A Study on the Relationship between Teacher Candidates' Attitudes towards Teaching Critical Thinking and Critical Thinking Standards

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ABSTRACT
This study aims to determine the relationship between the attitudes of teacher candidates towards teaching critical thinking and critical thinking standards. The population of the study consists of teacher candidates studying at the faculties of education in 2020-2021. The sample of the study consists of 743 teacher candidates determined by the appropriate sampling method. Descriptive statistics, MANOVA, and regression analyses have been used for the analysis of the data. As a result of the research, It has been determined that knowing the teaching of critical thinking has a positive effect on attitudes towards teaching critical thinking and critical thinking standards. Attitudes toward teaching critical thinking and critical thinking standards results of the teacher candidates who read four or more books per month are higher than that of those who have never read a book or read just a book per month. It has been observed that there is a positive moderate relationship between the attitudes toward teaching critical thinking and critical thinking standards results of the teacher candidates. When critical thinking standards are examined as a predictor of attitudes towards teaching critical thinking, critical thinking standards explain 37% of the variance related to attitudes towards teaching critical thinking.

INTRODUCTION
In the words of Kant, naming the Enlightenment period, mature thinking (Gokberk, 1993) is also the acceptance of criticism, and reasoning (Lewis & Smith, 1993) as the most basic criterion in evaluating the correctness of traditional decisions (Ozdemir, 2008). Critical Thinking (CT) has deep historic roots and has a history as long as philosophy, in general (Thayer Bacon, 1998). Through the questions such as "How do I know this? What is the proof that I know it? If this is true, can it be falsified?", CT is a valuable learning and teaching tool from the era of Socrates to the present, which protects people from falling into a knavery; a standard of thinking (Glasser, 1985; Lewis and Smith, 1993; McKendree et al, 2010), an attitude for democratic citizenship (Glasser, 1985; Kurum, 2002; Dewey, 2008; Gundogdu, 2009) the ability and tendency to gather, evaluate and use information effectively (Semerci, 2003; Ertas, 2012). Critical thinking has been defined, as a result of the studies conducted in 1990 with the participation of 46 theorists from the United States and Canada under the leadership of the American Psychological Association (APA), as "the individual's making conscious judgments and expressing analytical, evaluative judgments to decide what to do and what to believe". (Evancho, 2000; cite, Seferoglu and Akbiyik, 2006).

CT has not only analytic and selective but also imaginative, inventive, and constructive aspects (Bailing, 1987). Enabling individuals to develop their ability to evaluate (Semerci, 2003), CT aims to determine criteria for action and belief and to doubt explanations until they acquire intellectual skepticism and all relevant information (Kale, 1993). CT enables people to develop their ability to evaluate (Semerci, 2003). CT is a type of thinking based on discussion, which allows for predicting the possible consequences of events, presenting new options, and giving a new perspective (Kurum, 2002). There is intellectual interest in the core of mental processes called critical thinking, it depends on the intellectual accumulation of individuals (Lewis & Smith, 1993) and is based on the passion for knowing, learning, and explaining (Yildirim, 1997). Critical thinking is the search for a reasoned and original answer to five Ws and one H questions. In science and intellectual history, it is seen that prices are paid for the sake of the phrase “I don't think the same” (Ozdemir, 2008). Therefore, critical thinking is a “mental hygiene” that will protect individuals against the falsifications and harms of wrong thinking (Gundogdu, 2009).

CT is, according to the perspective of Kuhn (1993), to be able to discuss people's different and complex beliefs, judgments, and conclusions that are at the heart of everyday life culture (Anderson, Howe, Soden, Halliday, Low, 2001). CT is a way of thinking in which prejudices, assumptions, and knowledge are tested, evaluated, and

judged and their different aspects, expansions, meanings, and consequences are discussed, ideas are analyzed and evaluated, reasoning, logic, and comparison are used, resulting in certain ideas, theories or behaviors (Gurkaynak et al., 2003). CT is the art of analyzing and evaluating to improve thinking (Paul & Elder, 2006), a thought-based approach to finding the truth (Yildirim, 1997), and one of the most effective ways for a person to understand himself and others (Ertas, 2012). Chance (1986) defined critical thinking as a set of skills for analyzing facts, generating and organizing ideas, comparing, drawing conclusions, evaluating arguments, and solving problems. Similarly, Inam (1994) says that the prerequisite for critical thinking is to understand the subjects and people. Based on the common points of all definitions, critical thinking is to have original communication and production contents that require the power of correct judgment, and consistency of words and actions.

Teaching Critical Thinking

Different definitions of critical thinking have been made (Yildirim, 1997; Fernández-Balboa, 1993; Potts, 1994; Akar Vural and Kutlu, 2004; Onal, 2020); it is stated that there are various approaches to teaching critical thinking, different measurement tools related to its measurement and that these tools have similarities and differences with each other (Akar Vural and Kutlu, 2004; Onal, 2020), and therefore, critical thinking should not be measured with traditional methods (Sahinel, 2005); there are still some difficulties in measuring critical thinking (Ertas, 2012).

Undergraduate programs for teacher training should be open to innovation, research, and inquiry-based and support effective citizen skills through critical thinking. Critical thinking should retain its importance as one of the most important skills during the development of higher education programs (Torres & Cano, 1995; Kokdemir, 2003; Doganay and Yesilpinar, 2014). Individuals are expected to be sustainable, flexible, creative, and researcher throughout their lives to be successful in developing technology, changing economic conditions, professional job expectations of the digital age, etc. So, it is of great importance for teachers to be ready for the important responsibility of developing the standards of critical thinking in their classrooms and teaching these standards (Kurum, 2002; Akınoglu, 2003; Hamurcu, Gunay, and Akamca, 2005; Chin, 2005; Tok and Sevinc, 2010; Aybek, Aslan, et al. Dincer and Coskun-Arisoy, 2015; Tezci et al., 2017). Learning activities related to content and method in the university should consist of critical thinking practices (Emir, 2012; Kokdemir, 2012) and measurement processes should also be capable of testing these skills (Cikrikci Demirtasli, 2010). Because, as mentioned above, the most important indicator of being able to think at a high level is critical thinking (Semerci, 2000; Cokluk Bokeoglu and Yilmaz, 2005). Therefore, due to the nature of the individual and the subject area (Sonmez, 2015), critical thinking standards and teaching should be given importance in teacher training programs (Daniel & Drewe, 1998; Cokluk Bokeoglu and Yilmaz, 2005; Aybek, 2010). From this point of view, it has been aimed to examine the relationship between the attitudes of teacher candidates towards teaching critical thinking and critical thinking standards.

