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The Effect of Critical Thinking Course Carry Out with Distance Education on Critical Thinking Skills and Dispositions

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ABSTRACT

The purpose of this study is to examine the effects of a distance learning course in critical thinking on the critical thinking skills and dispositions of university students. The diversification model was adopted in the study, which was carried out in line with the mixed research method, which combines the results of the data obtained by collecting both quantitative and qualitative data and allows comparisons to be made. The data of the study conducted with 30 senior university students were obtained with the "California Critical Thinking Disposition Scale" and open-ended questions about "What is critical thinking" and "Why is critical thinking important". Parametric and non-parametric analysis methods were used in the analysis of the quantitative data obtained from the data collection tools that were transferred to the online environment and applied to the participants before and after the critical thinking course. The content analysis method was used to analyze qualitative data gathered via open-ended questions. As a result of the analyses conducted, it was determined that there was a significant difference between the pre-test and post-test in terms of the participants' critical thinking dispositions. It was determined that there were no significant gender or departmental differences in the participants' critical thinking dispositions. As a result of the content analysis carried out within the framework of open-ended questions, it was determined that there were differences in the views of senior university students towards critical thinking before and after the critical thinking course. Within the framework of the results, it was suggested that more activities and practices for critical thinking should be included in undergraduate courses.

Keywords:
Critical thinking, critical thinking disposition, distance education

1. Introduction

Thinking is one of the most important features distinguishing individuals from other living things. The meaning of vital events is revealed by making sense of the things in the mind through thinking (Yılmaz, 2021). Thinking, which helps individuals live together within the framework of social cohesion, contributes to their individual development, provides solutions to the problems they encounter, leads a more conscious life, and is among the most basic skills of the individual (Semerci, 2003). Through thinking, individuals determine the goals of their lives, plan their goals accordingly, and make smart decisions to reach their goals thanks to their thoughts (Chaffee, 1994). In other words, thinking affects individuals' behaviors such as making sense, summarizing, classifying, analyzing, comparing, interpreting, generalizing, and evaluating. In this respect, most countries focus on studies to improve individuals' thinking skills (Güneş, 2012).

Considering the needs of the 21st-century world, it has become a need for people to skills acquisition for thinking (Seferoğlu & Akbıyık, 2006). Beyer (1988) identifies three stages of thinking skills: problem-solving, critical thinking, and information processing. Özden (2000) states that thinking skills include critical thinking, scientific thinking, creative thinking, reading comprehension, and problem-solving. According to Semerci

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(2003), there are numerous dimensions to thinking, including critical thinking, reflective thinking, and creative thinking. It is seen that thinking, which is generally handled in different dimensions, has many aspects such as reflective, creative, critical, inductive, and analytical. This study focuses on critical thinking (CT).

In the report published by the World Economic Forum held in 2020, CT is among the top ten skills of 2025 within the framework of evaluations for future professions (World Economic Forum, 2020). Again in the same report, CT skill comes first among the skills that will increase their importance the most according to different skill groups. National Association of Colleges and Employers (NACE) Job Outlook 2020 (NACE, 2019), The Foundation for Young Australians' (FYA) report The New Work Smarts (FYA, 2017), and the Future of Education and Skills 2030 (Taguma & Barrera, 2019) reports published by the Organization for Economic Co-operation and Development (OECD) are some reports emphasizing the importance of CT. As in business life, CT is an issue that should be emphasized in education life (Facione, 1990). In the 21st century, which is characterized as the information age, CT skills are among the skills that should be acquired to raise good and qualified individuals among the objectives of education (Aybek, 2007). According to Lau and Chan (2018), CT plays an undeniable role in developing presentation skills together with language in the new knowledge economy, encouraging individuals to be productive, and establishing the basis of science and democracy.

CT is a rich concept that continues its development and progress from the ancient Greek period 2500 years ago to the present day (Arısoy & Aybek, 2021). It is stated that the word "critical" comes from the Greek word "kritikos" which means to evaluate, make sense of, judge and analyze (Kaya, 1997). Kritikos can be expressed as understanding the people and people around us by questioning and making sense by analyzing the ideas and thoughts of others as well as our thought processes (Emir, 2012). The fact that the function and elements of CT have a complex structure and contain different approaches has led to the inability to make a clear definition accepted by everyone (Yılmaz, 2021). Norris and Ennis (1989) describe CT as acceptable and reflective thinking that focuses on deciding what to believe or do within a logical framework. Elder and Paul (1994) describe CT in the simplest way as the ability to take responsibility for one's thoughts or to be responsible for what one thinks. Cüceloğlu (1995) defines CT as an effective and orderly mental process that anticipates our thinking processes, considers the thinking processes of others, applies what is learned, and aims at the concept of ourselves and the events around us. With CT being a part of education, it can be said that students become more successful academically and more helpful, positive, and sensitive socially (Kökdemir, 2003). In the literature, it is seen that studies have been done in this direction.

Ennis (2015) and Fisher (1995) both say that CT and attitudes help people do better in school. Slavin (2014) emphasizes that a teacher should understand and use various methods, techniques, and teaching strategies to develop students' CT, problem-solving, and performance skills. Seferoğlu and Akbıyık (2006), on the other hand, concluded that there are significant differences in general academic achievement between the group with high CT dispositions and the group with low CT dispositions in their study at the ninth-grade level. Gök and Erdoğan (2011) concluded that there is no relationship between CT dispositions and academic achievements in their study with first-year primary school students. Similarly, Emir (2012) revealed that there is no significant difference in academic achievement in the CT dispositions of education faculty students. On the other hand, Can and Kaymakçı (2015) examined the participants' CT dispositions in terms of various variables in their study on science and classroom teacher candidates. At the end of the study, it was found that pre-service teachers' CT dispositions were low. It was suggested that activities, methods, and courses for CT should be given in undergraduate courses to develop pre-service teachers' CT dispositions positively.

