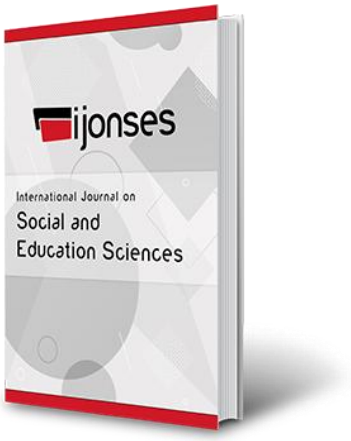

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To cite this article:

Zeybek, G. (2025). The relationship between critical thinking standards and critical thinking attitudes of teacher candidates. *International Journal on Social and Education Sciences (IJonSES), 7*(1), 36-57. https://doi.org/10.46328/ijonses.711

International Journal on Social and Education Sciences
2025, Vol. 7, No. 1, 36-57 https://doi.org/10.46328/ijonses.711

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Article Info

Article History

Received:
18 September 2024
Accepted:
30 December 2024

Keywords

Critical thinking
21st century skills
Teacher candidates
Teacher education

Abstract

The purpose of the research is to determine the direction and level of the relationship between the attitudes of teacher candidates towards critical thinking and their critical thinking standards and the degree to which the attitudes of teacher candidates towards critical thinking predict their critical thinking standards. The research model is a correlation survey model, one of the quantitative research models. The study group consists of teacher candidates studying at the faculty of education of a state university in Turkey in the 2023-2024 academic year. When the research findings are examined, it is seen that the attitude scores of the teacher candidates towards critical thinking and the critical thinking standards scores of the teacher candidates correspond to the "very high" level. According to another finding of the research, there is a moderately significant relationship between the level of teacher candidates' attitudes towards critical thinking and critical thinking standards. Also, it was seen that the attitudes of teacher candidates towards critical thinking significantly predicted critical thinking standards. It can be stated that 45% of the total variance regarding the critical thinking standards of teacher candidates is explained by their attitudes towards critical thinking.

Introduction

The basic quality that a person has and that enables them to live in harmony with nature and use the opportunities offered by nature to meet their needs is the ability to think. This skill is innate within certain limits, but it is developed through experience and can be used effectively. Critical thinking is also among the higher-order thinking skills that emerge with the effective use of thinking skills (Kazancı, 1989). According to some researchers, the most advanced level of thinking among thinking skills is critical thinking. Because critical thinking is not a random intellectual activity that individuals use to cope with problems, but a creative way of thinking that evaluates and examines problems from different perspectives (Açışlı, 2016). Critical thinking, which is associated with higher-order thinking skills that focus on the steps of Bloom's Taxonomy such as analysis, evaluation and synthesis, has a positive effect on skills such as decision making and problem solving (Yılmaz-Özelçi, 2012). The quality of an individual's studies at school, the effort he shows in his career, his contribution to social life and the way he handles personal issues also depend on his problem-solving and decision-making skills (Ruggiero, 2022). When critical thinking is applied as a way of learning, it also brings academic success (Chau-Kiu et al., 2001).

How the teachers of the future should be in the world has been a topic of discussion in recent years. Most of these discussions emphasize the importance of educating individuals with critical thinking skills and increasing the number of university graduates who can think critically at an advanced level, communicate effectively and solve problems is among the goals set for the 2000s and beyond (Gülveren, 2007). While educating individuals as critical thinkers is among the goals of professionalization in higher education, it is also a quality sought by employers who employ university graduates. The World Economic Forum (2016) stated in its Future of Professions Report that critical thinking will be one of the ten basic skills that will be heavily needed in current occupational groups that the fourth industrial revolution has created. At the International Summit on the Teaching Profession held in 2016, the cognitive skills that today's students are expected to have in their future careers were expressed as problem solving, creativity and critical thinking (Schleicher, 2016).

Similarly, the common frameworks determined by many institutions (P21, ATCS, EnGauge, NETS/ISTE) have emerged as critical thinking, problem solving, qualified product development/productivity (Cansoy, 2018). Therefore, it has been pointed out in many studies that critical thinking education should be a part of normal education (Kökdemir, 2003) and there is a consensus among educators that critical thinking is one of the most important goals of education (Siegel & Carey, 1989). Although developed countries have taken measures regarding critical thinking a long time ago, important steps have recently been taken in this regard in developing countries. It is seen that policy makers, educational administrators, curriculum developers and of course teachers, who are the implementers of educational practices themselves, are aware of the type of person needed in the century we live in and are working to raise this type of person. Therefore, critical thinking has taken its place in today's curriculum as a basic thinking skill that is targeted to be taught. Studies on gaining critical thinking skills and attitudes, which started in preschool institutions, continue until higher education.