Relevant Studies

When the literature is examined, it is seen that research on critical thinking teaching (Seferoglu and Akbiyik, 2006), critical thinking tendency of teacher candidates (Akar, 2007; Aybek, 2007; Zayif, 2008; Ekinci, 2009; Sen, 2009; Korkmaz, 2009; Can and Kaymakci, 2015; Gokkus and Delican, 2016; Besoluk and Onder, 2010; Cetinkaya, 2011, Dutoglu and Tuncel, 2008; Gok and Erdogan, 2011; Narin and Aybek, 2010; Kartal, 2012; Emir, 2012; Acun, Demir and Goz, 2010) and examining teacher candidates' critical thinking skills in terms of diverse variables (Alkin-Sahin, Tunca, and Ulubey, 2014; Acisli, 2015) have been carried out. It is also seen that there are studies on the critical thinking levels of university students (Dayioglu, 2003; Ozdemir, 2005; Bilgin and Eldeklioglu, 2007; Tumkaya and Aybek, 2008; Bulut, Ertem and Sevil, 2009, Ozturk and Ulusoy, 2008; Tumkaya, 2011; Sacli and Demirhan, 2008; Korkmaz, 2009; Emir, 2012), problem solving and critical thinking (Turnuklu and Yesildere, 2005; Tok and Sevinc, 2010).

Purpose of the research

The purpose of this study is to reveal the relationship between the attitudes of teacher candidates towards teaching critical thinking and critical thinking standards. In this context, the answers to the following research questions were sought:

1. What is the level of teacher candidates' attitudes towards teaching critical thinking?
2. What are the teacher candidates' levels of critical thinking standards?
3. Do teacher candidates' attitudes towards teaching critical thinking and their standards for critical thinking differ according to?
    - A. their gender,
    - B. their department,
    - C. their class level,
    - D. knowing teaching critical thinking

E. the number of books read monthly?

4. Are teacher candidates' critical thinking standards a meaningful predictor of their attitudes towards teaching critical thinking?

METHOD

This section includes information about the design, population and sample, data collection tools, data collection process, and data analysis process of the research.

Model of the Research

This research, which has a quantitative research approach, has a correlational survey model. Correlational research is used when it is aimed to decipher the relationship between more than one variable or to make an estimation depending on this relationship (Fraenkel, Wallen, and Hyun, 2012, p.12).

Population and sampling

The population of the research consists of the students studying at the faculty of education. According to 2019-2020 higher education institution statistics, a total of 214.441 students are studying (https://istatistik.yok.gov.tr/). Research data were collected by using convenience sampling, one of the Non-Probability Sampling Methods. In the convenience sampling method, the researcher begins to create his sample, starting with the most accessible respondents. An important limitation that should be mentioned here is that the use of an improbable sample in research conducted with online surveys reduces the generalizability of the findings (Cohen, Manion, and Morrison, 2018). Considering this limitation, 774 prospective teachers were reached within the scope of the research. After the analysis of the outliers and lost data, the analysis was carried out with 743 data. As a result, the sample of the study consists of 743 teacher candidates. Krejcie and Morgan (1970) have stated that 384 people are sufficient for the sample size when the population is 100000 or above.

Table 1: Demonstrates the Demographic Characteristics of 743 Teacher Candidates

Variable		Frequency	Percentage
Gender	Female	600	80.8
	Male	143	19.2
Department	Dept. of Basic Edu.	262	35.3
	Dept. of Math. and Sci. Edu.	110	14.8
	Dept. of Turkish and Social Sci. Edu.	268	36.1
	Other	103	13.9
Year	Freshman	168	22.6
	Sophomore	163	21.9
	Junior	175	23.6
	Senior	237	31.9
Knowledge of Teaching Critical Thinking	No	403	54.2
	Yes	340	45.8
Number of Books Read per Month	None or one	244	32.8
	Two books	217	29.2
	Three books	144	19.4
	Four books or more	138	18.6

When Table 1 is examined, it is seen that more than half of the teacher candidates are women (80.8%) and have knowledge about critical thinking teaching (54.2%). It is seen that the teacher candidates show a balanced distribution according to their class levels. 35.3% of the teachers are studying at the department of basic education and 36.1% are studying at the department of Turkish and Social Sciences Education. 32.8% of teachers read no or one book per month, while 18.6% read four or more books.

Data Collection Tools

The data of the research were collected with the attitude scale of teacher candidates towards teaching critical thinking and the critical thinking standards scale. The attitude scale of teacher candidates towards teaching critical thinking was developed by Onal (2020) with data obtained from teacher candidates. Likert-type five-point rating consisting of options from Strongly Disagree=*1* to Strongly Agree=*5* was used in the scale. The lowest score that can be obtained from the 19 items and one-dimensional scale is 19, and the highest score is 95. The variance ratio explained by the scale is 35.56%. The goodness of fit indices obtained by confirmatory factor analysis (CFA) are as follows: $\chi 2/sd=1.25$, GFI=.88, RMSEA=.042, SRMR=.06, CFI=.97, NFI= 93, NNFI=.98. Cronbach's Alpha internal consistency coefficient of the scale has been calculated as .885. Within the scope of this research, the Cronbach's alpha internal consistency coefficient of the scale has been calculated as .91.

