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The effect of critical thinking education on the critical thinking skills and the critical thinking dispositions of preservice teachers

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The aim of this study is to identify the dispositions and opinions of prospective teachers towards critical thinking and to develop primarily their critical thinking dispositions. Pretest-posttest research design was implemented in this study without a control group. The study group was formed with the purposive sampling method. A total of 57 preservice teachers, of whom 26 were males and 31 were females, volunteered for the study. California Critical Thinking Disposition Scale was used for data collection and semi-structured interview form was used to obtain the qualitative data. The overall critical thinking dispositions pre-test scores of the students as well as the scores they have obtained in the sub-dimensions of analyticalness, open mindedness, inquisitiveness, and systematicness revealed that they had moderate dispositions in these sub-dimensions, whereas the scores they obtained in the sub-dimensions of self-confidence and truth-seeking revealed that they had low critical thinking dispositions in the respective sub-dimensions. The overall critical thinking dispositions post-test scores of the students obtained after the experimental procedure indicated a moderate disposition, as it was revealed by the overall pre-test scores, with the exceptions of the sub-dimensions of self-confidence and truth-seeking, in which the students' scores increased from low to moderate. All in all, a significant difference was found between the mean pretest and posttest scores. It was determined that when encountered an event or a problem that the participants took cognizance of subjects such as paying attention to the data available and unavailable, being attentive to seeking evidence, developing empathy, making reasonable conclusions, and making judgments through creating criteria when making decisions.These results have indicated that the education provided contributes positively to critical thinking and to the critical thinkingdisposition.

Key words: Critical thinking, critical thinking disposition, preservice teacher, education, higher education.

INTRODUCTION

People are exposed to information in many ways today, which makes it extremely difficult to determine what is

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right and wrong (Akar, 2017). Is what we do good or bad? How true is what we hear and read? Which school should I send my child to? Which politician can make the right decisions for us? In which country is it better to live? These and many other questions have become of interest to many people as a result of the globalization of the world.Everyone expects to find the right answer (Ennis, 2013). There are many ways to find answers. These ways may either be scientific ways or ways that are adopted outside of science and which are doubtful that they can deliver the truth. Undoubtedly, it is extremely important for people to choose the scientific way to reach reality. It is essential that the information is consistent, stable and generalizable in order to reach the truth. Access of individuals to scientific information should be considered as the most important issue by the states. This is because information has the characteristic of a potential product, which can be used in life. In short, scientific knowledge has become production itself (Jacob, 1997; Ziman, 1994).

The state, which has come into existence as a system of society, has to raise and develop the individuals that makes it up, in the best way possible. The most important institution in this context is school. Schools try to furnish the individuals with the knowledge and skills they would require to cope with difficulties. Based on this idea, it can be said that the most important mission of the educational institutions is to train qualified individuals, who can distinguish right and wrong by intellectualizing what has been done from the past to the present, and shape their future correctly based on the information they have acquired (Ergün, 1996). States that have difficulties in accomplishing the said missionare amend their education programs according to today's conditions. Education programs put into effect in the 21st century reveal that these programs aim to furnish individuals with the knowledge and skills required by today's conditionsthat can benefit the individuals throughout their lives (Tay and Bas, 2015). The skills required by today's conditions and included in these programs include skills of critical thinking, creative thinking, problem solving, etc (Gini-Newman and Case, 2018; Gray, 2016). The path to become a strong society and look to the future with hope in this globalizing world passes through furnishing the individuals with the above-mentioned skills, and with the critical thinking skill in particular (Akar, 2017: 743; Baillargeon, 2016; MEB, 2005; Scales, 2012). According to Schafersman (1991), the only way to have the right knowledge about the world and to think correctly is through possession of critical thinking skills. Gaining critical thinking skills has become an important part of education systems, higher education systems in particular, in the first quarter of this century (Celuch and Salama, 1999). In the study conducted by Walkner and Finney (1999), the effect of critical thinking on research skills was examined, and it was found by the end of the study that the critical awareness increased, having facilitated the learning as a result. It appears that productive people with critical thinking skills must be present in order to overcome many of the problems we face in our rapidly changing world (Eldeleklioglu and Ozkilic, 2008; Walser, 2008). As a reason, the ongoing technological developments and the information explosion faced in the 21st century necessiated the individuals to make critical decisions on their own under the current conditions and solve the complex problems they face with a rational approach (Butera et al., 2014).

It is frequently stated in many scientific studies that critical thinking skill is one of the most basic skills in the 21st century (Ekici et al., 2017). Critical thinking is at the top of the list of basic skills that individuals need to acquire in order to be successful both in education and business life (Wagner, 2008; Rudinow and Barry, 2007). An ordinary person makes about 35,000 conscious decisions every day (Sahakian and LaBuzetta, 2013). A decision is made by comparing the different options available based on certain criteria and reasoning them out. In this context, critical thinking is an important tool that enables making correct decisions (Gurkaynaket al., 2008). Accordingly, the demand for critical thinking is increasing with each passing day in business life, in particular [Foundation for Young Australians (FYA), 2016)] In line with this demand, critical thinking has been included among the important skills to be acquired by students in the education programs of many developed countries, such as England (Qualifications and Curriculum Authority (QCA) 2011; Bourn, 2018). Teachers naturally have a key role in bringing these skills to students, and it takes well-trained teachers to enable students to acquire and develop thinking skills (Genc, 2008). The fact that teachers are individuals who can think critically besides having a good field knowledge will affect the students they educate. Teachers that have a good subject matter knowledge and can also think critically are the ones that have the highest impact on the students they bring up (Besoluk and Onder, 2010). Finland, which is one of the high performing countries in PISA (Programme for International Student Assessment), has linked its success to teacher quality (Stacey, 2010). Thus, it is important that the institutions, which train teachers, pay attention to critical thinking education, since it has been stated in various studies that the education prospective teachers receive in education faculties does not contribute to the development of critical thinking dispositions resulting in teachers with low or medium level critical thinking dispositions (Besoluk and Onder, 2010). Another point that should not be overlooked is the relationship between critical thinking and academic achievement. There is a misperception that the higher the academic success, the higher the critical thinking. There is not much evidence that indicates critical thinking develops in parallel with academic achievement, and lack of emphasis on critical thinking education in the education prospective teachers

receive in education faculties is responsible for it (Tekin et al., 2016). Undoubtedly, critical thinking, as a skill that can be improved by incorporating it into the curriculum, is an educational component that is necessary for prospective teachers and which will ensure the development of students (Can and Kaymakci, 2015). There are various ways and methods used to develop critical thinking, such as intelligence games and Science, Technology, Engineering and Mathematics (STEM) applications (Adalar and Yuksel, 2017; Ozturk, 2018; Savas, 2019).

CONCEPTUAL FRAMEWORK

Critical thinking was first mentioned in the teachings of Socrates (Fisher, 2011: 2). If the place we live in was a world where critical view and critical thinking did not develop, neither new views could have developed nor different perspectives could have emerged (Chaffee, 2000). Critical thinking does not only refer to making an analysis about an event, but also to making a synthesis and evaluation (Moore, 2001).Lipman (1987) states that critical thinking includes the processes of thinking and judgment based on certain criteria. The fact that criteria were mentioned is to point to the fact that the evaluation process should not be performed arbitrarily, but rather in order and consistency. Watson and Glaser (2012) describe critical thinking as the ability to identify, analyze and evaluate what is necessary to achieve an accurate result. McPeck (2017), on the other hand, mentioned the role of skepticism in critical thinking and said that different ways should be sought for. Critical thinking should bring to mind that there may be alternatives, and that thus a definite and single judgment should not be made based on the information heard, seen and read (Cubukcu, 2011). Being conscious is of utmost importance in critical thinking, as critical thinking is an organized mental process.Thanks to this state of consciousness, we can use the information we acquire as a filter and perceive what is happening around us better (Cuceloglu, 1993; Chaffee, 2000). According to Rudd (2007), critical thinking is a purposeful and logical way of thinking used in decision making, problem solving and learning basic concepts. Mason (2008) describes critical thinking as a method of thinking dominated by logic that takes into account different ideas with a skeptical approach.This approach is also expressed by Nosich (2016), Halpern (1996) and Pirozzi (2003), who laid emphasis on logical thinking. Logic appears as an important concept in critical thinking, whereas stereotyped judgements and unilateral perspectives are rejected. This framework drawn for critical thinking implies that the knowledge can change at all times, that the truth cannot be reached by sticking to stereotyped judgements, and that the logic of scientific approach that we rely on constitutes a structure intertwined with critical thinking. Facione (2007) associates critical thinking with good thinking, explanation, self-regulation, analysis, interpretation and evaluation. Critical thinking is the first line of defense where knowledge cannot always be trusted, directing the person to have beliefs consistent with the available evidence (Stanovich and West, 2000). As Paul and Elder (2016) have said, critical thinking is the awareness of being able to distinguish right from wrong. Today, critical thinking is one of the concepts, which we still trying to define according to the different backgrounds, thinking tendencies and traditions of different cultures (Alkin, 2012).