Critical thinking skills are important for all individuals in society as well as for students (Bostan-Sarıoğlan & Ürkek, 2022). It is stated that critical thinking skills are important not only in academic environments but also in every platform aimed at solving problems (Kökdemir, 2003). Critical thinking, which is effective in individuals' ability to make independent decisions and approach events critically, has both philosophical and cognitive foundations (Doğanay et al., 2007). Therefore, definitions made by researchers in different fields regarding critical thinking are encountered in the literature. According to Watson and Glaser (1994), critical thinking is a combination of information and attitudes; the use of information and the application of attitudes. This process is also explained as systematically and logically examining the evidence supporting conclusions and producing situations supported by evidence and reasoning. According to Norris and Ernis (1989), critical thinking is an acceptable and reflective way of thinking that focuses on what to believe or what to do; According to Potts (1994), it is a way of thinking that does not accept any idea without questioning its validity and accuracy. Cüceloğlu (1995) defined critical thinking as “an active and organized mental process that aims to understand ourselves and the events around us by being aware of our own thought processes, considering the thought processes of others and applying what we have learned.” Critical thinking is a rational, logical, reflective, consistent and evaluative process that enables decisions on what to do or not to do, what to accept or not to do and similar situations (Ben-Chaim et al., 2000). Johnson (2000) defined critical thinking as “a way of thinking in which a person organizes, analyses and evaluates information.” Paul and Elder (2007) defined critical thinking as the art of analysing and

evaluating it in order to improve thinking. According to Quitadamo et al. (2008), critical thinking is a purposeful self-control and judgment process in which problem solving and decision making are used. Apart from the definitions of critical thinking put forward by these different perspectives, joint studies have been conducted for an interdisciplinary definition. In this context, in the Delphi Report published as a result of the study conducted with the participation of 46 experts from different fields under the leadership of the American Psychological Association (APA) in 1990, critical thinking was defined as "the individual making conscious judgments aimed at analysis and evaluation in order to decide what to do and what to believe and expressing these judgments" (Evancho, 2000). This report mentions the cognitive skill dimension and the affective-disposition dimension of critical thinking and the skills and sub-skills on which experts have reached a consensus regarding the cognitive dimension of critical thinking are as follows (Facione, 1990).

Table 1. Cognitive Dimension of Critical Thinking

Skills	**Sub-Skills**
Commenting	Categorizing
	Analysing significance
	Clarifying meaning
Analysis	Examining ideas
	Identifying arguments
	Analysing arguments
Evaluating	Evaluating claims
	Evaluating arguments
Making inferences	Questioning evidence
	Predicting alternatives
	Drawing conclusions
Explaining	Expressing conclusions
	Validating the process
	Presenting arguments
Self-regulation	Self-assessment
	Self-correction

Critical Thinking Standards

Critical thinking is the individual thinking about his/her own thoughts in order to make his/her thinking effective and sufficient while thinking (Dilidüzgün, 2017). Nosich (2018) stated that Robert Ennis defined critical thinking as “logical reflective thinking focused on deciding what to believe or what to do”. In this context, the first condition that turns thinking into critical thinking is reflective thinking. Critical thinking is also meta-cognitive; it requires questioning why you have that thought about a subject, your evidence, other people's views on that subject and what they base these views on, whether yours or theirs is correct and making judgments that meet the criterion of reasonableness. The second condition of critical thinking is meeting high standards of thinking. These standards are specified by Nosich (2018) as clarity, accuracy, significance, adequacy, depth, breadth and precision.

These standards are valid for both the individual's own thoughts as a transmitter and the reader/listener's thoughts received as a receiver. According to Nosich (2011), critical thinking standards are a prerequisite for logical thinking; thanks to the standards, a person excludes uncritical thoughts, that is, critical thinking standards act as a filter. Therefore, in order to determine whether a thought is logical or not, this thought must pass through critical thinking standards.

Firstly, in the clarity standard, the thought must be expressed clearly, easily understood, not likely to be misunderstood, explained by going into detail when necessary, made concrete with examples, supported with visuals and be simple and understandable. In the accuracy standard; the thought must be correct, logical, the information given must be reliable, the information must be given in the correct order, the information must be based on reliable sources and it must express the truth. In the importance/relevance standard, important points must be emphasized while conveying thoughts, there must be a connection between the topics discussed and the main point of the thoughts must be made clear. In the sufficiency standard, thoughts must be conveyed comprehensively, the subject must be thought thoroughly, sufficient examples must be included and sufficient time and evidence must be provided. In the depth/width standard; the reasons for the subject must be explained in the finest detail, in-depth information must be provided about the subject and the subject must be viewed from different perspectives. In the accuracy standard; the subject must be conveyed without errors, it must be sufficiently detailed and the reasons for the events must be explained (Aybek et al., 2015).

A thought is clear if it is easily understood and does not carry the possibility of misunderstanding. The clarity of an expression can vary according to the target audience, discipline and stages of thinking. Thoughts and words are correct when they describe facts realistically and as they are. Also, thinking is important if it is directly related to the problem encountered. Thinking about a question or topic is sufficient when it is thought logically in a broad enough way for the purpose determined when all necessary factors are taken into account. Thinking about a question is deep when it is necessary to look below the surface of the topic (theories and explanations), when the underlying complexities are identified; it is broad when it is necessary to look at other perspectives, other similar problems and when these are identified and it is definitive when it is approached in sufficient detail and specificity to think logically about a topic (Çotuksöken, 2011; Dilidüzgün, 2017).