While Kaloç (2005), Özdemir (2005), Myers and Dyer (2006), Gök and Erdoğan (2011), Franco and Almedia (2015), Salahshoor and Rafiee (2016), Bagheri and Ghanizadeh (2016) indicated that there was no significant gender difference in students' CT dispositions, Facione et al. (1995), Hayran (2000), Kökdemir (2003), Hamurcu et al. (2005), and Zayif (2008) state that CT dispositions differ according to gender. Walsh and Hardy (1999) emphasized that females achieved better results than males in the open-mindedness and maturity sub-dimension of the California Critical Thinking Disposition Inventory (CCTDI). Zetriuslita et al. (2016) concluded that there is no significant difference by gender in individuals with medium and low CT ability, while there is a significant difference in CT abilities according to gender in individuals with high CT skills. Gülveren (2007), in her study with teacher candidates studying at the faculty of education, concluded that pre-school teacher candidates are more successful in terms of CT skills than teacher candidates from other departments. Similarly, in the study conducted by Emir (2012), it was stated that there is a significant

difference between the CT dispositions of teacher candidates in the classroom teaching department and other departments. In their study, Ricketts and Rudd (2004) emphasized that the CT skills of students studying at different faculties differ according to the departments they study. There are remarkable differences between the students of the faculty of agriculture and those outside the faculty of agriculture in terms of CT. Contrary to the studies of Gülveren (2007), Emir (2012), and Ricketts and Rudd (2004), in the study conducted by Franco and Almedia (2015) at the university level in the fields of humanities and engineering, it was concluded that there was no significant difference in CT skills of university students according to departments.

In the literature, it is seen that studies on the effect of the CT course are also carried out with university students studying in the nursing department of universities. Kanbay and Okanlı (2017) carried out one of these studies. In the study, the effect of CT education on the problem-solving skills of nursing students was examined. As a result of the study, it was revealed that CT education improves problem-solving. In another study on the effect of CT courses, Çalışkan et al. (2020) tried to determine the effect of the CT course on the CT dispositions and motivations of nursing students. The study conducted with 116 university students studying in the nursing department and taking the CT course concluded that the CT course increased the CT disposition of the students. Niu et al. (2013) conducted a meta-analysis of studies on the impact of instructional initiatives on university students' CT skills. The study emphasized that instructional interventions longer than 12 weeks were more effective in improving the CT skills of university students than shorter-term interventions. It was concluded that the development of CT skills is possible through classroom teaching.

1.1. The Aim of the Study

In general, it can be seen that the studies done for CT are meant to find out the levels of the participants and whether or not there are differences in different variables. In other words, it can be said that most of the studies are aimed at determining the critical skill levels of the participants and revealing a descriptive situation in terms of different variables. There are not enough studies in the literature on the effectiveness of the CT course (Çalışkan et al., 2020). When the studies on CT skills in the literature are examined, it can be stated that there is a need for studies on how to develop CT skills. Can and Kaymakçı (2015) state that pre-service teachers have a low tendency towards CT and emphasize that there should be techniques, methods, and courses for developing CT skills at the undergraduate level. In addition, most universities emphasize the importance of CT as a general skill at the center of their education (Davies, 2011). However, some studies show that university students' CT skills are insufficient and emphasize that students' CT skills do not develop enough during their education (Arum & Roksa, 2011; Can & Kaymakçı, 2015; Solbrekke et al., 2016). In this context, this study aimed to examine the effect of the CT course given through distance education on university students' CT skills and tendencies.

Although it is generally accepted that it is necessary to develop university students' CT skills and tendencies, discussions on how CT can be developed through education continue (Niu et al., 2013; Tiruneh et al., 2014). With this study, it can be said that by contributing to the literature on how to develop CT skills, the importance of the CT course at the university level will be revealed.

1.2. Research Problem

What is the effect of the CT course on the CT dispositions of university students?

1.3. Sub Problems

1. Is there a significant difference between the CT dispositions of the participants before and after the CT course?
2. Is there a significant difference between the CT dispositions of the participants before and after the CT course, based on their departments and gender?
3. Is there a difference in the participants' views on CT before and after the CT course?

2. Methodology

2.1. Research Model

The mixed research method was adopted in this study, in which the effect of the CT course on the CT skills and dispositions of university students was examined. The mixed research design, in which qualitative and

quantitative methods are used together, provides researchers with a stronger data collection opportunity (Silverman, 2010). Creswell (2009) determined that mixed research design is a method in which researchers collect data about problems, analyze them, present findings, and make inferences using qualitative and quantitative approaches. On the other hand, Johnson et al. (2007) define mixed methods research as a type of research in which researchers collect and integrate qualitative and quantitative data in line with the depth and breadth of understanding and validation. It is thought that qualitative or quantitative data alone will not be sufficient in examining the effect of CT courses on CT skills and tendencies of university students. In this direction, the diversification (combination) model, one of the mixed research methods and allows comparisons by combining the results of the data obtained by collecting both quantitative and qualitative data, has been adopted.