The critical thinking standards scale was developed by Aybek, Aslan, Dincer, and Coskun-Arisoy (2015) based on the data obtained from teacher candidates. The scale consists of 42 items, including 30 positive and 12 negatives. Aiming to determine the extent to which teacher candidates have critical thinking standards, this scale uses a five-point Likert-type rating scale from strongly disagree=*1* to strongly agree=5 The resulting Critical Thinking Standards Scale, consisting of the sub-dimensions of "depth, breadth, and adequacy", "precision and accuracy" and "importance, relevance and openness" explains 35.96% of the total variance. The goodness of fit indices obtained by confirmatory factor analysis (CFA) are as follows: $\chi 2/sd=3.81$, GFI=.85, AGFI=.83, RMSEA=.08, CFI=.92, NFI=.90, NNFI=.90. While the lowest score that can be obtained from the scale is 42 and the highest score is 210, scores between 18-90 can be obtained from the 18-item depth, breadth, and proficiency subscale; 12 - 60 from the precision and accuracy subscale consisting of twelve items; 12 - 60 from the importance, relevance and openness subscale consisting of twelve items. The Cronbach's alpha internal consistency coefficient of the scale has been determined as .89, .78, and .63 for the sub-factors, and .75 for the overall scale. Within the scope of this research, the Cronbach's Alpha internal consistency coefficient of the scale has been calculated as .86.

Analysis of the Data

The statistical analyses used to answer the research sub-problems are descriptive analyses, regression analysis, and MANOVA. Pallant (2016) has stated that, before the MANOVA analysis, the prerequisites should be met, the outliers should be removed from the data set, the variables should show multicollinearity and normal distribution, there should be multicollinearity and there should be no singularity problem, and the variance-covariance matrix should be homogeneous. In this direction, all the data were examined and no missing data were found in the data set. It was checked whether the z scores were greater than +4 or less than -4 to determine univariate outliers (Stevens, 2001). The values that were not between these two values were removed from the data set. The data with outliers appearing in the boxplot were also removed from the analysis. In the last case, the skewness and kurtosis coefficients of the variables and the histogram graph with a normal distribution curve were examined to evaluate the univariate normality. As a measure of the assumption of normality, the skewness and kurtosis coefficients should be in the range of -1 to +1 (Morgan, Leech, Gloeckner & Barrett, 2004). It has been observed that none of the scores remained outside the limits of ±1 so the scores did not significantly deviate from the normal distribution. Therefore, the results obtained are that the scale sub-dimensions also show a normal distribution. Therefore, the univariate normality assumption is provided.

It is recommended to examine whether there are outliers related to the variables to determine whether the variables show a multivariate normal distribution. In this way, the outliers that make it difficult to meet the linearity assumption are also reached (Buyukozturk, 2019). For this purpose, Mahalanobis distances were calculated for all dependent variables that would be used primarily in the analysis of MANOVA. The data with Mahalanobis distances above 13.82 determined for variable number two were removed from the data set. In the last case, it has been determined that the 'Mahalanobis Distance Values' vary between 002 and 12,417. This value is below 13.82 determined for the minimum variable number two (Pallant, 2016). When the obtained Mahalanobis distances were examined, no outlier value was observed. When the scatter plots belonging to all bilateral relations of dependent variables are examined, it is seen that the plots have an oval shape and, therefore, there are no conditions that threaten linearity. Both variables show a normal distribution and if there is a linear relationship between the two variables, the scatter plot will have an oval shape (Tabachnick and Fidell, 2013).

No high correlation was detected as a result of the correlation analysis conducted to check the multiple common linearities. The Box's M Test was used to test the assumption of homogeneity of covariance matrices. If the value of p (sig) is greater than 0.001 in this test, it means that this assumption is not neglected (Pallant, 2016). Since the p (sig.) value is $p>0.001$ in all variables in the tests performed, it can be said that the homogeneity assumption of the variance-covariance matrices is also ensured. For simple regression analysis, it has been examined whether the relationship between the variables was linear with the scatter diagram and it has been determined that the relationship was linear. The analyzes were interpreted by including the percentage, frequency, mean, and standard deviation values of the variables at the .05 significance level. The calculated Cohen's d statistics regarding the level of significant difference being affected by the difference between the means have been reported. The value obtained by eta squared has been interpreted as .01=small effect, .06=moderate effect, and .14=large effect (Cohen, 1988).

Ethics and Procedure

The research data was obtained using the “online survey” technique due to the pandemic. The data was collected by using an online survey through Google Forms. Information about the purpose of the research is given on the first page of the online survey. On the second page, informed consent is given. When the participants click the "I have read and approved" button, they move on to the survey questions. This research has been carried out with

the ethical compliance decision of Bandirma Onyedi Eylul University, Social and Human Sciences Ethics Committee dated 2021-5.

FINDINGS

In this section, the findings obtained as a result of the analyses are given respectively according to the four sub-problems of the research.

Findings related to the first sub-problem of the research

Table 2: Descriptive Statistics of Teacher Candidates' "Attitude Scale towards Teaching Critical Thinking" Scores

Scales	n	Item Number	min	max	$\bar{x}$	s
Attitude	743	19	56.00	95.00	82.71	7.80

The score that teacher candidates receive from the 19-item attitude scale for teaching critical thinking ranges from 19-95. It has been observed, on the other hand, that the scores of the teacher candidates participating in the research were between 56-95. The mean scores of the teacher candidates' attitudes towards teaching critical thinking scale ($\bar{x}$=82.71) are observed to be at a high level. Therefore, it can be said that teacher candidates have positive attitudes towards teaching critical thinking.

Findings related to the second sub-problem of the research

Table 3: Descriptive Statistics of the Scores of Teacher Candidates on the "Critical Thinking Standards Scale"

Scales	n	Item Number	min	max	$\bar{x}$	s
Critical Thinking Standards	743	42	128.00	200.00	162.214	12.47

The score that the teacher candidates receive from the critical thinking standards scale ranges from 42-210. It has been observed, on the other hand, that the scores of the teacher candidates participating in the research were between 128-200. The mean scores of the teacher candidates on the critical thinking scale ($\bar{x}$=162.214) are observed to be at a high level. Therefore, it can be said that teacher candidates have critical thinking standards.

Findings related to the third sub-problem of the research by gender

Table 4: MANOVA Results of Teacher Candidates' Attitudes towards Teaching Critical Thinking and Critical Thinking Standards Scores by Gender

Independent Variable	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Gender	.99	2.82	2.00	740,00	.06	.008

When Table 4 MANOVA results are examined, no statistically significant difference is found between the independent variables, women and men, F(2,740)=2.82; p=.06; Wilks' Lambda=.99; Partial Eta Squared=.008.