Critical Thinking Attitude

According to educational philosophers, being able to think critically is a necessary condition for being educated; critical thinking is not one of the options that can be used in the teaching process, but an inseparable part of education (Norris, 1985). Studies show that students with developed critical thinking skills generally have higher levels of academic success (Aybek et al., 2015). However, critical thinking is not only a cognitive skill, but also a form of application and decision-making (Bökeoğlu & Yılmaz, 2005). Individuals' having critical thinking skills is not enough for them to be defined as critical thinkers. Using these skills effectively is as important as having the skill. At this point, we come across attitudes and tendencies that are thought to guide individuals' behaviours. The use of skills is associated with attitude. In order for individuals to be defined as "good thinkers", they need to exhibit willing attitudes in searching for meaning, gathering information and reconsidering solutions. Critical

thinking attitude is an element that is affected by experience and learning and affects individuals' behaviours (Yılmaz-Özelçi, 2012). According to Gülveren (2007), being purposeful, having knowledge about the relevant subject, looking for evidence that supports or refutes the ideas put forward, being systematic, thinking systematically, thinking flexibly rather than rigidly, being open to all kinds of opinions, expressing one's thoughts easily and having self-confidence are indicators of the critical thinking attitude. The critical thinking attitude basically includes three elements; open-mindedness, sincerity and having the responsibility to face the consequences constitute the positive attitude towards critical thinking (Yılmaz-Özelçi, 2012).

Importance, Purpose and Questions of the Research

When critical thinking skills are used regularly, students' participation in the critical thinking process increases (Seferoğlu & Akbıyık, 2006). One of the important goals of education is to prepare and implement the necessary programs to raise individuals who can think critically. Ennis (1991) emphasized that the most important factor in teaching critical thinking skills is the "teacher" (as cited in Dam & Volman, 2004). It is very difficult for students to be taught critical thinking reliably by their families or peers. In order to gain this skill, trained, knowledgeable and experienced teachers are needed (Schafersman, 1991). According to Tokyürek (2001), students' critical thinking skills are affected by the attitudes of teachers. Attitudes can change with learning and life (İnceoğlu, 2000; Kağıtçıbaşı, 1999). When the teacher's attitudes and behaviours are carefully examined by students, every message given by the teacher, explicitly or implicitly, is important (Yılmaz-Özelçi & Saracaloğlu, 2017). Students can only develop a positive critical thinking attitude if their teachers also have a positive critical thinking attitude (Sakar & Aybek, 2016). Ashton (1988) stated that the biggest obstacle to schools' aim of raising critically thinking individuals is that teachers lack critical thinking knowledge and skills.

According to Wilks (1995), in order for schools to raise students who question well, are more participatory, more open to discussions, determine predictions and priorities, seek alternatives and make sense of various opinions, it is necessary to first train teachers to gain these competencies. It is considered important to increase teacher candidates' awareness of critical thinking, help them question the nature of the work they do or will do, enable them to make comments about their own fields and provide clues on how they can gain this skill in their students (Yılmaz, 2021). In order for the culture of discussion and the practice of critical thinking to spread throughout society in the long term, it is important to determine the level of critical thinking attitudes and standards of teacher candidates who will raise future generations, their changes depending on different variables and the direction and level of the relationship between these two dependent variables.

When the relevant literature is examined, it is seen that studies on critical thinking mostly focus on critical thinking skills (Terenzini, 1995; Behar-Horenstein & Niu, 2011; Alsaleh, 2020; Marni et al., 2020; Anggraeni et al., 2023; Campo et al., 2023; Guo & Lee, 2023; Rini & Aldila, 2023) and critical thinking dispositions (Facione, 2000; Krupat et al., 2011; Liu et al., 2023; Liu & P´asztor, 2023; Orhan, 2023; Sutoyo et al., 2023; Taşgın & Dilek, 2023; Emir, 2009; ´Alvarez-Huerta et al., 2024; Bulut & Çiftçi, 2024; Chen et al., 2024; Xu & Yang, 2024); especially in recent years, experimental studies (Miri et al., 2007; Palavan, 2020; Asigigan & Samur, 2021; Barta et al., 2022; Adhelacahya et al., 2023; Ho et al., 2023; Essien et al., 2024; Jamil et al., 2024; Rizki & Suprapto,

2024; Yusuf et al., 2024) have been predominant. When the studies are reviewed, it is seen that a limited number of studies have been conducted to measure Nosich's (2011) critical thinking standards and attitudes towards critical thinking for university level students. In addition, no study has been found examining the relationship between critical thinking attitudes and critical thinking standards. Based on this, it is anticipated that the study to be carried out will have an original value in terms of literature and will contribute to practitioners, researchers and program developers.

In line with what has been mentioned so far, the purpose of the research is to determine the direction and level of the relationship between the attitudes of teacher candidates towards critical thinking and their critical thinking standards and the degree to which the attitudes of teacher candidates towards critical thinking predict their critical thinking standards. In line with this general purpose, answers were sought for the following sub-problems.