A person's critical thinking skills can be said to be advanced only if he/she can use and exemplify concepts in line with their meanings. Additionally, one with advanced critical thinking skills should accept information only after assessing it on the basis of certain criteria instead of accepting it as it is without questioning it, studying it in a planned manner, and be patient despite being flexible at the same time (Paul and Elder, 2016; Semerci, 2000). Individuals that possess these qualities cannot be raised by chance.Critical thinking has to be supported and taught from early ages, as it is not a skill that occurs automatically when a certain maturity level and age are reached (Daniel and Auriac, 2011). The school is the most important institution, where critical thinking can be supported and taught in a planned and programmed manner, making it a permanent skill. Schools also fulfill the task of raising individuals who will keep the state and the state-owned regime alive.Taking this fact into consideration, the schools should not only bring to mind a structure consisting of walls, tables and desks, but also the teachers and the students these teachers raise; as it is both the teachers and the students who add vitality to that structure and are key to creating that structure. Teachers play an important role in today's education systems. There are many things that teachers can add to their students within the framework of social learning by setting an example for them. For this reason, before a quality or skill is taught to the children,it is important that the quality or skill in question is first acquired by the teacher him/herself.In this way, while organizing the classroom environment and classroom activities, teachers can motivate students and develop their self-confidence when they begin to reflect and develop qualities such as questioning, developing different perspectives, making analysis, resorting to different solutions (Aybek and Yolcu, 2018).In today’s world, critical thinking skill is considered as an important output in university education, and is taken into consideration in the training of professional individuals such as psychologists, nurses, doctors and teachers, who directly affect human life (Finkelman, 2001; Kandemir, 2017; Tapper, 2004). However, it is observed that there is an inadequacy in the development of critical thinking skills via university education (Gupta, 2005). The studies conducted on critical thinking skills in general, and within the framework of teacher education in

particular, do not depict an encouraging picture (Brownell and Jadallah, 1993; Bransky and Hadass, 1992; Zohar and Schwartzer, 2005). The study conducted with 140 educators by Paul et al. (1997) revealed that the educators appeared to have attached importance to the development of critical thinking, but that only 19% of the educators were able to accurately define critical thinking, and that only 9% have actually improved critical thinking themselves. As a pre-condition, it is important for an individual to have critical thinking skills, but it is not enough. Studies conducted on this matter indicate that the individuals, who possess the necessary critical thinking skills, were not able to use these skills in many of the situations they encounter (Ekinci and Ekinci, 2017). The fact that an individual possesses a skill does not mean that he/she will use it (Seferoglu and Akbiyik, 2006). In addition to possessing a skill, there must be a tendency to use that skill. Having a tendency towards a thinking skill demonstrates how eager the individual is in realizing that skill (Valenzuela et al., 2011). In this framework, there is a strong and meaningful relationship between possessing critical thinking skill and the tendency to use the critical thinking skill (Facione, 2000). However, it should be kept in mind that critical thinking disposition is not the same as the critical thinking skill, but is rather complementary to the critical thinking skill (Cesur and Yaralı, 2019). In their study, McGrath (2003), Shin et al. (2006) and Yang and Chou (2008) found a positive relationship between critical thinking skills and the critical thinking dispositions. Dispositions have an enforcement power over the individual's behavior and skills (Tishman et al., 1992). The skill will be used only if the strength of the disposition increases. Given this fact, critical thinking dispositions are vital in an individual's life (Watson and Glaser, 2008: 3).

When it comes to critical thinking dispositions, associated qualities that come to mind are; the desire to be informed, trying to see an event from different perspectives, revealing relationships, reflective thinking, seeking evidence, skepticism, respecting others' thoughts and tolerance (Eggen, 2006). Facione et al. (1995) explained Critical Thinking Dispositions in 6 dimensions, which are as follows:

Inquisitiveness: Inquisitiveness is an individual's desire to follow and learn topical issues. It is the willingness to learn more. An inquisitive person would say: "It is not clear what you will need and when. But I should always be prepared when the need arises".
Open Mindedness: Open mindedness refers to being tolerant towards different views and not avoiding to seeing the truth due to prejudices.
Systematicness:Systematicness refers to focusing on, and questioning a problem in an organized fashion.
Analyticalness: Analyticalness refers to acting on the basis of evidence in resolving problems, and reasoning within the framework of the available data.
Truth-seeking: Truth-seeking refers to the state of seeking and asking for the best and most accurate information with courage, even though it contradicts one's own view.
Self-confidence: Self-confidence refers to the state of one confiding in his/her own decisions using his/her own mind and based on his/her own reasons.

Two main methods are reported in the literature for developing critical thinking skills and critical thinking dispositions. The first of these methods is the teaching of critical thinking as a course, whereas the second one is the incorporation of the activities that can be used in developing critical thinking into all courses (Kokdemir, 2003b; Wright, 2002). Both of these methods have their respective limitations. In the case of teaching critical thinking as a course; there is the difficulty of fitting a very broad subject such as critical thinking into the limited hours of lessons, and also the probability of incorporating the critical thinking into all spheres of life is very low. In the studies conducted by Hanley (1995), Eldeleklioglu and Ozkılıc (2008), it was determined that critical thinking was in fact developed as a result of providing it within the scope of a separate one-hour course, but there is no evidence with regards to how much of this theoretical education could be reflected on life. This aspect of providing critical thinking as a separate course is considered to be inadequate by Huitt (1998) as well. On the other hand, in the event that critical thinking is taught by inclusion, the problem of not having enough time and patience to wait for all the teachers to become experts in critical thinking and teach it to their students arises (Wright, 2002; Eldeleklioglu, Ozkılıc, 2008). In the meta-analysis study conducted by Abrami et al. (2008), four methods of critical thinking education are mentioned, and not two. In this study, 117 experimental studies were reviewed and the educational approaches adopted in these studies towards critical thinking education were categorized as direct, indirect, general or mixed, and the mixed approach was found to have the highest effect.This finding indicates that we should choose to simultaneously implement both methods of critical thinking teaching, that is, by incorporating it into regular curriculums and within the scope of a general independent course.One of the interesting results revealed by the research was that the increase in students' critical thinking skills was found to be associated with the fact that their teachers have been specifically trained in critical thinking skills. From this point of view, it is clear that we must first train the teachers in terms of critical thinking skills if we want the students to increase their critical thinking skills and use them in life. As a result of these studies, it was found that teachers play a key role in the critical thinking education process [American Philosophical Association (APA), 1990]. There are findings in the literature suggesting that teachers' critical thinking skills increase when they are

provided with a training on critical thinking skills (Korkmaz, 2018; Slameto, 2014). These findings are encouraging in terms of critical thinking. However, it is also necessary to know to what extent these skills can be used or will be used. For this reason, there is a need to further study and develop this issue. At this point, it may be useful to start with classroom teachers.Classroom teachers will be successful in teaching critical thinking skills if they could make sufficient progress before service. Taking the Turkish education system into consideration, classroom teachers usually teach almost all the courses to their students and for about 4 or 5 years. The fact that they teach their students almost all courses throughout a very long period such as 4 or 5 years provides the classroom teachers the time and patience they need to teach the students the critical thinking skills.Rote learning is getting abandoned in today's education systems. This abandonment emerged as a result of the transition from essentialism, as an educational approach, to progressivism and re-constructionism. For this reason, 21st century teachers are asked to attach more importance to the education of thinking skills instead of memorization and to improve their thinking skills. In order to achieve this, teachers must first adopt an educational approach that is not based on rote learning.There are findings in the literature suggesting that there is an inverse relationship between teachers' critical thinking dispositions and the essentialism educational approach (Sahin et al., 2014). The general position of many researchers in this regard is that the teachers need to receive good education before and after the service and be well-equipped in order to improve students' critical thinking skills (Walsh and Paul, 1998; Willard-Holt and Bottomley, 2000; Loughran, 2002; Genc, 2008).