Findings related to the third sub-problem of the research by the department

Table 5: MANOVA Results of Teacher Candidates' Attitudes towards Teaching Critical Thinking and Critical Thinking Standards Scores by Department

Independent Variable	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Department	.97	3.113	6.00	1476.00	.005	.012

When Table 5 MANOVA results are examined, a statistically significant difference is found according to the departments of the teacher candidates, F(6,1476)=3.113; p=.005; Wilks' Lambda=.79; Partial Eta Squared=.012. In Table 8, the results obtained for the dependent variables are handled separately and the effects between the groups are given.

Table 6: Tests of Between-Subjects Effects and Group Averages by Department Variable

Dependent Variable	Department	n	$\bar{x}$	s	df	Mean Square	F	Sig.	Partial Eta Squared
Attitude	Dept. of Basic Edu.	262	83.62	7.23	3	300.82	5.016	,002	,020
	Dept. of Math and Sci. Edu.	110	80.30	7.68					
	Dept. of Turkish and Social Sci. Edu.	268	83.00	8.11					
	Other	103	82.24	8.04					
Critical Thinking Standards	Dept. of Basic Edu.	262	167.41	12.38	3	430.98	2.788	,040	,011
	Dept. of Math and Sci. Edu.	110	164.38	11.82					
	Dept. of Turkish and Social Sci. Edu.	268	168.38	12.66					
	Other	103	166.66	12.58					

When Table 6 is examined, a statistically significant difference is found in the scores of attitudes towards teaching critical thinking (F (3, 739) =5.016; p=.002; Partial Eta Squared=.02) and in the scores of critical thinking standards (F (3, 739) =2.788; p=.04; Partial Eta Squared=.01) according to the variable of the department. The scheffe post hoc test has been performed to determine which groups caused the significant difference. The results obtained show that the attitudes of teacher candidates in the Department of Mathematics and Science Education Sciences towards teaching critical thinking are more negative than those of teacher candidates in the Department of Turkish and Social Sciences (p=.024) and Basic Education (P=.003). Likewise, teacher candidates in the Department of Mathematics and Science Education Sciences have been found to have less critical thinking standards than those of teacher candidates in the Department of Turkish and Social Sciences Education (p=0.45).

Findings related to the third sub-problem of the research by class level

Table 7: MANOVA Results of Teacher Candidates' Attitudes towards Teaching Critical Thinking and Critical Thinking Standards Scores According to the Variable of Class Level

Independent Variable	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Class Level	.99	.915	6.000	1476.000	.483	.004

When Table 7 MANOVA results are examined, no statistically significant difference is found according to the independent variable of class level; F(6,1476)=5.33; p=.915; Wilks' Lambda=.99; Partial Eta Squared=.004.

Findings related to the third sub-problem of the research by the status of knowledge on critical thinking teaching

Table 8: MANOVA Results of Teacher Candidates' Attitudes Towards Teaching Critical Thinking and Critical Thinking Standards Scores According to the Variable of Knowledge on Teaching Critical Thinking

Independent Variable	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Teaching Critical Thinking	.96	12.124	2.00	740,00	.000	.032

When the MANOVA results are examined in Table 8, a statistically significant difference was found according to the independent variable of knowing teaching critical thinking, F(2,740)=12.124; p=.000; Wilks' Lambda=.96; Partial Eta Squared=.032. In Table 11, the results obtained for the dependent variables are handled separately and the effects between the groups are given.

Table 9: Tests of Between-Subjects Effects and Group Averages According to the Variable of Knowledge on Teaching Critical Thinking

Dependent Variable	Knowing Teaching Critical Thinking	n	$\bar{x}$	S	df	Mean Square	F	Sig.	Partial Eta Squared
Attitude	Yes	403	83.87	7.67	1	1174.742	19.764	.000	.026

	No	340	81.34	7.74	1				
Critical Thinking Standards	Yes	403	169,02	12.70	1	2895.698	19.052	.000	.025
	No	340	165,06	11.87					

When Table 9 is examined, a statistically significant difference is found in the scores of attitudes towards teaching critical thinking (F (1,954) =25.81; p=.000; Partial Eta Squared=.026) and critical thinking standards (F (1,954) =22.64; p=.000; Partial Eta Squared=.023) according to the variable of knowing teaching critical thinking. When the average scores are examined, it shows that those who know about teaching critical thinking have positive attitudes toward teaching critical thinking at a higher level and have critical thinking standards. The effect size is small for both dependent variables.

Findings related to the third sub-problem of the research by the Number of Books Read per Month

Table 10: MANOVA Results of Teacher Candidates' Attitudes towards Teaching Critical Thinking and Critical Thinking Standards Scores According to the Variable of Number of Books Read per Month

Independent Variable	Wilks' Lambda	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Number of Books Read per Month	.94	6.965	6.000	1476.000	.000	.028

When Table 10 MANOVA results are examined, a statistically significant difference is found according to the number of books read monthly, F (6, 1476) =6,965; p=.000; Wilks' Lambda=.94; Partial Eta Squared=.028. In Table 11, the results obtained for the dependent variables are handled separately and the effects between the groups are given.

Table 11: Tests of Between-Subjects Effects and Group Averages by Number of Books Read Monthly

Dependent Variable	Number of Books	n	$\bar{x}$	S	df	Mean Square	F	Sig.	Partial Eta Squared
Attitude	Zero or one book	244	81.25	8.44	3	423.449	7.120	.000	.028
	Two books	217	82.47	7.31					
	Three books	144	83.45	7.47					
	Four books or more	138	84.89	7.16					
Critical Thinking Standards	Zero or one book	244	163.95	12.45	3	2032.591	13.728	.000	.053
	Two books	217	166.61	12.34					
	Three books	144	169.35	11.54					
	Four books or more	138	171.68	11.99					

When Table 11 is examined, a statistically significant difference is found in the scores of attitudes towards teaching critical thinking (F (3,739) =7.10; p=.000; Partial Eta Squared=.028) and critical thinking standards (F (3,739) =13.72; p=.000; Partial Eta Squared=.053) according to the independent variable of the monthly number of books read. The scheffe post hoc test has been performed to determine which groups caused the significant difference. The results obtained demonstrate that the attitudes of teacher candidates who read none or one book towards teaching critical thinking are more negative than those of those who read four books or more (p=.000). Likewise, the level of critical thinking standards of teacher candidates who read none or one book is more negative than those of who read four books or more (p=.000).