1. What is the level of critical thinking attitudes of teacher candidates?
2. Does the level of critical thinking attitudes of teacher candidates differ significantly according to the grade level?
3. Does the level of critical thinking attitudes of teacher candidates differ significantly according to the status of taking a “critical thinking course”?
4. What is the level of critical thinking standards of teacher candidates?
5. Does the level of critical thinking standards of teacher candidates differ significantly according to the grade level?
6. Does the level of critical thinking standards of teacher candidates differ significantly according to the status of taking a “critical thinking course”?
7. Is there a significant relationship between the critical thinking attitudes of teacher candidates and critical thinking standards?
8. Are the critical thinking attitudes of teacher candidates a significant predictor of critical thinking standards?

Method

Research Design

The research model, which aims to determine the direction and level of the relationship between the attitudes of teacher candidates towards critical thinking and critical thinking standards and the degree to which the attitudes of teacher candidates towards critical thinking predict critical thinking standards, is a correlation survey model, one of the quantitative research models. Correlation survey models are research models that aim to determine the existence and degree of co-variation between two or more variables (Karasar, 2009).

Study Group

The study group consists of teacher candidates studying at the faculty of education of a state university in Turkey in the 2023-2024 academic year. The demographics of the study group are presented in Table 2.

Table 2. Demographics of the Study Group

Undergraduate Program	**Frequency**	**Percent**
Guidance and Psychological Counselling	87	25.9
Mathematics Teaching	89	26.5
Turkish Teaching	48	14.3
Primary School Teaching	74	22.0
Preschool Teaching	38	11.3
Total	336	100.0
Sınıf	**Frequency**	**Percent**
2.sınıf	219	65.2
3.sınıf	56	16.7
4.sınıf	61	18.2
Total	336	100.0
Taking a critical thinking course	**Frequency**	**Percent**
Yes	137	40.8
No	199	59.2
Total	336	100.0

Data Collection Tools

Within the scope of the research, the Critical Thinking Attitude Scale developed by Yılmaz-Özelçi and Saracaloğlu (2017) was used to determine the attitude levels of teacher candidates towards critical thinking. The 19-item five-point Likert scale consists of five dimensions: information collectability, self-regulation, inference, evidence-based decision making and reason seeking. The reliability coefficients of the scale range from .52 to .70 for the subscales. The internal consistency coefficient was recalculated based on the research data and Cronbach α=.761 was found for the entire scale. It can be said that this value is considered sufficient for a Likert-type scale (George & Mallery, 2003).

The scale is scored as (1) strongly disagree, (2) disagree, (3) somewhat agree, (4) agree, (5) strongly agree, while the reverse items are scored as (1) strongly agree, (2) agree, (3) somewhat agree, (4) disagree, (5) strongly disagree. The lowest score that can be obtained from the entire scale is 19 and the highest score is 95. The lowest score that can be obtained from the dimensions of information collectability and reason seeking is 4 and the highest score is 20; the lowest score that can be obtained from the dimensions of inference and evidence-based decision making is 3 and the highest score is 15; the lowest score that can be obtained from the dimension of self-regulation is 5 and the highest score is 25.

Within the scope of the research, the Critical Thinking Standards Scale for Teacher Candidates developed by Aybek et al. (2015) was used to determine the critical thinking standards of teacher candidates. The 42-item five-point Likert scale consists of three dimensions: depth, width and competence; precision and accuracy; importance, relevance and clarity. The reliability coefficients of the scale vary between .63 and .89 for the subscales and the

internal consistency coefficient for the entire scale is Cronbach α=.75. The internal consistency coefficient was recalculated based on the research data and Cronbach α=.874 was found for the entire scale. It can be said that this value can be considered sufficient for a Likert-type scale (George & Mallery, 2003). The scale is scored as (1) I totally disagree, (2) disagree, (3) undecided, (4) partially agree, (5) totally agree, while the reverse items are scored as (1) totally agree, (2) partially agree, (3) undecided, (4) disagree, (5) totally disagree. The lowest score that can be obtained from the entire scale is 42 and the highest score is 210. The lowest score that can be obtained from the depth, width and competence dimensions of the scale is 18 and the highest score is 90; while the lowest score that can be obtained from the precision and accuracy and importance, relevance and clarity dimensions is 12 and the highest score is 60.

Data Collection

The participants of the study were teacher candidates who were studying at a state university in Turkey in the 2023-2024 academic year and who agreed to participate in the study voluntarily. The study data were collected from the participants through printed forms. A text explaining the purpose of the study, stating that participation in the study was voluntary, that the information obtained through the relevant form would be kept confidential and used only for scientific purposes within the scope of this study and that personal identifiers such as name, surname and school number should not be written, was added as a consent text at the beginning of the form developed for the collection of the study data.