Different studies revealed different results in terms of the critical thinking dispositions of teachers and preservice teachers. For example, studies conducted by Akar (2017), Dutoglu and Tuncel (2008), and Hamurcu et al. (2005) revealed that the critical thinking dispositions of teachers and preservice teachers were at a high level, whereas the studies conducted by Kartal (2012), Kezer et al. (2016), Korkmaz (2009), Kucuk and Uzun (2013), Sacli and Demirhan (2008), Şen (2009), Turnuklu and Yesildere (2005) revealed that the critical thinking dispositions of teachers and preservice teachers were moderate, and the studies conducted by Akar (2007), Acisli (2015), Argon and Selvi (2011), Besoluk and Onder (2010), Can and Kaymakci (2015), Gulveren (2007), Kiziltas (2011), Kuvac and Koc (2014), Sen (2009), Polat (2017) and Zayif (2008) revealed that the critical thinking dispositions of teachers and preservice teachers were at a low level. Many factors such as differences in population sampling, differences arising from the measurement tools and the study environments may have been effective in the emergence of the different results revealed by different studies. It is noteworthy that in one of such studies conducted by Polat (2017) on classroom teachers, majority of the classroom teachers (55%) were found to have "low" critical thinking dispositions. The low level of the critical thinking dispositions of teachers, who serve at the first stage of basic education, indicates the difficulty of developing critical thinking skills in the society and reflecting these skills on life. A study that supports this argument was carried out by Ersoy and Baser (2012). In this study, which was carried out with 615 students at primary education level, the students' critical thinking dispositions were examined and it was revealed that they could not acquire higher-order thinking skills due to their low critical thinking disposition scores.Factors such as education system, curriculum structure and teachers were listed as the reason for the said result. When the effects of teachers on students and students' achievements are taken into consideration, it can be said that teachers have a great role in students acquiring of critical thinking skills (Polat, 2017). However, regardless of the reason for the said result, if the current critical thinking levels of the individuals, and of the teachers in particular, are not sufficient, then their critical thinking dispositions must be improved. The studies that stipulate this improvement were carried out by Aybek (2006), Hanley (1995), Eldeleklioglu and Ozkilic (2008), Plath et al. (1999), where it was determined that the students' critical thinking dispositions increased with increasing critical thinking dispositions of the teachers.

In a study conducted by Besoluk and Onder (2010) with 528 preservice teachers studying at the faculty of education, it was determined that the critical thinking dispositions of a majority of the preservice teachers were found to be moderate, whereas the critical thinking dispositions of some of them were found to be low and only a very small part of them were found to have high critical thinking dispositions. It was inferred from this result that the education provided to the preservice teachers in the faculty of education does not contribute to the development of their critical thinking dispositions, and thus these preservice teachers will mostly graduate with moderate and low critical thinking dispositions.A similar result was reported by Cetinkaya (2011). It was determined in the study of Cetinkaya (2011) that the preservice teachers' overall critical thinking dispositions were low. It was found as a result of the same study that the critical thinking dispositions of preservice teachers were highest in the "analyticalness" and "open mindedness" sub-dimensions, moderate in the "inquisitiveness" sub-dimension, and low in the "systematicness", truth-seeking" and "self-confidence" subdimensions.It can be inferred from these results a separate study should be conducted in education faculties directed at developing both critical thinking skills and critical thinking dispositions. The study conducted by Basiga (2006) is important in this regard. It was determined as a result of this study, in which teachers' critical thinking practices were examined, that first the teachers themselves must become critical thinkers; in

other words, that they must have the tendency to reflect their critical thinking skills in life, before they actually teach critical thinking to students, and that teachers need to be trained in this regard. It can be inferred based on these findings that it is imperative to carry out pre-service or in-service training activities to meet this need of teachers and preservice teachers. The meta-analysis study conducted by Abrami et al. (2008) revealed that there was a significant increase in students' critical thinking skills when teachers were given training on critical thinking.The contents of the education programs and the learning-teaching processes can be re-arranged at every grade level in order for the students to acquire critical thinking skills (Ozden, 2008). From this point of view, it can be said that both critical thinking and critical thinking dispositions can be developed as a result of certain studies and trainings. It should not be forgotten that the trainings to be provided to teachers and preservice teachers will be a step taken to train the future generations as well.

Objectıve of the study

The objective of this study is first to increase the critical thinking dispositions of the preservice teachers by determining their critical thinking dispositions, and then to reveal the factors that are effective in this increase. The fact that the procedures that are well-accepted in the literature in respect of how critical thinking will develop have been implemented within the scope of a one-hour course and the factors that affect the students have been determined; this distinguishes this study from other comparable studies available in the literature.It is known that individuals make their selections more consciously and inquiringly after having received critical thinking education. For this reason, it is important to transform teacher education programs into a format that will develop critical thinking skills (Sahin et al., 2014). In addition to furnishing the individual with any skill, the willingness to use that skill by the individual should not be ignored.In addition to gaining and developing a skill, the extent of disposition to use that skill is also very important.From this point of view, answers to the following questions were sought in this study:

1. Is there a significant difference between the critical thinking dispositions of the preservice classroom teachers before they receive the critical thinking education and after they have received the critical thinking education, that is, by the end of the experimental process?
2. Does critical thinking education have an impact on the preservice classroom teachers' views on critical thinking?

METHODOLOGY

This study was carried out within the framework of mixed research design. There are four types of mixed research design: embedded, triangulation, explanatory and exploratory (Creswell, 2017). Embedded research design was preferred in this study, since one of the research methods has come to the fore (Creswell and Plano-Clark, 2011). This study is largely quantitative, whereas the qualitative method has been used in this study as an alternative method to support, generalize or explain the data collected by going deep into the data. The qualitative data were incorporated into the predominant quantitative data. Information on the quantitative and qualitative dimension of the study is provided below.

Quasi-experimental design was preferred as it was not possible to control all variables in quantitative dimension and also because it is the most used research design in educational research (Cohen et al., 2000). The study was carried out as a quasi-experiment since it was not possible to randomly select the participants that made up the experimental group due to the limitations such as the characteristics of the institution, educational process, time and place (Buyukozturk et al., 2018). Within the scope of this type of research design, the pretest-posttest research design without a control group was implemented. The facilities of the university, where the research was conducted, were not suitable for forming two groups out of the study sample. Some of the students did not have any other choice but to enroll in the critical thinking course, as there were not many courses available for students to choose from. Thus, not all the students enrolled in the course volunteered for the study. These students did not participate in the research process. As a result, the absence of the control group is not a preference made by the researcher and is thus accepted as a limitation of the study. In the pretest-posttest design without a control group, experimental process is implemented on a single group. In this way, the experimental group that is subjected to experimental procedure is examined against the dependent variable following the intervention.The main objective here is to determine the effect of the independent variable, which is the intervention element before and after the experimental procedure, on the subjects (Buyukozturk et al., 2018; Kose, 2013). The pretest data are collected before the experimental process is started by using the scale used for measuring the dependent variable, whereas the posttest data are collected after the experimental process is completed by using the same scale. The scales are applied to the same subjects and a comparison is made (Buyukozturk et al., 2018). In addition, qualitative data were collected in order to see the changes that may occur in the students.

Case study was preferred as the research design in the qualitative dimension of the research. Case study is used to describe the cases that draw attention in respect of the research subject, in depth (Johnson and Chiristensen, 2014; Yildirim and Simsek, 2013). In addition, via case study, the connection of a current phenomenon with daily life is established (Merrriam, 2015). The cases in this study are about critical thinking dispositions.Case study design was used to reveal the situations that affect the critical thinking dispositions of the preservice teachers that make up the experimental group as well as to reveal the situations that affect the development of their critical thinking dispositions. In qualitative studies not all the data obtained are presented, instead the data are presented within the scope of a structure that is created from the data that overlap, where sufficient details are provided, so that the reader feels that the data are actually there (Neuman, 2016) (Table 1).

Research design

Study group

The study group was formed with the purposive sampling method. A total of 57 students of volunteered for the study. 26 were males and 31 were females. They study at the Faculty of Education

Table 1. Research design.

Parameter	Pre-test	Procedure	Post-test
	O_1 (Dependent variable)	X	O_2 (Dependent variable)
Quantitative Dimension	Critical Thinking Disposition Scale	13-week long critical thinking course (intervention) (independent variable)	Critical Thinking Disposition Scale
Qualitative Dimension	Semi-Structured Interview		Semi-Structured Interview

Classroom Teaching Program and enroll in the elective "Critical Thinking" course. 15 students, who accepted to be interviewed, were selected for the collection of the qualitative data. One of these 15 students did not attend the last interviewing session, thus the qualitative data evaluated comprised the data obtained from 14 participants.