Findings related to the fourth sub-problem of the research

Table 12. Simple Regression Analysis of Critical Thinking Standards as a Predictor of Attitude towards Teaching Critical Thinking

	R	R^2	Adjusted R Square	Std. Error of the Estimate	F.	Sig
Critical Thinking Standards	,609	,371	,370	6.19434	437.504	,000

When Table 12 is examined, it is seen that critical thinking standards explain 37% of the variance [R=.609, R^2=.371, F (1,741) =437.504, p<.01] regarding the attitude towards teaching critical thinking. It is also observed that there is a positive mediate level (Buyukozturk, 2019) relationship between teacher candidates' critical thinking standards and their attitudes towards teaching critical thinking.

Table 13: Coefficients Table of Simple Regression Analysis of Critical Thinking Standards as a Predictor of Attitude towards Teaching Critical Thinking

	Unstandardized Coefficients		Standardized Coefficients		
Model	B	Std. Error	Beta	t	Sig.
1 (Constant)	18.972	3.056		6.208	.000
CT Standards	.381	.018	.609	20.917	.000

When Table 13 is examined, it is foreseen that a one-unit change in critical thinking standards will lead to an increase of .381 units in the attitude towards teaching critical thinking. In summary, the estimation result of the model is: y=18.972+0.381x

CONCLUSION AND DISCUSSION

It has been determined as a result of the research that the attitudes of teacher candidates towards teaching critical thinking are positive. When the relevant literature is examined, this finding has parallels with the results of some studies. It has been found in a study conducted by Gelen (2002) that classroom teachers consider themselves sufficient to implement thought-enhancing activities in the classroom environment and to acquire thinking skills. However, in the observation made with participation, it has been revealed that the teachers were “Inadequate” on average. It has been found that the vast majority of teachers have never asked any questions at the assessment level. Kaya (2008) has found that teacher candidates responded to the items related to creating a classroom environment that improves thinking at a fairly adequate level. It has been concluded that the classroom teachers feel "completely adequate" regarding the teaching of critical thinking skills (Gobel, 2013); and that the majority of primary school teacher candidates and primary school teachers consider themselves adequate regarding the teaching of critical thinking (Yesilpinar 2011; Yesilpinar and Doganay, 2014). It has been also stated in a study conducted by Inan and Ozgen (2008) that Mathematics teacher candidates consider themselves adequate at a high level in acquiring critical thinking skills in the Mathematics course. As Akdere (2012) stated, the fact that teacher candidates attach a high level of importance to teaching strategies that will improve critical thinking skills indicates that they are ready to improve themselves to put them into practice in the future. However, having a positive attitude towards teaching critical thinking does not guarantee that critical thinking will be taught in the best way.

The results of this research, in which the attitudes of teacher candidates towards teaching critical thinking are positive, do not coincide with the results obtained in some studies. It is stated in a study conducted by Akdere (2012) that the attitudes of teacher candidates towards teaching critical thinking are moderately positive. Likewise, Kiziltas (2011) states that the tendencies of classroom teachers to teach critical thinking are also moderate. Cicek Saglam and Buyukuysal (2013) have determined in their qualitative research on the barriers to teaching critical thinking to teacher candidates that the teacher candidates think that both the program and the teachers/instructors do not support the critical thinking process.

It has been found as a result of the research that teacher candidates have critical thinking standards, in other words, high levels of critical thinking skills. Studies supporting this finding in the literature are as follows: It has been determined that the critical thinking tendencies of the classroom teacher candidates (Aybek and Aslan, 2017; Yilmaz, 2017; Askin Tekkol and Bozdemir, 2018), the Religious Culture and Moral Education Teaching (Cekin, 2013), the Science (Tekin, Aslan, and Yagiz, 2016) and the Science and Primary Education Teacher candidates (Hamurcu, Akamca Ozyilmaz, Gunay, 2005), the education faculty students (Karali, 2012), the music teacher candidates (Piji Kucuk and Uzun; 2013) and the students maintaining their education in the English and Science Teaching departments (Bayat, 2014) are good, positive and high. This finding may be because critical thinking standards are involved in teacher training program achievements and the teacher candidates participating in the study internalize these tendencies and develop their research and inquiry skills. As is known, teacher training undergraduate programs are mostly structured on basic skills, attitudes, value acquisition, and adaptation. In addition to field knowledge, professional knowledge and skills for the education and training of the field have been created by prioritizing the acquisition of standards such as Science literacy and Mathematics literacy, for example (YOK, 2018).

It has been determined, on the other hand, in some studies on the subject, contrary to this finding, that the teacher candidates in the Department of Basic Education (Kiziltas, 2011), visual arts teacher candidates (Ayberk Arslan, 2016), students in the last years of primary, secondary and higher education (Korkmaz and Yesil, 2009), and teacher candidates studying in other departments have a moderate level of critical thinking tendency and power (Kurum, 2002; Cekic, 2007; Cetin, 2008; Gulveren, 2007; Dutoglu and Tuncel, 2008; Korkmaz, 2009; Deniz, 2009; Besoluk and Onder, 2010; Kartal, 2012; Gedik, 2013; Kuvac and Koc, 2014; Bayat, 2014; Kocak et. al.,

2015; Gokkus and Delican, 2016; Durnaci and Ultay, 2020). Also, some research results (Gulveren, 2007; Genc, 2008; Guven and Kurum, 2008; Zayif, 2008; Tumkaya, 2011; Cetinkaya, 2011; Tural, Secgin, 2012; Cicek Saglam and Buyukuysal, 2013; Yuksel, Uzun, Dost, 2013; Sarpkaya and Aktas, 2013; Can and Kaymakci, 2015; Karaman, 2016; Acisli, 2016; Colak et. al., 2019) demonstrate that teacher candidates have a low level of critical thinking tendency. On the other hand, it has been found in the studies conducted with university students (Kaya, 1997; Coskun, 2001; Dayioglu, 2003; Ozgen, 2009) that students have moderate critical thinking power. It is thought that SWOT analyzes and qualitative research are necessary regarding the barriers to critical thinking in pre-service education of teacher candidates, considering the amount of research in the literature on teacher candidates' mostly moderate and low levels of critical thinking tendency and skills. The courses included in the program can be conducted through further research and inquiry-based activities.