Data Analysis

In order to make the necessary analyses in line with the research sub-problems, firstly the skewness coefficients were examined in order to determine whether the research data had a normal distribution. It was observed that the skewness values varied between .279 and -1.09 and the kurtosis values varied between .021 and -1.869. The skewness and kurtosis values between ±1.0 are considered excellent for most psychometric purposes, but the values between ±2.0 are also acceptable in many cases (George & Mallery, 2016). In this case, it was concluded that the scores obtained from both scales did not deviate excessively from the normal distribution and it was decided to use parametric tests in the analysis of the data. In the study, descriptive statistics were used to determine the level of critical thinking attitudes of teacher candidates and the level of critical thinking standards and the Pearson Correlation Coefficient, one of the simple correlation techniques, was used to determine the direction and level of the relationship between these two dependent variables; the simple linear regression technique was used to determine the degree to which the critical thinking attitudes of teacher candidates predicted critical thinking standards.

Results

Attitudes of Teacher Candidates towards Critical Thinking

Descriptive statistics techniques were applied to determine the level of attitudes of teacher candidates towards critical thinking and the results are given in Table 3.

Table 3. Descriptive Statistics of the Attitude Scores of Teacher Candidates towards Critical Thinking

	N	Min	Max	$\bar{X}$	S
Information collectability	336	7.00	20.00	16.67	2.17
Self-regulation	336	8.00	25.00	19.38	3.02
Inference	336	7.00	15.00	13.53	1.47
Evidence based decision making	336	3.00	15.00	10.56	2.59
Reason seeking	336	7.00	20.00	16.29	2.35
Total	336	53.00	95.00	76.41	7.71

When Table 3 is examined in terms of the scores that can be obtained from the scale, it can be said that the attitude scores of the teacher candidates towards critical thinking correspond to the "very high" level ($\bar{X}$=76.41). When the mean scores are examined in terms of the dimensions of the scale, it can be said that the means correspond to the "very high" level in the information collectability dimension ($\bar{X}$=16.67), "high" in the self-regulation dimension ($\bar{X}$=19.38), "very high" in the inference dimension ($\bar{X}$=13.53), "high" in the evidence based decision making dimension ($\bar{X}$=10.56) and "very high" in the reason seeking dimension ($\bar{X}$=16.29).

Attitudes of Teacher Candidates towards Critical Thinking According to Grade Level

A one-way ANOVA was applied to determine the change in attitudes of teacher candidates towards critical thinking according to grade level and the results are given in Table 4.

Table 4. ANOVA Results of Attitude Scores of Teacher Candidates towards Critical Thinking According to Grade Level

		Sum of squares	df	Mean square	F	p
Information collectability	Between groups	17.30	2	8.65	1.84	.160
	Within groups	1563.37	333	4.70		
	Total	1580.67	335			
Self-regulation	Between groups	32.84	2	16.42	1.81	.166
	Within groups	3029.40	333	9.10		
	Total	3062.24	335			
Inference	Between groups	21.30	2	10.65	5.02	.007
	Within groups	706.34	333	2.12		
	Total	727.64	335			
Evidence based decision making	Between groups	32.93	2	16.47	2.47	.086
	Within groups	2221.99	333	6.67		
	Total	2254.93	335			
Reason seeking	Between groups	36.43	2	18.21	3.34	.037
	Within groups	1818.57	333	5.46		

		Sum of squares	df	Mean square	F	p
	Total	1854.10	335			
Total	Between groups	645.32	2	322.66	5.58	.004
	Within groups	19256.18	333	57.83		
	Total	19901.50	335			

When Table 4 is examined, it is seen that the attitudes of the teacher candidates towards critical thinking show a significant difference according to the grade level ($F=5.58$, $p\leq.05$). When the scores are examined in terms of the dimensions of the scale, it is seen that the attitudes of the teacher candidates towards critical thinking differ significantly according to the grade level in the dimensions of "inference" ($F=5.02$, $p\leq.05$) and "reason seeking" ($F=3.34$, $p\leq.05$). It can be said that as the grade level of the teacher candidates increases for the total score and the specified dimensions, their attitude scores towards critical thinking increase. As a result of the LSD test, it can be said that this difference is significant between the 2nd and 4th grades in favour of the 4th grade.

Attitudes of Teacher Candidates towards Critical Thinking According to the Status of Taking a "Critical Thinking" Course

In order to determine the change in the attitudes of teacher candidates towards critical thinking according to the status of taking a critical thinking course, an independent samples t-test was applied, and the results are given in Table 5.

Table 5. Results of the t-Test on the Attitude Scores of Teacher Candidates towards Critical Thinking According to the Status of Taking a Critical Thinking Course

	Course	N	$\bar{X}$	S	df	t	p
Information collectability	Yes	137	16.93	1.93	334	1.88	.041
	No	199	16.48	2.31	322.09		
Self-regulation	Yes	137	19.53	2.93	334	.79	.756
	No	199	19.26	3.09	302.13		
Inference	Yes	137	13.89	1.18	334	3.76	.001
	No	199	13.29	1.60	332.47		
Evidence based decision making	Yes	137	10.87	2.39	334	1.84	.210
	No	199	10.34	2.71	313.88		
Reason seeking	Yes	137	16.61	2.30	334	2.11	.857
	No	199	16.07	2.37	298.63		
Total	Yes	137	77.83	6.53	334	2.83	.013
	No	199	75.44	8.30	328.05		

When Table 5 is examined, it is seen that the attitudes of the teacher candidates towards critical thinking show a significant difference according to the status of taking a critical thinking course ($t=2.83$, $p\leq.05$). When the scores are examined in terms of the dimensions of the scale, it is seen that the attitudes of the teacher candidates

towards critical thinking differ significantly in the dimensions of "information collectability" (t=1.88, p≤.05) and "inference" (t=3.76, p≤.05) according to the status of taking a critical thinking course. It is seen that the attitude scores of the teacher candidates who took a critical thinking course for the total score and the specified dimensions are significantly higher than the teacher candidates who did not take the course.