Data collection tool

California critical thinking disposition scale

California Critical Thinking Disposition Scale was used for data collection in this study. The original name of the scale is "California Critical Thinking Disposition Inventory"(CCTDI), which was translated into Turkish by Kökdemir (2003a), who also conducted the validity and reliability studies of the scale. There were a total of 75 items in the original scale, whereas only 51 of them were included in the version translated into Turkish as a result of the analyses conducted. These 51 items were categorized into six sub-dimensions.The internal consistency coefficient of this 51-item Likert type scale was found to be 0.88. The items were scored as follows; 6 points were given if the expression of "I totally agree" was chosen as the answer choice, 5 points were given if the expression of "I agree" was chosen as the answer choice, 4 points were given if the expression of "I partially agree" was chosen as the answer choice, 3 points were given if the expression of "I partially do not agree" was chosen as the answer choice, 2 points were given if the expression of "I do not agree" was chosen as the answer choice, and lastly, 1 point was given if the expression of "I do not agree at all" was chosen as the answer choice. The final score in each sub-dimension was calculated by first adding up the scores of the answers in each sub-dimension of the original scale,which was prepared by Facione et al. (1998) as a 6-point likert type. The sum was then divided by the number of questions available in that sub-dimension, which was then converted to a standard score after multiplying the quotient with 10. This results in a final score that can be 6 at the lowest and 60 at the highest [For example: (1 + 4 + 5 + 4 + 5 + 6 + 2 + 3) = 28/8 = 4,5 * 10 = 45].Critical thinking dispositions of those who had a score of less than 40 in any of the sub-dimensions in the critical thinking dispositions scale were considered to be "low", whereas thecritical thinking dispositions of those who had a score of more than 50 in any of the sub-dimensions in the critical thinking dispositions scale were considered to be "high". The lowest and highest values were constant for all sub-dimensions. Hence, taking into consideration this scale, which is adapted into Turkish, as a whole, students, who scored less than 240 (40x6) points, were considered to have "low"overall critical thinking dispositions, and those who scored more than 300 (50x6) were considered to have "high" overall critical thinking dispositions. Scores of the items 05, 06, 09, 11, 15, 18, 19, 20, 21, 22, 23, 25, 27, 28, 33, 36, 41, 43, 45, 47, 49, and 50 in the scale were reversed and taken into account as such. The sub-dimensions of the scale were determined as "analyticalness", "open mindedness", "inquisitiveness", "self-confidence", "truth-seeking", and "systematicness" (Kökdemir, 2003a).

1. Analyticalnes ssub-dimension: It consists of a total of 10 items (02, 03, 12, 13, 16, 17, 24, 26, 37, 40). Its internal consistency coefficient was found to be 0.75.
2. Open mindedness sub-dimension: It consists of a total of 12 items(05, 07, 15, 18, 22, 33, 36, 41, 43, 45, 47, 50).Its internal consistency coefficient was found to be 0.75.
3. Inquisitiveness sub-dimension: It consists of a total of 9 items (01, 08, 30, 31, 32, 34, 38, 42, 46). Its internal consistency coefficient was found to be 0.78.
4. Self-confidence sub-dimension: It consists of a total 7 of items(14, 29, 35, 39, 44, 48, 51).Its internal consistency coefficient was found to be 0.77.
5. Truth-seeking sub-dimension: It consists of a total of 7 items(06, 11, 20, 25, 27, 28, 49).Its internal consistency coefficient was found to be 0.61.
6. Systematicness sub-dimension: It consists of a total of 6 items(04, 09, 10, 19, 21, 23). Its internal consistency coefficient was found to be 0.63 (Kökdemir, 2003a).

Semi-structured ınterview form

In this study, semi-structured interview technique was used to examine,both before and after the experimental process,the knowledge of the preservice teachers, who participated in the critical thinking skills education, about the concept of critical thinking. It was done to examine their opinions with regards to the experimental process, and to allow them to make their statements through their own expressions.Semi-structured interview is a technique in which questions are prepared beforehand in an open-ended manner in order to collect data while explaining details on any given subject (Esterberg, 2002). Open-ended questions make it easier for participants to give their answers as they wish, as well as for the researcher to collect, compare and analyze data (Karasar, 2012).

The interview form was prepared by the researcher in order to obtain detailed information about both the prior knowledge and the learning process both before and after the experimental process.The literature available on critical thinking and critical thinking dispositions was reviewed during the elaboration of the interview form, and a pool of 6 questions was created as a result. The opinions of two people, who are experts in the field of curriculum development, about the form were sought for first. The opinion of a specialist in Turkish Language and that of specialist in measurement and evaluation were sought for. In this way, a total of four experts were consulted about the form, and the necessary corrections and changes were made in the form in line with the opinions and suggestions of these experts. The questions were prepared in a certain manner to ensure that they are not multi-dimensional and that they do not create unnecessary burdens on the participants, in order to enable the participants to provide clear, understandable and detailed answers.Care was taken to prepare clues that are to be provided in case the questions could not be

comprehended (Yildirim and Simsek, 2013). The interview form was tested in advance on three preservice teachers, and finalized based on whether these preservice teachers understood the questions included in the interview form or not. Pilot applications help the researcher to determine the purpose, which the interview form serves, and whether the interview is suitable for the group that is to be interviewed (Yildirim and Simsek, 2013).

Application procedures

Critical thinking education would not be deemed to have been provided only by informing about what critical thinking skill is, the importance of the critical thinking skill, and how it can be applied (Van Gelder, 2005). Applied activities and methods towards applied activities should be used in critical thinking education. According to Bezanilla et al. (2019), the methods that university teachers use most frequently to develop critical thinking can be categorized into three groups: The first group includes methods of verbal and written communication, discussion, analysis and synthesis; the second group includes case studies, collaborative learning, and real life problems; whereas the less used third group includes methods of evaluation, follow-up and feedback.

Methods and techniques such as brainstorming, role playing, six thinking hats, analogies, concept maps, metaphors, schema, case studies, vision development, and problem solving are recommended to be used in a critical thinking course (Bonk and Smith, 1998; Van Gelder, 2005). A review of the studies conducted by Tsui (2002), Makhene (2017), Olivares and Heredia-Escorza (2012) reveal that the studies carried out orally and in writing are the best methodologies. Galinsky and Gardner (2016) also state that asking open-ended questions, such as "Why?", "How?", "How come?", "Why did this happen?", and "What will happen next time?" are critical in critical thinking education. It was demonstrated in a study conducted by Cleveland (2015), which aims to teach critical thinking by using the method of socratic inquiry, that socratic inquiry is an effective way that encourages and develops critical thinking. In the study conducted by Gurdoğan-Bayir (2010), on the other hand, it has been demonstrated that current events are effective in developing critical thinking skills.Problem solving method and the practice of regular writing were also found to have a positive effect on critical thinking (Quitadamo and Kurtz, 2007). It should also be noted that it is necessary to have a classroom environment that is focused on student and teacher interaction in order to develop critical thinking (Arnett, 2014).

In this framework, methods such as in-class discussions, case studies, writing studies, questioning techniques and real life problems were utilized in this study. Analysis, synthesis and evaluation of case studies have been tried to be made in this course in order to use the problem solving method.Care was taken to ask thought-provoking questions to overcome students' reluctance during the in-class discussions. Attention was paid to create tables of pros and cons while making analyses. Some of the case studies were animated and in some cases drama method was utilized.In order to demonstrate how effective the education given within the framework of the Critical Thinking course is, the group comprising the preservice teachers, who enrolled in the Critical Thinking course, which was included in the curriculum as an elective course, is designated as the experimental group and these preservice teachers took a one-semester course. 57 volunteers included in the experimental group have taken the "Critical Thinking" course, conducted by the researcher himself, in the form of a 90 min block lesson that is held once a week, for 13 weeks.During the education program, theoretical explanations about critical thinking were made first, and in the following weeks, the students developed critical thinking skills by means of relevant educational activities, which are briefly given in Table 2.

Data collection

An information session was held on 27.09.2018 about the study to be conducted. Preservice teachers were informed that the answers they will provide on a voluntary basis will not affect their semester grades, that confidentiality is essential, and that no names will be used within the scope of the study. The collection of research-related data was first started with the California Critical Thinking Disposition Scale pre-test, which was completed by the preservice teachers, who enrolled in the critical thinking course and accepted to participate in the study, in order to determine their critical thinking disposition levels before the start of the course.The test form was given to the students by a test manager at a scheduled time on the determined day and they were provided to fill the form. When the test was completed, the students put the test in a designated box placed in the class. A total of 61 people completed the test. After the test, 61 candidates who voluntarily participated in collecting data for the qualitative dimension of the research from 61 people, were asked about what they understood and their opinions about the lesson when critical thinking was asked within the framework of the interview form.The test form was administered to the students by a test manager at a scheduled day and at a scheduled time. The students put the test in a designated box in the class after they have completed the test. A total of 61 students completed the test. After the pre-test, 15 out of these 61 students, who voluntarily participated in the qualitative dimension of the research, were asked within the scope of the interview form about what they understand from the concept of critical thinking and about their opinions in respect of the critical thinking course. The researcher conducted the interview avoiding any manipulation in the interview questions. California Critical Thinking Disposition Scalepost-test was administered after 13-week long experimental process was completed by the students on 28.12.2019, and the completed forms were collected in a box. 3 of the 61 people, who had completed the pre-test were absent on the day of the post-test and 1 person's test was considered invalid, hence the study ended with 57 people. After the completion of the post-test, the final data were collected from 14 of the 15 volunteering students (one of these 15 students was absent), who were interviewed initially to collect the qualitative data after the pre-test within the framework of the semi-structured interview form that contain questions in order for the students to evaluate the critical thinking course and redefine critical thinking.