The variation design aims to combine the results of the data obtained by qualitative and quantitative methods. While Creswell & Plano Clark (2010) consider the variational design as a convergent parallel design, they state that this design can be used when quantitative results want to be compared with qualitative findings. The model of the research design according to Creswell & Plano Clark (2010) is presented below:

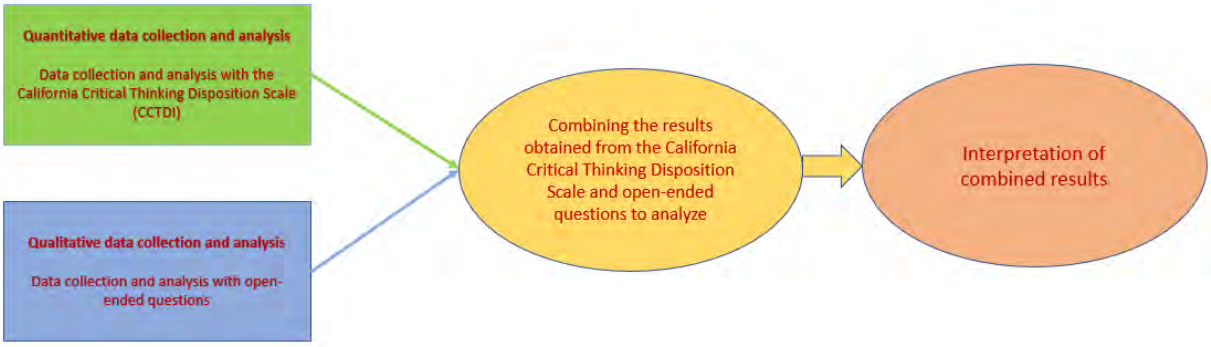

Figure 1. *Prototype model of the research method (Creswell & Plano Clark, 2010)*

In Table 1, the models used for quantitative and qualitative methods are presented:

Table 1. *Methods and Models Used in the Research*

Method	Model
Quantitative	One-group pretest-posttest model (Experimental Design)
Qualitative	Case Study

In the quantitative dimension of the research, the "one-group pre-test-post-test model" was preferred among the experimental designs. Since it is impossible to randomly assign individuals to groups in most educational studies, it is difficult to use real experimental designs in educational research (Cohen, Manion & Morrison, 2005). In this context, in the study, a single group pre-test-post-test model was preferred in the framework of the lack of randomness and matching in group determination and the CT course being carried out with one group. This model provides some information as it allows us to know whether there is a difference between the pre-test and post-test (Johnson & Christensen, 2014). In the qualitative aspect of the study, a case study was preferred, which aims to provide a detailed analysis and explanation of university students' views on critical thinking.

2.2. The Study Group

The study group of the research consists of 30 senior university students receiving education at a state university in Turkey through distance education. In the study, the criterion sampling method, which is one of the non-random purposeful sampling methods, was preferred. The main purpose of criterion sampling is expressed as the study of situations created by the researcher or meeting pre-existing criteria (Yıldırım & Şimşek, 2016). In this context, since the study aims to determine the effect of the CT course on CT skills and dispositions, the fact that the participants take the CT course is the criterion for the selection of the study group. The distribution of the study group by department and gender is presented in the table below:

Table 2. *Demographic Characteristics of the Working Group*

Department	Female	%	Male	%	Total	%
Pre-school Teaching	13	76.47	4	23.53	17	56.67
Computer and Instructional Technologies Education (CEIT)	6	85.71	1	14.29	7	23.33
Mathematics Teaching	2	50.00	2	50.00	4	13.33
Industrial Engineering	0	0.00	2	100.00	2	6.67
Total	21	70.00	9	30.00	30	100

17 pre-service teachers studying in the fourth grade of Preschool Education constitute 56.67% of all participants. 13 of the pre-school teacher candidates are female (76.47%) and four are male (23.53%). Seven pre-service teachers from Computer and Instructional Technologies Education (CEIT) who participated in the research constitute 23.33% of all participants. Six of the pre-service teachers in CEIT are female (85.71%) and one is male (14.29%). Four pre-service teachers from the mathematics teaching department participated in the research and constituted 13.33% of the whole group. Of the pre-service mathematics teachers are two female (50%) and two male (50%). Two male engineer candidates from the Industrial Engineering department, constituting 6.67% of all participants, participated in the research.

2.3. Data Collection Tools

California critical thinking disposition scale (CCTDI): The California Critical Thinking Disposition Scale (CCTDI) developed by Facione et al. (1998) was adapted into Turkish by Kökdemir (2003). The reliability of the scale, which was adapted into Turkish, was calculated as .88 using the Cronbach alpha method. CCTDI, which is a six-point Likert type, consists of 51 items. The scale consists of six sub-dimensions: analyticity, inquisitiveness, open-mindedness, self-confidence, systematicity, and truth-seeking. The CCTDI was chosen for this study because it is one of the most commonly used scales in studies revealing CT skills and because it is "a scale for measuring critical thinking dispositions at the university level" (Can & Kaymakçı, 2015, p.69). In accordance with the study's pre- and post-tests, the Cronbach alpha reliability value was calculated to be 0.90.

When the sub-dimensions of the scale are examined; “Truth-seeking” is defined as an orientation to evaluate different thoughts or alternative thoughts. “Open-mindedness” is expressed as being sensitive to one's mistakes in the face of different thoughts or approaches. “Analyticity” is the tendency to be attentive to potentially problematic events and use reasoning and objective evidence in all situations. “Systematicity” is defined as the disposition of careful and planned research in an organized manner. “Self-confidence” refers to the confidence one has in one's reasoning process. “Inquisitiveness” reflects the desire to procure knowledge and learn new things without any interest or expectation.