Critical Thinking Standards of Teacher Candidates

Descriptive statistical techniques were applied to determine the level of critical thinking standards of teacher candidates and the results are given in Table 6.

Table 6. Descriptive Statistics of Critical Thinking Standards Scores of Teacher Candidates

	N	Min	Max	$\bar{X}$	S
Depth, width and competence	336	52.00	90.00	77.03	7.31
Precision and accuracy	336	26.00	60.00	48.86	5.75
Importance, relevance and clarity	336	28.00	60.00	50.07	4.88
Total	336	124.00	206.00	175.96	14.07

When Table 6 is examined in terms of the scores that can be obtained from the scale, it can be said that the critical thinking standards scores of the teacher candidates correspond to the "very high" level ($\bar{X}$=175.96). When the mean scores are examined in terms of the dimensions of the scale, it can be said that they correspond to the "very high" level in the depth, width and competence dimension ($\bar{X}$=77.03), "very high" in the precision and accuracy dimension ($\bar{X}$=48.86) and "very high" level in importance, relevance and clarity dimension ($\bar{X}$=50.07).

Critical Thinking Standards of Teacher Candidates According to Grade Level

A one-way ANOVA was applied to determine the change in the critical thinking standards of teacher candidates according to grade level and the results are given in Table 7.

Table 7. ANOVA Results of the Critical Thinking Standards Scores of Teacher Candidates According to Grade Level

		Sum of squares	df	Mean square	F	p
Depth, width and competence	Between groups	167.49	2	83.75	1.57	.209
	Within groups	17734.21	333	53.26		
	Total	17901.70	335			
Precision and accuracy	Between groups	125.60	2	62.80	1.91	.150
	Within groups	10948.10	333	32.88		
	Total	11073.70	335			
Importance, relevance and clarity	Between groups	153.67	2	76.83	3.27	.039
	Within groups	7831.76	333	23.52		

		Sum of squares	df	Mean square	F	p
Total	Between groups	7985.43	335			
	Within groups	1205.47	2	602.73	3.08	.047
	Total	65117.030	333	195.55		

When Table 7 is examined, it is seen that the critical thinking standards of the teacher candidates differ significantly according to the grade level (F=3.08, p≤.05). When the scores are examined in terms of the dimensions of the scale, it is seen that the critical thinking standards of the teacher candidates differ significantly according to the grade level in the dimension of "importance, relevance and clarity" (F=3.27, p≤.05). As a result of the LSD test, it can be said that this difference is between the 2nd and 3rd grades and the 4th grade and in favour of the 4th grade.

Critical Thinking Standards of Teacher Candidates According to the Status of Taking a "Critical Thinking" Course

In order to determine the change in the critical thinking standards of teacher candidates according to the status of taking a critical thinking course, an independent samples t-test was applied, and the results are given in Table 8.

Table 8. Results of the t-Test of the Critical Thinking Standards Scores of Teacher Candidates According to the Status of Taking a Critical Thinking Course

	Course	N	$\bar{X}$	S	df	t	p
Depth, width and competence	Yes	137	77.68	6.10	334	1.35	.177
	No	199	76.58	7.50	305.15		
Precision and accuracy	Yes	137	49.59	5.04	334	1.93	.054
	No	199	48.36	6.15	323.88		
Importance, relevance and clarity	Yes	137	50.32	4.41	334	.79	.432
	No	199	49.90	5.18	319.21		
Total	Yes	137	177.59	12.40	334	1.77	.078
	No	199	174.84	15.04	323.24		

When Table 8 is examined, it is seen that the critical thinking standards of teacher candidates do not differ significantly according to their status of taking a critical thinking course (t=1.77, p≤.05).

Relationship between Teachers Candidates' Attitudes towards Critical Thinking and Critical Thinking Standards

In order to determine whether there is a significant relationship between the level of teacher candidates' attitudes towards critical thinking and critical thinking standards, the Pearson Correlation technique, one of the simple correlation techniques, was applied and the results are given in Table 9.