It has been found as a result of the research that the attitudes of teacher candidates towards teaching critical thinking and the standards of critical thinking do not differ by gender. It is seen that there are studies in the literature that have obtained similar results (Kaya, 1997; Semerci, 2003; Dayioglu, 2003; Chin, 2005; Aybek, 2006; Cekic, 2007; Yildirim and Yalcin, 2008; Ekinci, 2009; Korkmaz, 2009; Leach and Good, 2011; Tural, Secgin, 2012; Karali, 2012; Piji Kucuk and Uzun, 2013; Yuksel, Sari Uzun, and Dost, 2013; Gokkus and Delican, 2016; Tekin, Aslan, and Yagiz, 2016; Aypek Arslan, 2016; Yilmaz, 2017; Askin Tekkol and Bozdemir, 2018; Durnaci and Ultay, 2020). Gelen (2002) states that gender does not constitute a significant difference in the teaching of thinking skills of teachers. Likewise, Inan and Ozgen (2008) also note that there is no difference in the views of teacher candidates regarding their ability to acquire thinking skills by gender. It is seen that other research results support the result obtained in this study, that is, the critical thinking tendencies of teacher candidates do not change by gender.

On the other hand, in some studies on the subject, it has been determined in the research findings that critical thinking tendencies differ in favor of female teacher candidates, in other words, they are more positive and higher than that of males (Kokdemir, 2003; Hamurcu, Gunay, and Akamca, 2005; Gulveren, 2007; Ay and Akgol, 2008; Besoluk and Onder, 2010; Ozsoy Gunes, Cingil Baris, and Kirbaslar, 2013; Kuvac and Koc, 2014; Yuksel, Uzun, and Dost, 2013). It has been determined that male students' critical thinking levels are more positive or higher (Cokluk Bokeoglu and Yilmaz, 2005; Zayif, 2008; Leach and Good, 2011; Kartal, 2012; Cicek Saglam and Buyukuysal, 2013), and they use their critical thinking skills more while expressing their views and thoughts on current controversial issues (Doganay et. al., 2003). As can be seen, different results have been found in the literature regarding the tendency, attitude, and standards of critical thinking for the gender variable. In line with these results, it can be said that critical thinking is a tendency independent of the gender variable. Therefore, no generalization can be made in this regard. As a result of the research, there is no significant difference between the attitudes of teacher candidates toward teaching critical thinking and the standards of critical thinking by the class level.

In parallel with this finding, it is stated that the class level does not make a significant difference in the studies conducted with teacher candidates on their critical thinking dispositions (Ekinci, 2009; Besoluk and Onder, 2010; Yuksel, Sari Uzun, and Dost, 2013; Sarpkaya Aktas and Unlu, 2013; Kuvac and Koc, 2014; Memduhoglu and Keles, 2016; Aybek and Sahin, 2017; Ozdemir, Buyruk, and Gungor, 2018). In Korkmaz's (2009) study, it has been determined that the critical thinking tendencies and levels of graduate students are higher than those of new students, but generally, critical thinking tendencies and levels in all classes are moderate. According to the author, the tendency and level of critical thinking of students do not increase to the highest level in the upper class. Based on the results, it can be said that as the class level increases, the attitude towards teaching critical thinking and the standard of critical thinking do not change. Besoluk and Onder (2010) state that this situation does not contribute to the development of critical thinking tendency in the education faculty, so these people will generally graduate with medium and low critical thinking skills. This does not correspond to the quality of the teacher in today's understanding of education. Therefore, when teacher candidates do not encounter a lesson or practice for abstraction skills such as academic writing, free reading activities, art education, projects, and out-of-school education environments to improve their high-level thinking skills they have from the first class, there may not be a significant difference between their class levels.

In contrast to the findings of this study, according to the meta-analysis study conducted by Colak, Turkkas Anasiz, Yorulmaz, and Duman (2019), it is stated that the effect of the class level variable on the critical thinking tendencies of teacher candidates is at a very low level. Although the effect size is at a very low level, the critical thinking tendencies of teacher candidates studying in the third and fourth classes are higher than those studying in the first and second classes. In parallel, Cetin (2008) has stated in his study that there is a significant difference in favor of the seniors in terms of critical thinking power level, and Tumkaya (2011) has stated that there is a significant difference between the critical thinking tendencies of science students according to the class

level, in the self-confidence dimension in favor of the senior students. It is stated that the critical thinking tendencies of the seniors are higher than that of the freshman (Can and Kaymakci, 2015), and similarly, in the studies conducted by Gokkus and Delican (2016), Karali (2012), and Kartal (2012), there is a significant difference in favor of the upper classes in the class level variable. Cokluk Bokeoglu and Yilmaz (2005) also state that there are significant differences in both research concerns and analytical, curiosity, and self-confidence dimensions in terms of the age variable of university students; Acisli (2016) has also found that the critical thinking tendencies of teacher candidates differ in favor of senior students in terms of open-mindedness according to their class levels. This can be explained by the fact that senior students are more experienced than those in the lower classes. It can be considered that the richness of experience and life increases self-confidence in senior students (Tumkaya, 2011).

As a result of the research, ATCT results of the teacher candidates in the Department of Mathematics and Science Education Sciences are more negative than that of the teacher candidates in the Department of Turkish and Social Sciences and Basic Education. This result coincides with the finding in the study conducted by Tumkaya (2011) that primary science teacher candidates have a low tendency to think critically. Tural and Secgin (2012) have found that the critical thinking tendencies of candidates of Social Studies and Science and Technology teachers of a similar nature differ significantly in favor of candidates of Social Studies teachers. It has been determined in the study conducted by Sengul (2007) that Physics teachers working in secondary education have a low level of critical thinking tendency and that teachers do not include critical thinking in the activities they organize in the classroom and treat them as if they have nothing to do with daily life. When the relevant literature is examined, it is stated, contrary to this finding, in the study conducted by Kuvac and Koc (2014) that the critical thinking tendency of science teacher candidates is at a medium level, and, it is stated as being above the medium level by Kartal, (2012).