Open-ended questions: Two open-ended questions were asked to reveal the opinions and disposition of the participants towards CT in parallel with the scale applied. With questions about what CT is and why it is important, it is aimed that the participants express their feelings and thoughts about CT in detail. Two experts, one Prof. Dr., and one Dr. Lecturer, were consulted for two open-ended questions. In line with the opinions received, the questions were finalized.

2.4. Data Analysis

Since the CT course was carried out through distance education, data collection tools were transferred to the online environment through the Google forms application. Before implementing the data collection tools, the participants were explained in detailed text how they should mark the scale items, the importance of reflecting real views and thoughts to achieve the purpose of the application, and that the research was carried out voluntarily.

2.4.1. Quantitative Data Analysis

The data obtained in line with the Google forms application were taken from Microsoft Office programs in Excel format, and the quantitative data (demographic information of the participants and the data obtained from CCTDI) were transferred to the SPSS application. The items of CCTDI, which is a 6-point Likert scale for the data transferred to SPSS, are rated as “Strongly Disagree”:1, “Disagree”:2, “Partly Disagree”:3, “Partly Agree”:4, “Agree”: 5 and “Totally Agree”: 6. Reverse coding was performed for 21 negative items on the scale. After the coding for each item in the scale, the total scores for the 6 sub-dimensions in the scale were taken,

divided by the total number of items, multiplied by 10, and standard scores were obtained for each sub-dimension, with the lowest 6 and the highest 60 points. Accordingly, the lowest and highest scores for each sub-dimension are fixed. When the scale is considered as a whole, the lowest 36 points and the highest 360 points are taken. When evaluating the CT dispositions of the participants, it can be said that those with less than 240 have low CT dispositions and those with more than 300 have high dispositions (Kökdemir, 2003). In line with this scoring, the participants' CT disposition level before the CT course was determined.

In order to determine the difference between the pre-test and post-test scores of the CCTDI for the analysis of quantitative data, firstly, the normality of the data group was examined. The purpose of examining the normality is to arrive at the result using an alternative analysis method in the event that the assumptions are not met. This is accomplished by determining whether the data group meets the assumptions for the distribution in order to determine the analysis method to be used (Can, 2014).In this context, by examining the normal distribution, it should be decided whether the analysis method to be applied in determining the difference, parametric or non-parametric methods, will be preferred (Büyüköztürk, 2013). There are many tests such as Anderson-Darling, Chi-square, D'Agostino-Pearson, Jargue-Bera, Kurtosis, Skewness, Kolmogorov-Smirnov, Lilliefors, and Shapiro Wilk tests for examining the normality of data groups (Özer, 2007). Kolmogorov-Smirnov and Shapiro Wilk tests were used for this study's normality analysis of the data groups. The normality of the data groups was examined by considering the Shapiro Wilk test when the data groups were below 30, and the Kolmogorov-Smirnov test when the data groups were more than 30 (Can, 2014).

As a result of the analysis of normality tests, it was observed that the pre-test and post-test scores of the CCTDI were normally distributed in terms of the gender variable ($p>.05$), while the pre-test and post-test scores did not show normal distribution according to the departments ($p<.05$). The t-test for related samples was used to determine the significant difference between the pre-test and post-test scores of the CCDTI. Since the pre-test and post-test scores of the CCDTI did not show normal distribution according to the departments, the Kruskal Wallis H test, one of the non-parametric analysis methods, was used to determine the significant difference between the departments.

2.4.2. Qualitative Data Analysis

In the qualitative data analysis, the content analysis method was used to evaluate the data obtained from the answers to the two open-ended questions directed to the participants. The main purpose of content analysis is to obtain conception and relationships that can represent the obtained data (Selçuk et al., 2014). What is basically done for content analysis is to gather the data that seem different from each other within the framework of specific concepts and themes and present them in an organized way that the readers can understand (Yıldırım & Şimşek, 2016). As a result of the content analysis, the themes of what CT is, the codes were grouped within the framework of six themes: truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, and inquisitiveness, which are sub-factors of the CCTDI. In the analysis of the views on why CT is important, the themes of exploring, agreeing, deciding, and problem-solving, which are the skills that emerged as a result of the concept analysis on CT by Çıtak and Uysal (2012), were used. In other words, these skills were determined as the analysis themes of the views on why CT is important. The reliability of the resulting codes was calculated using the safety level formula of Miles and Huberman (1994, p. 64) (reliability = number of agreements/total number of agreements+disagreements). The reliability of the coding carried out by the researcher at different times was calculated as 88%. A reliability level of 70% and above is considered sufficient for the reliability of the results (Yıldırım & Şimşek, 2016).

In order to respect the privacy and confidentiality of the participants (Creswell, 2009) and to protect their identities, the participants were coded as P1, P2, P3… and the opinions of the participants were presented accordingly.