Table 9. Relationship between Teacher Candidates' Attitudes towards Critical Thinking and Critical Thinking Standards

		Depth, width and competence	Precision and accuracy	Importance, relevance and clarity	Total
Information collectability	Pearson Correlation	.591	.351	.484	.618
	p	.000	.000	.000	.000
	N	336	336	336	336
Self-regulation	Pearson Correlation	.503	.278	.487	.544
	p	.000	.000	.000	.000
	N	336	336	336	336
Inference	Pearson Correlation	.285	.196	.259	.318
	p	.000	.000	.000	.000
	N	336	336	336	336
Evidence based decision making	Pearson Correlation	.180	.479	.152	.342
	p	.001	.000	.005	.000
	N	336	336	336	336
Reason seeking	Pearson Correlation	.238	.416	.228	.373
	p	.000	.000	.000	.000
	N	336	336	336	336
Total	Pearson Correlation	.552	.534	.498	.677
	p	.000	.000	.000	.000
	N	336	336	336	336

When Table 9 is examined, it is seen that there is a moderately significant relationship between the level of attitudes of teacher candidates towards critical thinking and critical thinking standards ($r=.677$, $p<.01$). Accordingly, it can be said that when the attitude scores of teacher candidates towards critical thinking increase, their critical thinking standards scores increase. It is seen that there is a significant relationship between the scores of teacher candidates from the dimensions of the Critical Thinking Attitude Scale and the scores they get from the dimensions of the Critical Thinking Standards Scale for Teacher Candidates ($p<.01$). The correlation values between the dimensions of both scales vary between $r=.196$ and $r=.591$.

Prediction of the Level of Critical Thinking Standards of Teacher Candidates According to the Level of Attitude towards Critical Thinking

In order to determine whether the attitudes of teacher candidates towards critical thinking significantly predict their critical thinking standards, a simple linear regression technique was applied, and the results are given in Table 10. When the table is examined, it is seen that the attitudes of the teacher candidates towards critical thinking significantly predict the critical thinking standards ($R=.677$, $R2=.459$, $F=283.312$, $p<.01$). Accordingly, it can be stated that 45% of the total variance regarding the critical thinking standards of the teacher candidates is explained

by their attitudes towards critical thinking. The scores that the teacher candidates received from the dimensions of the Critical Thinking Attitude Scale significantly predict the scores they received from the dimensions of the Critical Thinking Standards Scale for Teacher Candidates. The explained variance rate for the dimensions of both scales varies between 2% and 35%.

Table 10. Prediction of the Critical Thinking Standards of Teacher Candidates According to Their Attitudes towards Critical Thinking

		Depth, width and competence	Precision and accuracy	Importance, relevance and clarity	Total
Information collectability	R	.591	.351	.484	.618
	R^2	.350	.123	.235	.383
	F	179.547	46.798	102.351	206.922
	p	.000b	.000	.000	.000
Self-regulation	R	.503	.278	.487	.544
	R^2	.253	.077	.237	.296
	F	113.298	27.904	103.762	140.295
	p	.000	.000	.000	.000
Inference	R	.285	.196	.259	.318
	R^2	.081	.038	.067	.101
	F	29.469	13.301	23.969	37.493
	p	.000	.000	.000	.000
Evidence based decision making	R	.180	.479	.152	.342
	R^2	.033	.230	.023	.117
	F	11.241	99.670	7.929	44.381
	p	.001	.000	.005	.000
Reason seeking	R	.238	.416	.228	.373
	R^2	.057	.173	.052	.139
	F	20.074	69.883	18.264	53.873
	p	.000	.000	.000	.000
Total	R	.552	.534	.498	.677
	R^2	.305	.285	.248	.459
	F	146.322	132.889	109.987	283.312
	p	.000	.000	.000	.000

Discussion and Conclusion

When the research findings are examined, it is seen that the attitude scores of the teacher candidates towards critical thinking correspond to the “very high” level. When the mean scores are examined in terms of the dimensions of the scale, it can be said that the means correspond to the “very high” level in the dimension of

information collectability, “high” in the dimension of self-regulation, “very high” in the dimension of making inferences, “high” in the dimension of evidence based decision making and “very high” in the dimension of seeking reasons. According to another finding of the research, it is seen that the critical thinking standards scores of the teacher candidates correspond to the “very high” level. When the mean scores are examined in terms of the dimensions of the scale, it can be said that the means correspond to the “very high” level in the dimension of depth, width and competence, “very high” in the dimension of precision and accuracy and “very high” level in the dimension of importance, relevance and clarity. Critical thinking is a high-level thinking skill that has come to the forefront all over the world today and is accepted by institutions and platforms such as the World Economic Forum, the International Summit of the Teaching Profession, P21, ATCS, EnGauge and NETS/ISTE as a necessity for future employees (Cansoy, 2018). In Turkey, where the research was conducted, the curriculum published by the Ministry of National Education in the 2016-2017 academic year included achievements related to original thinking, problem solving and critical thinking under the cognitive dimension (Presidency of the Board of Education [TTKB], 2017). In addition to this subject-based approach, the “thinking education” course, which is based on thinking skills with an approach independent of the subject area, was added as an elective course for one hour per week in the sixth, seventh and eighth grades of secondary school as of the 2006-2007 academic year and continues to be given in the seventh and eighth grades as of the 2017-2018 academic year (Ministry of National Education [MEB], 2016). The Teacher Strategy Document, which was published between 2017-2023 and is seen as a guide in the field of teacher education in Turkey, includes raising critically thinking individuals among the ultimate goals of education (MEB, 2017). In addition, thinking skills are also prominent within the scope of the Turkish Higher Education Qualifications Framework (TYYÇ) (Council of Higher Education [YÖK], 2010). The teacher candidates who are the participants of the current study have been educated in line with the curriculum that includes achievements for critical thinking skills since their basic education. Although thinking skills are innate within certain limits, they are developed through experience and can be used effectively. Critical thinking is also among the high-level thinking skills that emerge with the effective use of thinking skills (Saracaloğlu & Yılmaz, 2011). Therefore, it is an expected result that the teacher candidates who participated in the study have a high level of attitudes towards critical thinking and critical thinking standards.