Data analysis

Analysis of the quantitative data

Kolmogorov-Smirnov and Shapiro-Wilk normality tests were performed in the analysis of the quantitative data obtained in the study in order to understand whether the data exhibit normal distribution or not. The pre-test and post-test data of the experimental group were analyzed by using paired sample t-test to determine whether the critical thinking education provided has made a difference in the students' critical thinking dispositions (Altunisik et al., 2010). On the other hand, content analysis method was used in the analysis of qualitative data.

Analysis of the qualitative data

Validity: The collected data were examined in detail and the opinions of the preservice teachers that were interviewed were frequently included in the data analysis through direct quotations. The results of the study were explained based on these data. In this way, the validity work of the study was performed.

External validity: Results of this study are consistent with the

Table 2. Analysis of the critical thinking definitions provided by the students following the completion of the course.

Basic information	Defination
An infrastructure was tried to be created for critical thinking, within the framework of the determined questions.	What is thinking? What is critical thinking? And What is not? What are the characteristics that the individuals who perform critical thinking should possess? What is the role and importance of critical thinking in the 21st century? How can critical thinking be taught? What is the effect of the teacher on the development of critical thinking? How should be the classroom atmosphere in which critical thinking is to be developed?
Questioning the accuracy of information to solve the problem, searching for evidence for claims, and summarizing the situation	Participants are informed about how they can access reliable information. Participants are asked questions in order to determine whether they are aware of valid and invalid generalizations. Participants are directed to ask relevant questions and any well-thought questions asked by the participants are rewarded. The participants are asked to ask each other questions about the text they have read, such as: What did you do to identify the problem? Did you talk to the others about the problem? How do you decide what to do? Have you thought again onthe decision you have made? How did you decide that your answer was correct? Has your choice ever been wrong? How did you figure out that this method was not working? Did the methods you have used in the problems you encountered before work out here as well? (Korkmaz, 2018) Participants are given enough time to consider and prepare their answers to the questions. It is reminded to the participants that they should summarize before the remarks, and that it would be useful for them to use materials such as concept maps and charts.
Studies on dwelling on what is known, what is misunderstood and what ought to be known and on asking the right questions (Information Table)	With regards to a given subject; Reviewing what is known about that subject. Reviewing whether the information is evidence-based or not Identification of points that cannot be proven but are presumedto be familiar Creating an "information" table that consists of “The things I want to know about the subject”, and “The things I'm curious about” Creating an "information" table after the subject has been covered in class that consists of; “The things I have learned about the subject”, and “The things, which I thought were true” (Crawford vd., 2005). Participants are encouraged to use concept maps or charts when summarizing.
	A case study text such as “Teacher Burak's Excitement”, or a movie such as “Captivity”, or a caricature that depicts “Capitalist System”, is reflected in the classroom. Participants are asked to guess what can be inferred from the name of the event found in the image.

Table 2. Contd.

	Creating an information table about the event after the event is understood by everyone
	Having read or watched, participants are asked about the state of the guesses they have made.
	Those who made the right guesses and those who did not make the right guesses are asked to tell the reasons as to why their guesses were right or wrong.
Analysis and Inference Studies:	Group work is conducted, where the participants can discuss the correctness of their answers about a given event, with their friends. They are asked to take into account the steps of problem-solving.
Case study	It is discussed whether an alternative ending can be written and alternative scenarios are animated.
Cartoon	Participants are asked to make an inference based on a given text, a caricature or a movie.
Movie	They are asked to explain what they are based on in the inference made. Was it constructed having started with the general and ended with the specific or vice versa?
	It is emphasized that participants should prove their opinions and reasons that refute or support a claim (Kormaz, 2018).
	Participants are encouraged to use concept maps or charts when summarizing.
	Showing Empathy
	Participants are given a situation and are asked to improvise this situation through drama.
Drama studies	As it is in the case of “A customer who dines at the restaurant that calls the waiter when he/shesees that there is a fly in the meal that was served”
	After the animation, students, who played the role of waiter and customer, are asked to switch their roles and animate the scene once more.
	A problem is brought up and the participants are asked to come up with a solution.
	For example, "How do the students gain the habit of reading?"
	The resulting opinions are written on the board without being criticized.
Brain-storming	The opinions expressed are discussed, and it is asked whether they are compatible with the opinions expressed to date.
	It is asked whether the opinions provided before were successful or not.
	Unsuccessful opinions are eliminated.
	They are asked about the kind of benefits they have expected out of re-expressing a failed opinion.
	Stating that others'views will be valuable and referring to others' views while explaining his/her views
	It is stated that the participant should listen to the opinions of other people in order to be aware of his/her prejudices.
	For example, "How will the developments in education contribute to the national economy?"
	Participants are divided into groups to defend their ideas.
Diagonal Method	Ideas are written on a cardboard and corners are created.
	People in the same corner may be asked to reach a consensus and write a report.
	Students are given the opportunity to prepare for the activity.
	Participants are encouraged to use concept maps or charts when summarizing.
	Participants are given assignments/studies that will require them to investigate opinions and reasons that refute or support a claim.
	(Kormaz,2018).
	Discussions are held in accordance with the six thinking hat technique.
Six Thinking Hats	Students are provided feedback on whether the words or expressions they used are clear and understandable.
	Participants are encouraged to use concept maps or charts when summarizing.

conceptual context of the research question. The explanations that are necessary to be provided in order for the results obtained in this study to be tested in other studies were provided. To ensure that the results of this study can be generalized to similar environments, the reader has been properly informed about all stages of the study. The reader may not be able to generalize the results of this study directly to his/her own environment. However, he/she may at least draw some conclusions that may apply to his/her environment, which would increase the generalizability of the qualitative results of this study (Yildirim and Simsek, 2013).

Table 3. Critical thinking dispositions pre-test results.

n	$\bar{X}$level	ss
57	250.78, Moderate	22.38

Table 4. Critical thinking dispositions pre-test scores normality test results.

Kolmogorov-Smirnov[a]			Shapiro-Wilk		
Statistics	**df**	**p**	**Statistics**	**df**	**p**
0.067	57	0.200*	0.989	57	0.865

Table 5. Distribution of preservice teachers' pre-test scoresby the critical thinking disposition sub-dimensions.

Pre-test		Low			Moderate			High			Overall		
		f	$\bar{X}$	%	F	$\bar{X}$	%	f	$\bar{X}$	%	$\bar{X}$	ss	level
		20	227.05	35.1	37	263.60	64.9	0		0	250.78	22.38	Moderate
Sub-dimensions *	**1**	11	36.72	19.3	26	44.84	45.6	20	53.75	35.1	46.40	6.78	Moderate
	2	12	36.04	21.1	38	44.17	66.7	7	51.07	12.3	43.30	5.12	Moderate
	3	17	34.18	29.8	28	44.16	49.1	12	53.42	21.1	43.12	7.41	Moderate
	4	30	32.05	52.6	19	43.08	33.3	8	53.21	14.0	38.69	8.58	Low
	5	29	34.04	50.9	25	43.09	43.9	3	51.90	5.3	38.95	6.71	Low
	6	23	33.55	40.4	27	43.14	47.4	7	51.42	12.3	40.29	6.79	Moderate

*1, Analyticalness; 2, Open Mindedness; 3, Inquisitiveness; 4. Self-confidence; 5, Truth-seeking; 6, Systematicness.

Reliability: In this study, the researcher wanted to obtain the following: learn how to conduct an effective and productive critical thinking education, learn how critical thinking disposition could increase, know the misconceptions people have about critical thinking and the origins of these misconceptions, find out how these misconceptions can be eliminated as a result of an efficient critical thinking education, and learn how to avoid directing preservice teachers that have been interviewed while seeking for answers to these questions. In short, the role of the researcher was only to ensure that the preservice teachers speak in line with the subject and purpose of the study.In the study, the researcher received support from another specialist regarding the data obtained through the interview and about the analysis of these data. For this purpose, each stage of the study was decided together. In this way, any differences that are likely to occur between the data and the the analysis were minimized. In the content analysis method, the fact that different analysts and observers reach the same or similar results on the basis of the analyzed documents increases the objectivity and reliability of the findings (Tavsanci and Aslan, 2001). Additionally, the factors to be considered in forming the questions and while conducting the interview were decided after having them discussed with the experts.