2.5. Ethical

In this study, all rules stated to be followed within the scope of the "Higher Education Institutions Scientific Research and Publication Ethics Directive" were followed. Ethical Review Board Name: Balikesir University Science and Engineering Sciences Ethics Committee. Date of Ethics Evaluation Decision: 14.01.2022 Ethics Assessment Document Issue Number: E.107739

3. Findings

3.1. Findings Regarding the First Sub-Problem

The first sub-problem concerns the participants' level of CT disposition before and after the CT course, as well as whether there is a significant difference between their CT dispositions. In this context, the table below shows the CT disposition levels of the participants prior to the CT course:

Table 3. *The CT Disposition Levels of the Participants Before the CT Course*

Department	Low	%	Middle	%	High	%	Total
Pre-school Teaching	4	23.53	11	64.71	2	11.76	17
CEIT	2	28.57	5	71.43	0	.00	7
Mathematics Teaching	1	25.00	2	50.00	1	25.00	4
Industrial Engineering	0	.00	2	100.00	0	.00	2
Total	7	23.33	20	66.67	3	10.00	30

According to Table 3, it was concluded that 23.33% of the participants had a low level of CT disposition before the CT course and that the majority of the participants (66.67%, n=20) had a moderate level of CT disposition. It is seen in Table 3 that people with a high level of CT disposition are in the pre-school and mathematics teaching departments. Almost 25% of teacher candidates have a low level of CT disposition.

Within the framework of the first sub-problem, the findings regarding the critical thinking dispositions of the participants after the critical thinking lesson are presented in Table 4:

Table 4. *The CT Disposition Levels of the Participants After the CT Course*

Department	Middle	%	High	%	Toplam
Pre-school Teaching	13	76,47	4	23.53	17
CEIT	7	100.00	0	.00	7
Mathematics Teaching	2	50.00	2	50.00	4
Industrial Engineering	2	100.00	0	.00	2
Total	24	80.00	6	20.00	30

When Table 4 is examined, it is seen that there is no university student with a low level of CT disposition after the CT course. Most participants (80%, n=24) have a moderate level of CT disposition. Compared to the pre-CT course, the number of university students with a moderate and high level of CT disposition has increased.

Table 3 and Table 4 determined the level of CT disposition of the participants before and after the CT course. In the continuation of the research, the difference between the CT dispositions of the participants before and after the CT course was examined. In this context, the findings obtained for the t-test analysis results for the related samples are presented in Table 5:

Table 5. *T-Test Analysis Results for Participants' CCTDI*

CCTDI	N	M	SD	df	t	p*
Pre Test	30	260.10	26.26	29	-5.54	.00
Post Test	30	282.90	19.49			

*p<.05

When Table 5 is examined, it is seen that the significance level (p=.00) is lower than the significance value (p<.05). In line with this finding, it can be said that there is a significant difference between the CT dispositions of university students before the CT course and their CT dispositions after the course (t=-5.54, p=.00, p<.05). Table 5 shows a significant difference between the participants' mean score for the CCTDI before the CT course ($M_{pretest}$=260.10) compared to the post-course average point ($M_{posttest}$=282.90). This shows that the CT course positively affects the CT disposition of university students.

3.2. Findings Regarding the Second Sub-Problem

The second sub-problem of the study is the difference in the CT dispositions of the participants by department and gender before and after the CT course. The results regarding the difference between participants' CT dispositions by the department before and after the CT course are shown in Table 6:

Table 6. *Kruskal Wallis H Analysis Results For The Departments According To The Pre-Tests*

CCTDI	N	Sum of squares.	df	χ^2	p
Pre-school Teaching	17	14.94	3	.95	.81
CEIT	7	16.00			
Mathematics Teaching	4	14.25			
Industrial Engineering	2	21.00			

p>.05

According to the Kruskal Wallis H test analysis performed in line with the pre-test data, there was no significant difference between the CT dispositions of the participants in terms of departments (χ^2=.95, p=.81, p>.05). According to the pre-tests, it was concluded that the mean score of the participants in pre-school teaching ($M_{Pre\text{-}School}$ =259.71), the mean score of the participants in CEIT ($\bar{X}_{CEIT}$ =258.69), and the mean score of the participants in mathematics teaching ($M_{Mathematics}$ =257.28) were very close to each other.

Significant differences were also examined according to the post-test scores of the participants for the departments. The analysis result of the Kruskal Wallis H test, which was performed according to the CCTDI post-test scores, is presented in Table 7:

Table 7. *Kruskal Wallis H Analysis Results For The Departments According To The Post-Tests*

CCTDI	N	Sum of squares.	df	χ^2	p
Pre-school Teaching	17	16.82	3	2.75	.43
CEIT	7	11.71			
Mathematics Teaching	4	18.75			
Industrial Engineering	2	11.00			

p>.05

When the analysis table of the Kruskal Wallis H test, which was performed in line with the post-tests, is examined, it is seen that the significance value (p=.43) is greater than the significance level (p>.05). In this context, it can be said that there is no significant difference between the CT dispositions of university students according to the departments in terms of post-tests (χ^2=2.75, p=.43, p>.05).

The other aspect of the second sub-problem is to determine the participants' CT dispositions by gender prior to and after the CT course. In this regard, Table 8 displays the results of the t-test analysis for samples that were unrelated to data collected before and after the CT course:

Table 8. *T-Test Results According To Pre-Tests in Terms Of Gender*

CCTDI	N	M	SD	df	t	p
Female	21	260.31	30.39	28	.06	.95
Male	9	259.61	13.84			

p>.05

According to Table 8, before the CT course, there was no significant difference between the participants' CT dispositions by gender (t=.06, p=.95, p>.05). When the mean scores of females (M_{Female} =260.31) and males (M_{Male} =259.61) are examined, it is seen that the values in the two groups are very close to each other. This shows that there is no significant difference in the CT dispositions of the participants according to gender.