In his research on mathematics teacher candidates, Cekic (2007) has concluded that most mathematics teacher candidates have a “moderate” level of critical thinking tendency while Yuksel, Sari Uzun, and Dost (2013) have concluded that it is at a “low” level. Also, Chin (2005) has claimed that the attitude of teacher candidates toward science is moderately positive. Therefore, these results regarding Mathematics teacher candidates are consistent with this research finding. Contrary to this finding, in the study conducted by Inan and Ozgen (2008), it has been determined that mathematics teacher candidates find themselves highly adequate in acquiring critical thinking skills in the Mathematics course, and their attitudes towards teaching critical thinking in other different branches (SMT: Secondary Education Mathematics Teaching, PMT I: Primary Education Mathematics Teaching I., PMT II: Primary Mathematics Teaching II.) of the Mathematics department do not change. In the findings obtained from this study and when some research findings are examined, although it is expected that the critical thinking tendency levels of Mathematics and Science teacher candidates are high, the reasons why their attitudes towards teaching critical thinking are more negative should be investigated and precautions should be taken. Contrary to this finding, Besoluk and Onder (2010) have found that science teacher candidates' critical thinking tendencies do not change according to the department they study, and in some studies, science teachers candidates' critical thinking tendencies are high and positive (Bayat, 2014; Tekin, Aslan, Yagiz, 2016).

Likewise, Yesilpinar (2011) has determined that the teachers and teacher candidates in the Department of Basic Education attach importance to methods-techniques and approaches suitable for teaching critical thinking, e.g; they use social teaching approach (discussion, educational games, drama, and role playing); direct approaches (question-answer); independent teaching approaches (case study, six thinking hats, and brainstorming). In support of this finding, it has been determined that teacher candidates studying in numerical fields have a more teacher-oriented approach and adopt less student-oriented strategies than those studying in social sciences (Tezci, Dilekli, Yildirim, Kervan, and Mehmeti, 2017).

Similar to the findings of this study in other sub-problems, it has been observed that Mathematics and Science Education teacher candidates have less critical thinking standards than Turkish and Social Sciences Education teacher candidates. In a study conducted by Turnuklu and Yesildere (2005), in parallel with this research finding, it is stated that the CT tendencies of mathematics teacher candidates are high, but their CT skill levels are moderate. Similarly, Sarpkaya Aktas and Unlu (2013) have stated that the critical thinking standards of mathematics teacher candidates are at a moderate level. In contrast to this research finding in the literature, it has been determined that teacher candidates in the Department of Basic Education (Kiziltas, 2011) have a moderate level of critical thinking standards. Studies in the literature that do not agree with this finding (Korkmaz, 2009) have stated that Science Teaching students' critical thinking tendencies are more positive than other students while Emir (2012) states the same for the students in the Department of Classroom Teaching. It is also stated that there is no significant difference between the departments regarding the critical thinking skills of teacher candidates (Gulveren, 2007).

It has been found that knowing the teaching of critical thinking has an effect on attitudes and standards of critical thinking towards teaching critical thinking. It is shown that those who have knowledge of teaching critical thinking have positive attitudes toward teaching critical thinking at a higher level and have critical thinking standards.

It supports the finding that knowing critical thinking teaching improves critical thinking standards. According to Kokdemir (2003), critical thinking education increases students' critical thinking tendencies. In the study of Cokluk Bokeoglu and Yilmaz (2005), it is stated that individuals who receive research education have low research concerns and that preparing research projects or taking part in different research activities contributes to the development of critical thinking. Yildirim and Yalcin (2008) have concluded that education based on critical thinking skills has a positive effect on the development of learning products such as critical thinking. Karakaya (2012) states that among the skills for teaching critical thinking, especially those who take chess lessons have higher critical thinking skills than other individuals. In other words, it has been found that as students' chess levels increased, their critical thinking skills also increased. It has been stated in a study conducted by Ozturk, Buyruk, and Gungor (2018) that critical thinking tendency is not related to a biological variable such as age and gender, but rather to individuals' lives and experiences and the processes of making sense of these lives and experiences. Likewise, it has been stated in a study conducted by Aybek, Yalcin, and Ozturk (2019) that subject-based critical thinking teaching improves students' critical thinking standards such as their willingness to gather information, and self-regulation, inference, and evidence-based decision making. In summary, when the relevant literature is examined, it has been determined that the critical thinking attitudes and skills of the participants in the sample increased after the practices that developed their critical thinking skills in the experimental researches on critical thinking (Ozcinar, 1996; Semerci, 2000; Akinoglu, 2001; Sahinel, 2001; Kokdemir, 2003; Akar Vural, 2005; Aybek, 2006; Aybek, 2007; Yildirim and Yalcin, 2008; Ertas, 2012; Bayram, 2015; Schreglmann, 2011; Schreglmann and Karakus, 2017).

The fact that knowing the teaching of critical thinking has an impact on the attitude toward teaching critical thinking coincides with the research finding conducted by Onal (2020). In the research conducted the Curriculum of the Critical Thinking Course, which was applied for one semester, was effective in the positive development of the teacher candidates' tendency to critical thinking and their attitudes towards teaching critical thinking. In the study conducted by Semerci (2003), it is stated that the courses of teaching professional knowledge conducted by the method of research and inquiry in the faculties of education contribute to critical thinking. In Halpern (2003, cited, Gundogdu, 2009), it is determined that students who take a critical thinking skills course are more successful than other students in many subjects such as problem solving and searching for evidence, and they can use these skills outside of school. Ertas (2012) states that in physics teaching, critical thinking teaching supported by out-of-school scientific activities can be beneficial in developing students' critical thinking tendencies and increasing their attitudes towards the lesson. It has been determined in the study carried out by Narin and Aybek (2010) that there is a positive and significant relationship between the critical thinking skills of teachers and the teaching method they use. In summary, it is understood that critical thinking standards are a cognitive process that can be gained through effective methods (Kokdemir, 2012). Therefore, it can be said that as the knowledge, manners, and experience in teaching critical thinking increase, the attitude towards teaching critical thinking and the standards of critical thinking may also improve, become more consolidated and support professional autonomy and professional development of the teacher candidate.