RESULTS

Quantitative results

Students' critical thinking disposition pre-test scores are given in Table 3. The critical thinking dispositions pre-test scores of the students exhibit normal distribution as their significance level was found to be greater than 0.05 on the basis of the Kolmogorov-Smirnov and Shapiro-Wilks tests. Critical thinking disposition pretest scores revealed that the students' overall critical thinking dispositions level was moderate with an average score of $\bar{X}$= 250.78 (Table 4).

As it can be seen in Table 5, students' pre-test scores revealed that 20 students had low overall critical thinking disposition with an average score of $\bar{X}$ =227.05; whereas 37 students had moderate overall critical thinking disposition with an average score of $\bar{X}$ =263.60. None of the students from the experimental group was found to have high overall critical thinking disposition. On the other hand, distribution of the pre-test scores by sub-dimensions revealed the following results; In the analyticalness sub-dimension; 11 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 36.72; 26 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44.84; and 20 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 53,75.

In the open mindedness sub-dimension; 12 students were found to have low critical thinking disposition with

Table 6. Critical thinking dispositions post-test results.

n	$\bar{X}$	ss
57	266.66	25.42

Table 7. Critical thinking dispositions post-test scores normality test results.

Parameter	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistics	df	p	Statistics	df	p
Critical thinking dispositions post-test	0.069	57	0.200*	0.987	57	0.816

an average score of $\bar{X}$ = 36.04; 38 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44,17; and 7 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =51.07.

In the inquisitiveness sub-dimension; 17 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 34.18;28 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44,16; and 12 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =53.42.

In the self-confidence sub-dimension; 30 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 32.05; 19 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 43.08; and 8 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =53.21.

In the truth-seeking sub-dimension; 29 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 34.04; 25 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 43.09; and 3 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =51.90.

In the systematicness sub-dimension; 23 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 33.55; 27 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 43.12; and 7 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =51.42. Students' critical thinking disposition post-test scores are given in Table 6.

The critical thinking dispositions post-test scores of the students exhibit normal distribution as their significance level was found to be greater than 0.05 on the basis of the Kolmogorov-Smirnov and Shapiro-Wilks tests.

As it can be seen in Table 7, students' post-test scores revealed that 9 students had low overall critical thinking disposition with an average score of $\bar{X}$ = 230.96; 43 students had moderate overall critical thinking disposition with an average score of $\bar{X}$ =268.29; and 5 students had high overall critical thinking disposition with an average score of $\bar{X}$ =316.94. The fact that there were 5 students, who had high overall critical thinking disposition after the experimental process, compared to the fact that there was no such students before the experimental process, indicates that the critical thinking education provided was beneficial.On the other hand, distribution of the pre-test scores by sub-dimensions revealed the following results.

In the analyticalness sub-dimension; 6 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 38.00; 23 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 45.57; and 28 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =53.71. Despite the fact that preservice teachers' critical thinking disposition level in the analyticalness sub-dimension was still moderate, their mean scores rose from $\bar{X}$ = 46.40 to $\bar{X}$ =48.77.

In the open mindedness sub-dimension; 9 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 34.44; 20 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 45.99; and 28 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =52.35. Despite the fact that preservice teachers' critical thinking disposition level in the open mindedness sub-dimension was still moderate, their mean scores rose from $\bar{X}$ = 43.30 to $\bar{X}$ =47.29.

In the inquisitiveness sub-dimension; 12 students were

Table 8. Distribution of preservice teachers' post-test scoresby the critical thinking disposition sub-dimensions.

Post-test		Low			Moderate			High			Overall		
		f	$\bar{X}$	%	f	$\bar{X}$	%	f	$\bar{X}$	%	$\bar{X}$	ss	Level
		9	230.96	15.8	43	268.29	75.4	5	316.94	8.8	266.66	25.42	Moderate
Sub-Dimensions*	1	6	38.00	10.5	23	45.57	40.4	28	53.71	49.1	48.77	5.89	Moderate
	2	9	34.44	15.8	20	45.99	35.1	28	52.35	49.1	47.29	6.97	Moderate
	3	12	35.09	21.1	24	44.03	42.1	21	53.60	36.8	45.67	7.54	Moderate
	4	26	33.79	45.6	20	44.14	35.1	11	54.03	19.3	41.32	8.50	Moderate
	5	20	33.50	35.1	27	42.96	47.4	10	52.00	17.5	41.22	7.51	Moderate
	6	14	33.69	24.6	39	44.36	68.4	4	53.34	7.0	42.36	6.54	Moderate

*1, Analyticalness; 2, Open Mindedness; 3, Inquisitiveness; 4. Self-confidence; 5, Truth-seeking; 6, Systematicness.

found to have low critical thinking disposition with an average score of $\bar{X}$ = 35.09; 24 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44.03; and 21 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =53.60. Despite the fact that preservice teachers' critical thinking disposition level in the inquisitivenesssub-dimension was still moderate, their mean scores rose from$\bar{X}$ = 43.12 to $\bar{X}$ =45.67.

In the self-confidence sub-dimension; 26 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 33.79; 20 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44.14; and 11 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =54.03.Preservice teachers' critical thinking disposition level in the self-confidence sub-dimension rose from low to moderate, whereas their mean scores rose from$\bar{X}$ = 38.69 to $\bar{X}$ =41.32.

In the truth-seeking sub-dimension; 20 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 33.50; 27 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 42.69; and 10 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =52.00.Preservice teachers' critical thinking disposition level in the truth-seekingsub-dimension rose from low to moderate, whereas their mean scores rose from $\bar{X}$ = 38.95 to $\bar{X}$ = 41.22.

In the systematicness sub-dimension; 14 students were found to have low critical thinking disposition with an average score of $\bar{X}$ = 33.69; 39 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ = 44.36; and 4 students were found to have moderate critical thinking disposition with an average score of $\bar{X}$ =53.34. Despite the fact that preservice teachers' critical thinking disposition level in the systematicness sub-dimension was still moderate, their mean scores rose from $\bar{X}$ =40.29 to $\bar{X}$ = 42.36.

As seen in Table 8, mean critical thinking dispositions post-test scores($\bar{X}$ = 266.66) are significantly different from mean critical thinking dispositions pre-test scores ($\bar{X}$ = 250.78). Similarly, a significant difference was found between the pre-test and post-test data in each and every sub-dimension of critical thinking dispositions. Particularly in the self-confidence and truth-seeking sub-dimensions, the average level of critical thinking dispositions increased from low to moderate. These findings have demonstrated that the course taught had a significant effect on critical thinking dispositions.

Qualitative results

In 7 of the opinions expressed before the experimental process by the volunteering students, who were enrolled in the critical thinking course, a negative approach was expressed towards the concept of critical thinking. Some of these opinions are as follows:

Negative Opinions

"I think of critical thinking as always trying to find someone's negative aspects and discuss about these aspects (student 2)"
"...criticizing, disliking… (s4)"
"I think one-dimensionally on issues that I need to think critically...sometimes there are things that we don't want to accept (s6)"
"…I think about how this lesson will benefit us, and I find this course unnecessary (s7)"
"…I see critical thinking as negative thinking. Having only negative thoughts against someone… (s12)"

Based on the above-mentioned opinions, we can say that the students holding these opinions perceive critical

thinking as seeing events through a negative angle, dealing with the negative aspects, satirizing, and finding the deficiencies. It is understood that they perceive critical thinking as a one-sided and negative phenomenon. 3 of the preservice teachers reported neutral opinions. They generally stated in their statements that nothing comes to their minds when they think about critical thinking, and that they do not have sufficient information about the subject. Their statements are as follows:

Neutral opinions

"Frankly, I don't have any idea. (s5)"
"…to be honest, I have no idea about critical thinking. (s8)"

On the other hand, 4 of the preservice teachers, who have a certain level of knowledge and information about critical thinking, have demonstrated that they perceive critical thinking as doing research, questioning as well as reaching a conclusion by determining and evaluating the right and wrong within the framework of certain criteria from a multi-directional perspective. Their statements are as follows.

Positive opinions

"Critical thinking is a multi-faceted thinking on concrete or abstract issues to make definitive decisions. It is to think about a subject by evaluating it as good and bad… (s9)"
"It is to think more analytically and multi-faceted about any event or situation, and to make positive and negative inferences (s14)".