The results of a gender-based examination of the participants' CT dispositions following after the CT course are presented in Table 9:

Table 9. *T-Test Results According To Post-Tests in Terms of Gender*

CCTDI	N	M	SD	df	t	p
Female	21	284.33	22.62	28	.60	.55
Male	9	279.57	8.89			

p>.05

According to the analysis of the data obtained from the CCTDI applied to the participants after the CT course, there was no significant gender difference in terms of post-tests (t=.60, p=.55, p>.05). Although the mean score

of females (M_{Female} =284.33) according to the post-tests is higher than the mean score of males (M_{Male} =279.57), this is not sufficient for a significant difference.

3.3. Findings Regarding the Third Sub-Problem

The third sub-problem of the research is about qualitative data. In this context, the participants' views on CT before and after the CT course were examined. The findings obtained as a result of the content analyses are presented in the tables below. The content analysis of the participants' answers before the CT course to the question of what CT is, is presented in table 10:

Table 10. *Views on CT Before the CT Course*

Themes	Codes	f
Truth-seeking	Different points of view	5
	Deals with all aspects of the subject	4
	Neutral thinking	3
	Reaching the conclusion	1
Open-mindedness	Expressing an Opinion	2
Analyticity	Reasoning	5
	Analyzing	5
	Solution generation	1
	Analytical Thinking	1
Systematicity	Making Evaluation	2
Self-confidence	Express own thoughts	1
	Interpretation	1
	Making Assumptions	1
Inquisitiveness	Questioning	4
Total	14	36

When Table 10 is examined, according to the data obtained before the CT course, 36 opinions emerged in the content analysis in line with senior university students' views on what CT is. Table 10 shows that 14 different codes emerged from the content analysis of the participants' views under six themes on what CT is before the critical course. CT was mostly expressed as "Different points of view", "Reasoning" and "Analyzing" (f=5). It is seen that there are participants who stated that CT is analytical thinking before the course. In addition, a participant said, "Critical thinking is analytical thinking." It is also worth noting that he sees the opinion in the form of (P9) as the same as critical thinking and analytical thinking. Some participant views on the findings are presented below:

> *P5: "Avoid events/readings etc. It can be called a new perspective, I stopped looking from my own window and observing the world from other people's windows." (Different points of view)*
>
> *P30: "I think critical thinking is a reasoning process." (Reasoning)*
>
> *P11: "It is thinking by analyzing and investigating and examining in the face of an event or situation." (Analyzing)*
>
> *P13: "It is the ability to question in the face of the events we encounter." (Questioning)*
>
> *P6: "Taking all aspects of an issue and determining the aspects that do not suit us" (Taking the issue with all its aspects)*
>
> *P10: "It is to evaluate an issue impartially, considering its pros and cons." (Impartial thinking)*
>
> *P21: "A situation is a state of expressing a positive or negative opinion on an event or phenomenon" (Declaring an opinion)*
>
> *P24: "He concludes by analyzing a subject or something by centered, that is, by expressing the relationship between the whole and its parts. In other words, it is to assess a subject or an idea." (Making evaluation)*

The themes obtained as a result of the content analysis of the participants' views on why CT is important before the CT course are presented below:

Table 11. *Findings Regarding the Importance of CT Before the CT Course*

Themes	Codes	f
Exploring	Developing different perspectives	5
	Understanding life	3
	Getting the right results	1
	Recognizing deficiencies	1
Agreeing	Understanding different thoughts	3
	Inference	1
Deciding	Inquire	1
	Addressing the issue in all its aspects	1
	Generating new knowledge	1
Problem-solving	Problem-solving	1
	Analyzing	1
	Reasoning	1
No idea		11

When Table 11 is examined, it is striking that 11 participants do not have an idea about why CT is important. It was concluded that "developing different perspectives" (f=5) was the most mentioned expression among the codes within the four themes determined. Afterward, the most expressed opinion is that CT is necessary for "understanding life" and "understanding different thoughts". In general, it can be said that the majority of the participants do not have an opinion on why CT is important. Some participant views on the findings in Table 11 are presented below as an example:

> *P8: "We are different people after all, and it is important to look at it from different perspectives. Critical thinking will also allow us to look at it from different angles." (Developing different perspectives)*
>
> *P13: "Critical thinking is important. Because we have to think critically to understand life and improve." (understanding life)*
>
> *P28: "It is important because when you criticize a situation in a good way, that is, constructively, it makes things better and reveals many different opinions among people" (Understanding different thoughts)*

The findings obtained as a result of the analysis of the participants' thoughts on what CT is and why it is important after the CT course are presented in Table 12 and Table 13:

Table 12. *Findings Regarding CT After the CT Course*

Themes	Codes	f
Truth-seeking	Different points of view	9
	Making the right decision in line with the mental process of knowledge	7
	Deals with all aspects of the subject	4
	Correct interpretation	4
	Making decisions based on facts	1
	Case Analysis	1
Open-mindedness	Expressing an Opinion	1
Analyticity	Reasoning	5
	Analyzing	5
	Reflection	3
	Higher Thinking	3
Systematicity	Making Evaluation	2
	Rational assessment	1
Self-confidence	Better decision making	1
	Inference	1
Inquisitiveness	Questioning	7
Total	16	55

According to Table 12, it can be said that after the CT course, the number of opinions expressed about what CT is and the total number of codes (n=16) increased. While "Questioning" comes after the "different points of view, reasoning and analysis " codes before the course, it appears as the third most frequently expressed code after the CT course. While "Making the right decision in line with the mental process of knowledge" was

not expressed before the course, it was the second most expressed opinion after the course (f=7). Before the course, a participant's view that equates analytical and CT changed after the course. The opinions of some participants regarding the findings obtained in Table 12 are given below:

P23: "The individual's ability to evaluate the situation he/she encounters from a different perspective in line with his/her ability to question events." (Different points of view)

P9: "Critical thinking is the process of forming a logical inference by an individual's mind filtering a thought." (Making the right decision in line with the mental process of knowledge)

P11: "It is the ability to reason in the face of events and facts, to question and think, and to filter through the mind." (Reasoning, questioning)

P7: "Critical thinking is a form of evaluation that an individual uses in all areas of his life, analyzes and reveals his thoughts. (Analyzing)

P26: "It is a way of thinking that consists of mental processes such as reasoning, analysis, and evaluation." (Reasoning, analyzing, making evaluation)

P18: Critical thinking is a way of thinking that allows a situation's positive and negative aspects to be evaluated, judged, and differentiated. (Deals with all aspects of the topic)"

P23: "It can be expressed as a correct way of interpreting the facts by considering all aspects of the situations encountered" (Correct interpretation)

The themes and codes determined in line with the analysis of the participants' views on why CT is important after the CT course are presented in Table 13:

Table 13. *Findings Regarding the Importance of CT After the CT Course*

Themes	Codes	f
Exploring	Accessing the right information	7
	Developing different perspectives	5
	Understanding life	3
	Achieve independence of thinking	1
Agreeing	Understanding different thoughts	3
Deciding	Make the right decision	11
	Ability to express own thoughts	4
	Have a critical perspective	3
Problem-solving	Problem-solving	4
	Providing logical solutions	3

After the CT course, all participants expressed their views on why CT is important. It is seen in Table 13 that the codes under the exploration theme are higher than the other themes. It was found that the most mentioned expression in the "exploring" theme was "Accessing the right information" (f=7), followed by "developing different perspectives" (f=5). The theme of "Agreeing" only includes "understanding different thoughts" and it is one of the least mentioned thoughts after the expression "reaching independence of thought". After the CT course, "making the right decision" (f=11), which is the most expressed opinion in the opinions about why CT is important, was evaluated under the theme of deciding. The concepts of "problem-solving" (f=4) and "providing logical solutions" were considered as concepts under the problem-solving theme, in which some participants expressed the importance of CT skills. The opinions of some participants regarding the findings in Table 13 are given below:

P7: "Critical thinking is important because it enables us to make logical decisions and manage our lives properly." (Make the right decision)

P1: "With critical thinking skills, we reach the right information." (Accessing the right information)

P29: "As a teacher, it is important to evaluate each individual as himself. It allows me to take into account the perspective of each student and evaluate situations from their perspective." (Developing different perspectives)

P21: "It is important to be able to get ideas by filtering the event, thoughts, rather than the inferences of others." (Ability to express own thoughts)

P27: "It is important because it enables problems to be solved by thinking in different ways." (Problem-solving)

4. Conclusion, Discussion, and Recommendations

In line with the findings, it was concluded that the CT course, which is carried out with distance education, positively affects the CT skills and tendencies of university students. This finding is consistent with Davies' (2011) view that CT can be taught through a separate course or indirectly across disciplines and with that of Niu et al. (2013), who suggest that the CT teachings put forward in their studies support the idea that university students develop their CT skills. It was determined that university students' CT dispositions were generally at a moderate level before the CT course. It was found that approximately 25% of the participants had a low level of CT disposition before the CT course. In other words, it can be said that only 10% of university students have a high level of CT disposition. While this situation supports Can and Kaymakcı's (2015) conclusion that pre-service teachers have low attitudes toward critical thinking (CT), Ozdemir (2005) with university students, Yorgancı (2016) with prospective mathematics teachers, and Fitriani et al. (2018) in their study with pre-service teachers in the biology education program found that the participants had moderate CT skills. Although CT is among the most important outcomes of higher education (Davies, 2011), there is little evidence that pedagogical interactions lead students to think critically (An Le & Hockey, 2022). The results obtained from the pre-tests show that the CT levels of university students are insufficient to support this idea. Senior university students do not have a high level of CT skills before the CT course because they did not take any courses for CT skills before or did not participate in enough activities and practices to develop their CT skills. In this context, in-class CT activities and practices should be included to develop the CT skills of university students (Niu et al., 2013).

It has been determined that the most mentioned descriptive tendencies of university students towards CT before the CT course held with distance education are within the framework of "different points of view", "reasoning," and "inquiry" under the themes of "Truth Search" and "Analyticity". In some studies, it is seen that participants achieved better results in the analytical sub-factor than in other factors (Alper, 2010; Phillips et al., 2004; Yorgancı, 2016). These results support that the most effort to define what CT is in the study is within the framework of the "Analytics" theme. In the analysis, the finding that CT is confused with analytical thinking is also striking. This finding supports the idea that analytical thinking has a meaning mixed with CT (Gürkaynak et al., 2009). Remarkably, 36.67% of the participants did not express an opinion on why CT is important. In this respect, it can be interpreted that university students do not have enough knowledge about why CT is important. This finding concludes that university students' CT dispositions are not high, but they generally have moderate CT dispositions. Developing CT is an important step in achieving the basic goals of education (Rimiene, 2002). In this context, CT enables individuals to think effectively as well as acquire knowledge (Facione et al., 1998). The fact that the majority of university students' CT attitudes are at a medium level and nearly a quarter of them are at a low level may be attributable to their lack of knowledge about what CT is and why it is important, or to the fact that they do not engage in sufficient CT-related activities, practices, or readings throughout their university education. (Ozdemir, 2005) In this context, activities that encourage students to read critically can help them acquire CT skills.