The attitude and critical thinking standards of teacher candidates who read four or more books per month towards teaching critical thinking are higher than those who have never read a book or read 1 book per month. The fact that approximately 33% of the teacher candidates participating in the research have never read a book or only read one book, and approximately 18% have read four or more books indicates that teacher candidates are inadequate in reading. It is also stated in the study carried out by Gokkus and Delican (2016); Sahin Alkin, Tuca, and Ulubey (2014) that the critical thinking tendencies of teacher candidates who read “one book a week” or “one book every two weeks” are higher than those who “have never read a book”. Tural and Seckin (2012) have also found that reading books among the leisure time activities of social studies and science and technology teacher candidates is extremely low. Gomleksiz (2004) has revealed that while teacher candidates accept the necessity of reading books, the effect and benefits of reading are more adopted by female students.

From the point of view of socio-cultural theory, reading is a skill that students will develop at the university, although it depends on a complex and social basis (Bosley, 2008). It is stated that there is a moderate, positive, and significant relationship between classroom teacher candidates' critical thinking tendencies and their attitudes towards reading habits (Gokkus and Delican, 2016). “Critical literacy is based on being active, interpreting and reproducing in the process of constructing meaning away from acceptance” (Tuzel, 2012, p.6). Yilmaz (2013) has also stated that there is a significant relationship between teacher candidates' especially "magazine reading

habits and critical literacy and critical writing skills and that both the magazine reading habits of the candidates and their habits of following different magazines positively affect their critical literacy skills. Kocak, Kurtlu, Ulas, and Epcacan (2015) state that there is a low level, significant and positive relationship between critical thinking tendency and attitude toward reading. Therefore, it is noted that the tendency to critical thinking and the attitude to reading positively affect each other. When the relevant literature is examined, it is stated that the reading habit is also related to the academic writing habit. Bayat (2014) emphasizes the importance of considering the critical thinking levels of teacher candidates in increasing their academic writing success levels such as essays and reports. According to the results obtained from this study, the findings regarding the reading frequency declared by the teacher candidates indicate that the teacher candidates are unfortunately inadequate in this regard. Statistics on reading books in Turkey also show that the rate of reading books, magazines, and newspapers is lower than in countries with the same level of development (skills), and the extracurricular literacy level of most of the school-age children and youth is lower (Ortas, 2014).

It is also observed that there is a positive mediate level relationship between teacher candidates' critical thinking standards and their attitudes towards teaching critical thinking. This finding is consistent with Akdere's (2012) study that there is a moderate correlation between the teacher candidates' attitudes towards and the performance efficacy dimension of self-efficacy in teaching for critical thinking. Aybek and Aslan (2017) have also stated that the high standards of critical thinking of teacher candidates will make it easier for students to acquire these standards. Semerci (2000) supports this finding by stating that when the tendency of teacher candidates to think critically is developed, the ability to think critically may also improve. It is stated in the literature that the attitude towards teaching critical thinking is also related to the leadership and reflective thinking tendencies of teachers. Askin Tekkol and Bozdemir (2018) state that there is a positive, moderate relationship between teacher candidates' critical thinking standards and reflective thinking tendencies, and they change together. It is stated that critical thinking tendencies are also a strong predictor of leadership orientations (Ozdemir, Buyruk, and Gungor, 2018). Raths (1966, cited by Pithers and Soden, 2000) states that being an independent learner, fearful, operate within narrow rule sets are the most serious obstacles in the teaching of critical thinking skills. Therefore, the more flexible, the safer, and the less assisted learner you become, the more critical thinking standards will be able to develop. Hence, critical thinking and problem-solving in the workplace, or life, are not isolated activities. Willingham (2008) draws attention to the difficulties of teaching critical thinking. Especially beyond the superficial nature of the problems, he states that it is necessary to go deeper into the problem, define the problem and make decisions following the standards of critical thinking, the dimensions of "depth, breadth and adequacy", "precision and accuracy" and "importance, relevance, and clarity".

When the critical thinking standards as a predictor of the attitude towards teaching critical thinking are examined, it is seen that the critical thinking standards explain 37% of the variance related to the attitude towards teaching critical thinking. Therefore, it can be said that the teacher candidates having critical thinking skills will have an impact on their attitudes toward teaching critical thinking in the future. When the relevant literature is examined, Demir and Ulucinar (2012) state that individuals' displaying critical thinking tendencies does not mean that they think completely critically and that tendencies, attitudes, skills, and habits are structures that represent different but related dimensions. Aybek (2007) also points out that in terms of attitude towards teaching critical thinking, it is possible to raise individuals who can express themselves, discuss their thoughts freely, and question in a classroom environment where there is no fear and authority.

Trottier (2009) emphasizes the do's and don'ts in the teaching of critical thinking. According to the author, millennials are competent critical thinkers, they can even be called critics. As Richard Dawkins discusses in Enemies of Reason, presenting propositions that critical thinking is a method, making use of multimedia, and having interactive discussions with students are the things to be done in the name of critical thinking. Not taking an exam or not giving homework are things that should not be done in order not to inhibit critical thinking. Yildirim and Yalcin (2008) state that traditional teaching methods are not effective in the development of problem-solving and critical skill levels of teacher candidates. Cikrikci (1992) also states that critical thinking is an important dimension of mental ability and that critical thinking is affected by maturation and richness of experience. CT requires a rich vocabulary and knowledge of terms (Wright, 2002). The lack of competence of teachers in the teaching of critical thinking skills is a major obstacle in the teaching of critical thinking (Yesilyurt, 2021).

Recommendations

1. Studies can be carried out to design the course content and learning and teaching processes of the Faculty of Education in such a way as to improve the critical thinking skills of teacher candidates.
2. Teaching critical thinking to the curriculum of faculties of education can be added to the content of a course or a related course and given to teacher candidates programmatically.

3. Encouraging teacher candidates to read more books can be planned at the faculties of education.
4. Mathematics and Science Education teacher candidates can be allowed to choose courses in the field of Turkish and social sciences to support the development of critical thinking skills.
5. Sample lesson plans and designs can be developed based on critical thinking skills through the cooperation of the Faculty –School.

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