It cannot be said that students had sufficient knowledge and information about critical thinking prior to the start of the course. Although some of the opinions expressed were positive, it was seen that the majority of the students had incomplete information about critical thinking. It is not likely that individuals with insufficient information about critical thinking would possess critical thinking dispositions.In the light of these determinations, the procedures with regards to the experimental process were carried out and firstly the issue of what should beunderstood from critical thinking has been resolved. Later, lessons were continued to be taught using the appropriate techniques and methods to improve critical thinking, and the preservice teachers were encouraged and promoted to develop the desire to use these critical thinking skills in life. In this framework, volunteered preservice teachers, who attended the course, were asked again about their views on critical thinking education at the end of the semester. One of the preservice teachers stated that he/she did not experience any change as a result of having taken the course, with his/her following statement;
"Actually, I can't talk about a big change. Because I knew more or less what it was and I could already think critically in the face of events… (s14)"

With his/her above statement, the preservice teacher stated that he/she did not see any benefit as he/she already had enough knowledge of the subject. The reason why he/she made such a statement could be due to the fact that the repetition of what is already known may have created boredom, which would mean that he/she did not consider the course as unnecessary in general, but considered the course as unnecessary only for him/herself. As a matter of fact, 2 other preservice teachers reported that they experienced a partial change. They had expressed their opinions as follows.

Partially beneficial

"Some of my thoughts have changed. Because I didn't think it was such a comprehensive lesson. I learned that critical thinking is a very broad concept. I have come to know that some of the things that I know as truths were actually wrong (s13)"

"My ideas did not change but improved after taking the lesson. Previously I was thinking that critical thinking would be possible with a certain level of knowledge, and I think that now, too; so nothing has changed in that respect. However, now I understood better that approaching a situation from a different perspective, establishing a cause-effect relationship, and making the right choices and evaluations could only be possible with critical thinking(s1)"

The remaining 11 preservice teachers stated that the lesson was beneficial. They stated that they should make research and questioning before making a judgment within the framework of reason and logic, that they should consider all cases regardless of whether it is a case they desire or not, that they should empathize, that the stress negatively affects the decision-making process, that they should determine the good and bad aspects of the events, and that they should make decisions within the framework of criteria. In particular, it was observed that they focused on the phrase of "not to have blinders on". With this phrase they meant to having stayed away from having one-sided view.They had expressed their opinions as follows.

Beneficial

"Yes, my ideas have changed. Because, thanks to the course, I learned how to think critically. Now I am trying to empathize with the other person to understand him/her. Since reasoning is important in critical thinking, I think critically by reasoning the issues(s5)"

Table 9. T-test results related to the difference between the mean pre-test and post-test scores of the experimental group.

Parameter	Test type	N	Level	$\bar{X}$	ss	sd	t	p
Critical thinking dispositions	Pre-test	57	Moderate	250.78	22.38	56	-5.911	0.000*
	Post-test	57	Moderate	266.66	25.42			
Analyticalnesssub-dimension	Pre-test	57	Moderate	46.40	6.78	56	-2.401	0.020*
	Post-test	57	Moderate	48.77	5.89			
Open mindednesssub-dimension	Pre-test	57	Moderate	43.30	5.12	56	-5.071	0.000*
	Post-test	57	Moderate	47.30	8.37			
Inquisitivenesssub-dimension	Pre-test	57	Moderate	43.14	7.40	56	-2.895	0.005*
	Post-test	57	Moderate	45.67	7.54			
Self-confidencesub-dimension	Pre-test	57	Low	38.70	8.57	56	-2.272	0.027*
	Post-test	57	Moderate	41.33	8.50			
Truth-seekingsub-dimension	Pre-test	57	Low	38.95	6.71	56	-2.049	0.045*
	Post-test	57	Moderate	41.23	7.52			
Systematicnesssub-dimension	Pre-test	57	Moderate	40.29	6.79	56	-2.300	0.025*
	Post-test	57	Moderate	42.37	6.54			

P<0.05.

"…thanks to the course, my knowledge has improved. I learned that many things I knew that I thought were correct were actually wrong. I learned that I have to be attentive to look for evidence before I believe in something (s4)"
"Yes, I think the course had good contributions. It gave us different perspectives. It forced us to think. It enabled us not to look through blinders when looking at any event…Otherwise, when facing a situation, we write the end of the story as we wish, but the next thing you know usually is that it has ended the other way around… (s7)"
"I was thinking of critical thinking as negative thinking…Thanks to the course, my thoughts have changed. Previously I was biased against critical thinking, but now first of all I determine the pros and cons of an event, make a comment on the basis of certain researches, and make sure that I only speak of things based on evidence(s12)"
"After the course was over, I learned to think critically more comprehensively, and my ideas changed in the positive direction… I started to make decisions only after thinking over all the positive and negative aspects (s9)"

At the end of the experimental process, students were again asked about what critical thinking means to them, and the answers obtained were analyzed. It was seen within the framework of the answers given by the students that the students have used the following concepts when defining critical thinking (Table 9).

Concepts frequency

Multifaceted viewpoint14
Making an assessment based on criteria13
Seeking a cause and effect relationship10

Reasoning and ratiocinating 8

Total 45

Multifaceted viewpoint

"I can define critical thinking not as perceiving events negatively, but as reaching a result by determining the pros and cons of events and situations. A teacher would encourage an individual to have a worldview by developing his/her critical thinking skills (s12)."
"Critical thinking is to interpret the situations and facts from a different perspective. I used to try to look at the events from a single point of view. I would have done this either because this single point of view would have corresponded to the state that I desire it to happen or because I would not try to look at the events from other angles since I would think that I would be tired of doing that. But since then I have started to empathize…(s7)"
"Critical thinking skill corresponds to individual's production, use and evaluation of the information. It is

questioning. It is to avoid looking at an event onlyfrom a single perspective (s2)"

Analysis of the data revealed that the preservice teachers define critical thinking first of all as a perspective, and that they think of critical thinking as looking at the events not only from their own perspectives, but also through the eyes of others. We can say that they refrain from reaching a conclusion without determining the pros and cons as well as the positive and negative aspects in the events. In short, we can say that they abandoned the one-way perspective so called "having blinders on". Moreover, they nowtry to empathize to take these perspectives into consideration.

Making an assessment based on criteria

"…I started to make decisions based on certain criteria by taking all pros and cons into consideration before making a final decision (s9)"
"Critical thinking is the positive and negative evaluation and analysis of a situation, event, judgment, or a person on the basis of the causes and consequences… A teacher that fully possesses the critical thinking skill will never be a teacher that commends rote learning and that uses old methods all the time. Such a teacher is a teacher who is versatile, evolving, open to innovation and change (s4)"

Preservice teachers indicated in their statements that in case they have to make a judgment in order to achieve a result, they take into account the criteria established by them or others and pay attention to stay away from taboos. It can be said that they create these criteria based on evidence.

Seeking a cause and effect relationship

"Critical thinking skill implies the individual's positive or negative judgment on any subject… It is to investigate the causes and to question how it has attained its current state (s8)"
"It is to have different perspectives when evaluating a situation. It provides accurate inferences by establishing a connection between events and finding the causes (s1)"

The participants reveal in their statements that they understood with a determinist approach the fact that certain causes have certain results under certain conditions. They clearly stated that if there is a situation and a result, there is also an underlying source and a cause. It is possible to say that preservice teachers, who have understood the importance of first revealing the reason of a situation and a result, are not in a hurry to make a judgment.

Reasoning and Ratiocinating

"It is to handle an event or situation from every perspective when evaluating it… Reasoning is important in critical thinking. I can think critically about the issues that I can ratiocinate (s5)"
"Critical thinking is thinking with a different method and understanding. Critical thinking furnishes the individual with features such as questioning, predicting the outcome within the framework of logic based on what is available, making judgments, and analytical thinking (s13)"

The participants clearly stated the fact that logic is an important element of critical thinking. It can be said that the participants try to predict the results that can be reached or cannot be reached in the light of the information that is available and that is not, through reasoning within the framework of logic. In their predictions, they pay attention to be based on evidence.

DISCUSSION

The scores of the pre-test conducted in the experimental group revealed that 20 students had low critical thinking dispositions, and 37 students had moderate critical thinking dispositions, whereas no student was found to have high critical thinking disposition.The overall critical thinking disposition of the experimental group comprising 57 students was found to be at a moderate level. In terms of sub-dimensions, they were found to have moderate critical thinking dispositions in the analyticalness, open mindedness, inquisitiveness and systematicness sub-dimensions, whereas they were found to have low critical thinking dispositions in the self-confidence and truth-seeking sub-dimensions. Measurements conducted after the experimental process revealed significant results compared to the pre-test data.In terms of overall scores, 5 students were found to have attained high level of critical thinking after the experimental process compared to the pre-test scores, where there was no one who had high level of critical thinking disposition.Thus, although the results have not changed in terms of overall critical thinking disposition level, they were sufficient to give rise to significant differences between the pre-test and post-test data, the mean scores of which were found to be $\bar{X} =$ 250.78 and $\bar{X} =$ 266.66, respectively.This results have demonstrated that the critical thinking education provided has contributed positively to the critical thinking skills and critical thinking dispositions of the participating students.The results obtained in terms of overall scores were observed in the sub-dimensions of the scale as well. Statistically significant differences were found between the mean pre-test and post-test scores of all sub-dimensions of critical thinking disposition scale.In addition, students who were found to have a low level of critical thinking dispositions in the self-confidence and truth seeking sub-dimensions on the basis of the pre-test

data,were found to have reached a moderate level of critical thinking dispositionsas a result of the education provided, as it was detected on the basis of the post-test data.

