significant relationship between attitudes of preservice teachers from the CEIT department toward obstacles before utilization of the ICT and traditionalist thinking style. This suggests that Preservice teachers with traditionalist thinking style do not have inclination to use the ICT in education activities.

Conclusion

The present study investigated and shed light on the relationship between thinking styles of preservice teachers from the CEIT department and their attitude toward the ICT. Study group included in this research using screening model consisted of 186 preservice teachers. Thinking Styles Scale and Attitude Scale for the ICT were used as data collection tool. Whether

there are statistically significant differences between thinking styles of preservice teachers and their attitude toward the ICT according to their genders, grades and academic success levels were investigated through these tools based on significance level of 0.05; and the relationship between these two variables was researched. As data collection tool, “Thinking Styles Scale” adapted to Turkish by Sünbül (2004) in order to determine thinking style preferences of preservice teachers; “Scale for Attitude toward ICT” adapted to Turkish by Cavas et al. (2009) in order to determine their attitude toward the ICT; and “Personal Information Forms” to determine demographic characteristics were utilized.

In data analysis, frequency (f), percentage (%), average (X) and standard deviation (Sd) values were used as descriptive statistics. In order to measure the relationship among thinking styles of preservice teachers, their attitudes toward the ICT and their demographic characteristics (gender, grade level, and academic success level), t-test, one-way Anova test and Kruskal Wallis tests were utilized. In exploration of behavior of attitudes of preservice teachers toward the ICT with respect to their thinking styles, Pearson r correlation test was conducted.

Preservice teachers from the CEIT department at most preferred innovative thinking style which likes to deal with indetermined indefinite works and which exhibits innovative and visionary characteristics; at least preferred traditionalist thinking style which likes to follow rules and which exhibits more realistic characteristic. Accordingly, preservice teachers from the CEIT department prefer to take part in applications which necessitate novelty, vision, and productivity in education activities; on the contrary, they do not tend to follow rules and avoid conventional works.

Thinking styles preferred by participants do not exhibit significant difference gender variable. Grade level variable, similarly, is not significantly different with respect to thinking styles preferred by participants. However, it was observed that average scores have changed at grade level even though it is at minor level. For instance, scores of preservice teachers taken from innovative thinking style from the 1st grade to the 4th grade have increased annually. Hence, it can be concluded that preservice teachers from the CEIT department become more innovative at the end of their education activities in the faculty.

When the relationship between thinking styles of preservice teachers and academic success scores is considered, average scores of innovative and traditionalist thinking styles display changes with respect to academic success score. Accordingly, it is possible to conclude that academic success score has effect on thinking styles adopted by preservice teachers. In this regard, it can be suggested that more appropriate applications to be applied during education activities for thinking styles of students must be designed and developed.

Application of ICT in educational activities can play significant role in developing education quality. In this regard, teachers have essential role at this point. Application of ICT by teachers in education at highest possible level could elevate quality of education. Teachers from CEIT department are the professionals who would contribute in extension of ICT application in educational activities. From this point of view, scope of the research is rather important. Average score of the preservice teachers from the CEIT department in regard to effect of the ICT on education and teaching was calculated as 83.03. On the contrary, their average score in regard to the obstacles before utilization of the ICT was calculated as 23.96. This situation indicates that attitude of preservice teachers from the CEIT department toward the ICT is rather high. Finally, it is possible to conclude that preservice teachers from the CEIT department are eager to ICT in education activities.

Attitude of preservice teachers from the CEIT department toward the ICT does not display significant difference according to their gender. Similarly, attitude of participants toward the ICT does not display significant difference according to their grade levels. However, grade level of participants is moderately effective on their attitude toward to usage of ICT in education. From the 1st grade to the 4th grade, attitude of preservice teachers toward the effect of the ICT on education has increased in positive meaning.

There is positive and proportional relationship between academic success levels of preservice teachers from the CEIT department and their attitude toward the effect of ICT on education and teaching. As academic success level increases, preservice teachers’ tendency to use the ICT in education activities increases. Moreover, attitudes of participants toward obstacles before usage of ICT vary according to their academic success levels. Preservice teachers with lower academic success level do not find usage of the ICT appropriate in education activities.

As a result of correlation calculation conducted to determine the relationship between attitudes of preservice teachers toward the ICT and their thinking styles, it was revealed that as innovative thinking style perception level increases; their attitude toward the ICT develops in the same way. On the contrary, while perception level regarding traditionalist thinking style increases, their attitude toward the ICT decreases. Based on the research findings, since education outputs are expected to be more qualified, the following proposals can be expressed:

1. Each individual adopts different thinking style. Education activities are required to be conducted by considering the fact that students do not adopt the same thinking style. Since the most frequently preferred thinking styles by students are extrovert and innovative thinking styles, it is suggested that more innovative and

imaginative thinking styles which requires cooperation must be used in education process that will be applied to preservice teachers.

2. By considering that thinking is an individual process, first of all it is necessary to allow preservice teachers to raise their awareness regarding their thinking styles. To that end, new courses based on thinking education must be included in the curriculum. In the present study, thinking styles of preservice teachers, their attitude toward the ICT, and the prevailing relationship among them were investigated; and the scope of the research was limited with the registered students from the CEIT Department of the Educational Sciences Faculty at the Ahi Evran University. The present study can be developed further by means of more extensive studies including larger preservice teacher population from the CEIT Departments of other universities.

3. The relationship among attitudes of preservice teachers toward the ICT and learning approaches of individuals, material design sufficiency and techno-pedagogical sufficiency can be investigated.

Conflict of Interests

The author have not declared any conflict of interests.

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[i] This study was presented in II. International Dynamic, Explorative and Active Learning (IDEAL) Conference in Amasya and the abstract of the study was published in the Proceeding Book.