When the attitudes of teacher candidates towards critical thinking were examined according to the grade level, it was seen that as the grade level of the teacher candidates increased, their attitude scores towards critical thinking increased in the overall scale and in the dimensions of “inferences” and “seeking reasons” and this difference was significant between the 2nd and 4th grades in favour of the 4th grade. When the critical thinking standards of teacher candidates were examined according to the grade level, it was seen that as the grade level of the teacher candidates increased, their critical thinking standards scores increased in the overall scale and in the dimension of “importance, relevance and clarity” and this difference was significant between the 2nd and 3rd grades and the 4th grade and in favour of the 4th grade. When the discussions regarding the factors affecting critical thinking were examined, it was seen that hereditary and environmental factors were addressed as they are the case in all stages of mental and physical development (Yılmaz-Özelçi, 2012). Kazancı (1989) states that cognitive factors and experiences acquired later affect critical thinking. Critical thinking attitude; it is an element that is affected by experience and learning and affects the behaviour of individuals (Yılmaz-Özelçi, 2012). Considering the effect of experiences on critical thinking, it can be said that the fact that fourth-year students, in particular, have gained

significant experience in academic and social fields at the higher education level may have positively affected their attitudes towards critical thinking and their critical thinking standards.

When the attitudes of teacher candidates towards critical thinking were examined according to their status of taking a critical thinking course, it was observed that the attitude scores of teacher candidates who took a critical thinking course were significantly higher than those of teacher candidates who did not take the course, both in the scale and in the dimensions of "Information collectability" and "inferences". The "Critical and analytical thinking" course has been included as an elective course in the Teacher Training Undergraduate Programs of the Council of Higher Education (YÖK) since 2018. As the name suggests, elective courses are preferred by faculty students voluntarily. Therefore, it is an expected result that students who have chosen this course have a positive attitude towards critical thinking. When the critical thinking standards of teacher candidates were examined according to their status of taking a critical thinking course, no significant difference was observed. Although critical thinking skills or standards are affected by affective factors such as attitude and tendency, they cannot be explained entirely by these factors.

When the research findings were examined, it was seen that there was a moderately significant relationship between the level of teacher candidates' attitudes towards critical thinking and critical thinking standards. Accordingly, it can be said that when teacher candidates' attitude scores towards critical thinking increase, their critical thinking standards scores increase. Similarly, it was seen that there was a significant relationship between the scores that teacher candidates got from the dimensions of the Critical Thinking Attitude Scale and the scores they got from the dimensions of the Critical Thinking Standards Scale for Teacher Candidates. According to another finding of the research, it was seen that the attitudes of teacher candidates towards critical thinking significantly predicted critical thinking standards. It can be stated that 45% of the total variance regarding the critical thinking standards of teacher candidates is explained by their attitudes towards critical thinking. Similarly, the scores that teacher candidates got from the dimensions of the Critical Thinking Attitude Scale significantly predicted the scores they got from the dimensions of the Critical Thinking Standards Scale for Teacher Candidates. According to Watson and Glaser (1994), critical thinking is a combination of information and attitudes; the use of information, the application of attitudes. In the Delphi Report prepared under the leadership of the American Psychological Association (APA), the affective-disposition dimension of critical thinking was mentioned along with the cognitive skill dimension (Facione, 1990). The use of skills is associated with attitude. In order for individuals to be defined as "critical thinkers"; they must exhibit willing attitudes towards critical thinking (Yılmaz-Özelçi, 2012).

Recommendations

The importance of acquiring thinking skills, including critical thinking, from an early age is known. Therefore, it is important for critical thinking skills to be included in curriculum at every level from preschool to higher education. The way to raise critically thinking individuals is to raise critically thinking teachers. Therefore, it is important for teacher training programs to be developed in a way that will provide critical thinking skills. A curriculum is a program that will come to life in practice, that is, in the hands of the teacher. Therefore, it would

be useful to plan practices that will enable teachers and teacher candidates to develop positive attitudes towards critical thinking. This study is a survey study consisting of teacher candidates as a sample. Similar or different research designs can be planned with teachers, teacher educators, professional candidates studying in different units of universities and their educators. Critical thinking is one of the prominent thinking skills today and studies can be conducted on different types of thinking such as reflective thinking, creative thinking, analytical thinking and meta-cognitive thinking.

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