In the light of the findings obtained in the study, it was seen that the students' critical thinking skills have developed in the positive direction. Moreover, there was also a positive change in the students' critical thinking dispositions. Negative opinions were predominant in the definitions of critical thinking provided by the preservice teachers prior to the course. Preservice teachers were thinking of critical thinking as a one-sided and negative point of view. Having reviewed the answers given by the preservice teachers within the scope of the interviews conducted after the completion of the course,it was determined that they started to look at an event or a situationfrom a multi-faceted perspective and not from a one-sided perspective, and that they developed the tendency to make an assessment of the current situation or event by taking its pros and cons into account. On the other hand, when the statements of preservice teachers were reviewed, it was seen that the factors that allowed them develop critical thinking skills were to start evaluting an event firstly by asking questions, to discuss the differences between the beginning of an event and the point reached, and to seek supportive evidence for their thoughts that were shaped in light of the available information.We can say that at that stage they were now making evaluations within the framework of logic. This was an expected outcome, since critical thinking involves believing in the consequences of logic (Nosich, 2016). Furthermore, critical thinking is to reason objectively taking into account both pros and cons, to make impartial judgments, to ask for the claims to be supported with evidence, to reach a conclusion based on existing facts and not on the basis of imaginary information, and to solve the problems (Willingham, 2007). The fact that preservice teachers had been furnished with these qualities was a proof that the study has achieved its intended objective.The fact that the students were asked to give their opinions on critical thinking, that they were asked to explain why they think in that way, and that they explained their opinions through reasoning based on the available evidence were effective in the outcome achieved. In addition, they were also asked to empathize when explaining their thoughts, and this allowed them to be able to view an event from different perspectives.It was scrutinized whether they were stressed or not at the moment they made their decisions, and any existing differences were evaluated in order for them to account for profits and losses.It turns out that critical thinking is not a quick process, but rather a time-consuming way of thinking. It was also an important finding that the students have established criteria for making decisions. According to Kahneman (2011), critical thinking is an insightful way of thinking and making judgments, which replaces quick, one-way and automatic thinking that would lead to unfair and quick decision-making. From this point of view, it can be said that the preservice teachers thought of critical thinking as a one-sided negative way of thinking prior to the course, whereas after the completion of the course they started to think of critical thinking as a way of thinking that includes perceiving the events in a multi-faceted way and evaluating them through reasoning and taking the cause and effect relationships into consideration.It is useful to underline another point, which is the fact that the preservice teachers turned to seek logic in events and situations considering that certain causes have certain results was another positive outcome of the study. Similar situations were also observed in the study conducted by Koc-Erdamar and Bangir-Alpan (2017) on high school teachers.The results obtained in this study are consistent with the results of the studies conducted by Eldeleklioglu and Ozkilic (2008), Aybek (2006), Plath et al. (1999), with university students, the mental processes used by students in the decision-making process in uncertainty situations were investigated and it was observed that the groups with a high tendency to think critically were able to make more realistic decisions.Thus, it can be said that the 5 preservice teachers, who have reached a high critical thinking disposition level as a result of this experimental study, can make more realistic decisions in uncertainty situations. This is an important finding that reveals the benefit of the education provided within the scope of this study.

In the study conducted by Chukwuyenum (2013), the effect of critical thinking on students' mathematics achievement was studied, and a significant difference was found between the achievement levels of students that have received critical thinking education and the ones that did not. On the other hand, a positive relationship was found between critical thinking and success in the study conducted by Villavicencio (2011). Looking at the results of such studies, we see that not every success triggers critical thinking, but progress in critical thinking always triggers success. The learning environments, in which students are actively involved, doing research and applying the results of their research, contribute positively to the critical thinking skills of the students, leading them to success (Snyder and Snyder, 2008). Along the same lines, it was clearly stated in Karbalaei's study (2012) that supporting students' critical thinking skills can increase their academic success.

Critical thinking spares us from accepting what others are trying to make us believe without a good reason. In other words, critical thinking prevents us from doing something wrong and believing something wrong (Bowell and Kemp, 2018). Thus, the individual can be protected from being deceived and misled, as he/she can determine what is relevant or important on his/her own (Cottrell, 2017). From this point of view, developing critical thinking skills enables the individual to make sense of events or situations, to make qualified, fast and

correct decisions, to produce better solutions and recognize the available opportunities, to avoid mistakes and to get rid of the deadlocks in his/her mind early (Kallet, 2014).

It is important to underline that rote learning negatively affects critical thinking (Nosich, 2016), and makes it difficult to achieve success and maintain any success achieved. Even though rote learning brings some instant success, the information acquired by rote learning is bound to be forgotten before such information can be used for the purpose they are acquired for. Therefore, it is important to have a critical thinking disposition for lasting success, and the way to achieve this is through education and teacher. Inquiry is a very important starting point in critical thinking education. Ensuring active student participation (Abrami et al., 2018; Browne and Freeman, 2000), giving students the opportunity to express and defend their opinions (Ennis, 2013), group work and debates (Smith et al., 2018; Ten Dam and Volman, 2004) are effective in a process that starts with questions, such as “Why did I come here?”, “Why did it happen like this?”, etc. Teachers have an important role in practicing these methods. First of all, it is necessary to know the subject matter well enough in order to be a good practitioner. Choy and Cheach (2009) stated that teachers see themselves competent if they have in-depth knowledge of critical thinking, and that this is an important factor in the development of critical thinking skills. Yang (2012) found that critical thinking education provided to the prospective teachers in the pre-service period contributes to the personal and professional development of the prospective teachers rendering them educators and critical thinkers, and that they were able to reflect their acquisitions into their lesson designs as a result.

This study is the first study in the field of education at the undergraduate level in Northern Cyprus and in the field of classroom teaching in particular, which gives an idea about the critical thinking dispositions of the preservice teachers studying in Northern Cyprus and the impact of the critical thinking course on their critical thinking dispositions. The findings of this study are consistent with the findings of other international studies, where California Critical Thinking Disposition Inventory (CCTDI) was utilized.

Having acknowledged the importance of the education provided within the scope of this study, it is also important how much the change in their critical thinking dispositions experienced by the students will affect the lives of both the preservice teachers and the students they will provide education for.In other words, it was seen as a result of the education that preservice teachers attained the correct information about what critical thinking really is, but it should be important to know how much of this information they have transferred to life. Rote learning is a characteristic feature in the education systems of some Asian countries (McNeil, 2015), which gives rise to an atmosphere, where deep or multi-faceted view and reasoning, which are thought to be of vital importance in any critical thinking, are not considered important. Considering that the majority of university students coming to study in North Cyprus are of Asian origin, the critical thinking course can be said to be very important not only for preservice classroom teachers but also for all university students. Studies conducted in this direction should thus be given due importance.

RECOMMENDATIONS

In order to teach critical thinking, the teacher him/herself must also be able to think critically and demonstrate his/her own thinking process to the students (Paul, 2012). In this regard, importance should be given to asking questions in teacher education, since critical thinking starts with asking questions (Facione, 2015; Nosich, 2016). Students should be guided in their attempts to ask questions, otherwise they cannot perform well (Coon and Mitterer, 2011; Li et al., 2014).

It is important and necessary for university educators to promote the incorporation of critical thinking into thecurriculum. In addition to developing critical thinking, conducting studies to develop dispositions towards the use of critical thinking will enable undergraduate students to better use their critical thinking skills in a dynamic, complex and challenging life.

Basiga (2006) stated that teachers should themselves become critical thinkers before they teach critical thinking, and that teachers need in-service training to do that. Moreover, this training should also be provided during preservice teacher education in addition to being provided during in-service training. It would be more appropriate to provide the said training during preservice teacher education as a separate course and make it a compulsory course rather than an elective one.

This study has been conducted on critical thinking skill, which is one of the basic thinking skills, and on critical thinking disposition. Similar studies may also be conducted on the preservice teachers having education in other branches of teaching, based on this study, which was conducted on preservice classroom teachers, and the results obtained from these studies can be compared. In addition, other studies may be conducted in order to investigate preservice teachers’ and teachers’ other basic thinking skills.

Based on the fact that critical thinking education has a great influence on the development of teachers' critical thinking skills; studies to be conducted on how much the preservice teachers, who receive critical thinking training, reflect their critical thinking skills to their teaching when they become teachers and whether they become role models for their students in this sense, can contribute to this field of research. In addition, the kinds of activities they implement in order to furnish their students with the

same skills could be another research topic.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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