According to the quantitative results obtained from the CCTDI applied after the CT course held with distance education, it is seen that there is a positive change in the CT dispositions of university students. This finding is also supported by the content analyses carried out within the framework of qualitative data. It was determined that university students made more detailed definitions of what CT is than the pre-course application, and all participants expressed their views on the importance of CT after the course. It was concluded that there was a significant difference in CT dispositions compared to the pre-course. In this context, it can be said that the CT course is effective on students' CT skills and tendencies. This finding was reported by Caliskan et al. (2020) and supported the results of Kanbay and Okanlı (2007). Therefore, CT courses, which are offered as elective courses at the university level, should not be limited to only elective courses but should be spread into the curriculum. In other words, the CT skills and tendencies of the students can be increased by adding the activities to be carried out to gain CT skills and tendencies in the education programs at the university level (Seferoğlu & Akbıyık, 2006).

In most studies conducted with university students and using the CCTDI, it is reported that the least tendency of the participants is Truth-seeking (Alper, 2010; McBride et al., 2002; Rimiene, 2002; Phillips et al., 2004;

Yorgancı,2016). Within the context of this study, "truth-seeking" is the theme with the most opinions about what CT is in the most recent application. In this context, the theme in which students developed the most or in which their perspectives grew the most is the search for the truth. Phillips et al. (2004) suggest that experiences that support the idea of acquiring the best knowledge and challenging one's prejudices can be enhanced by truth-seeking. It can be said that the inclusion of ideas such as " Making the right decision in line with the mental process of knowledge", "Correct interpretation" and " Making decisions based on facts " under the theme of truth-seeking in the study supports the view of Phillips et al. (2004). It can be said that making the right decision, interpreting and making decisions according to the facts is a tool for obtaining the best information and overcoming one's prejudices. In this respect, behaviors such as making the right decision, interpreting correctly, and making decisions according to the facts will provide the best information to seek the truth.

In the study, it was also examined whether CT dispositions differed according to gender. From the results, it was concluded that there was no significant difference between the CT dispositions of university students according to gender before and after the course. While this result overlaps with the studies of Kaloc (2005), Özdemir (2005), Myers and Dyer (2006), Gök and Erdoğan (2011), Franco and Almedia (2015), Salahshoor and Rafiee (2016), Bagheri and Ghanizadeh (2016), It differs with the study of Facione et al. (1995), Hayran (2000), Kökdemir (2003), Hamurcu, Günay and Özyılmaz (2005) and Zayif (2008). It was determined that most participants had a low and medium level of critical thinking before the critical thinking course and that the majority had a medium level of critical thinking disposition after the course. According to the findings, no significant difference was found in the critical thinking dispositions of the participants in terms of gender variables. These results support the opinion of Zetriuslita et al. (2016) that there is no significant difference in critical thinking skills of individuals with moderate and low levels of critical thinking disposition according to gender. It is suggested that the reason why there is no significant difference between the gender at CT is that the practical and theoretical courses taken by the older students are planned in the same direction in most departments, or that the practical courses for CT are not sufficiently carried out so that they do not bring about a change in the CT disposition of the students.

It was observed that there was no significant difference in the CT dispositions of university students according to departments. This finding differs from the studies of Ricketts and Rudd (2004), Gülveren (2007), and Emir (2012). Similarly, the reason for the emergence of different results in studies on CT in terms of departments may be due to the design of the education carried out based on departments or the fact that CT activities are carried out or not in practice courses. In studies where the differences in terms of departments are revealed, Gülveren (2007) states that pre-school teacher candidates are in their study, and Emir (2012) states that primary school teacher candidates have different CT compared to teacher candidates in other departments. The reason for this is that the CT skills of pre-school and primary school teacher candidates may differ from those of other departments if they are taught in a way that allows them to deal with the subject from a multidisciplinary and holistic perspective, with training for the teaching of various disciplines such as mathematics, science, and life sciences. In other words, there may be a difference in CT skills between a pre-service teacher who has a perspective within the framework of mathematics and one who can evaluate subjects in mathematics, science, and social studies from multiple perspectives. In this study, the study group includes pre-school teacher candidates. However, the inability to recruit an equal number of participants from each department, which can be viewed as a limitation of this study, may have prevented a clear demonstration of this difference. In subsequent studies, studies can be carried out with equal numbers of participants according to the departments, and it can be revealed from a more detailed perspective whether there is a difference in CT and dispositions between departments.

In today's education programs, CT is among the skills that individuals should acquire (Davies, 2011; Niu et al., 2013; Seferoğlu & Akbıyık, 2006). The conclusion that the CT disposition of university students is insufficient before the CT course indicates that the students did not encounter enough activities to develop their CT skills during their previous student years. Considering the emphasis on raising individuals who can think critically in curricula (MoNE, 2018), it is necessary to include activities and practices for CT in textbooks and curricula.

5. Limitations

This study was limited to 30 senior university students who took the critical thinking course and participated in the study voluntarily. The fact that the study was carried out during the COVID-19 pandemic period limited detailed interviews with students. Including two students from industrial engineering and four from mathematics teaching in the study is another limitation of the study. The results for the critical thinking dispositions of the departments are limited to two students from industrial engineering, four from mathematics teaching, seven from CEIT, and 13 from pre-school. In this context, to generalize the results obtained for the departments, it is recommended to examine the difference between the critical thinking dispositions among the departments with more participants in future studies. The critical thinking education carried out within the framework of the study is limited to a 14-week critical thinking undergraduate course.

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