Intersections between Critical Thinking Skills and Reflective Thinking Skills toward Problem Solving

Eleştirel Düşünme Becerileri ve Problem Çözmeye Yönelik Yansıtıcı Düşünme Becerileri Arasındaki İlişkiler

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Abstract

This study investigates the relationship between the critical thinking skills and the reflective thinking skills toward problem solving and the effects of two variables weekly study hours and social activities on reflective and critical thinking. Positive correlations between reflective thinking and four sub-dimensions of critical thinking, analyticity, systematicity, self-confidence, inquisitiveness, also between critical thinking skills and all three sub-dimensions of reflective thinking, questioning, reasoning, and evaluation, are found. A regression model is obtained to predict the reflective thinking skills toward problem solving with three dimensions of critical thinking skills; self-confidence, analyticity, inquisitiveness. Weekly study hours have a significant effect on both reflective and critical thinking. As time spending on studying increases until 15 hours in a week, questioning and reasoning dimensions of the reflective thinking and inquisitiveness dimension of the critical thinking are increasing. As time spending on studying increases until 20 hours in a week, only evaluation dimension of the reflective thinking are increasing. Being an active undergraduate in studying affect questioning, reasoning, evaluation skills of reflective thinking, and also inquisitiveness skill of critical thinking while social activities affect not only questioning and evaluation dimensions of reflective thinking, but also truth-seeking, open-mindedness, and systematicity dimensions of critical thinking.

Keywords: critical thinking skills, reflective thinking skills, university students, study duration, social activity.

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Öz

Bu çalışma, eleştirel düşünme becerileri ile problem çözme yönünde yansıtıcı düşünme becerileri arasındaki ilişkiyi ve iki değişkenin, haftalık çalışma ve sosyal aktivite saatlerinin yansıtıcı ve eleştirel düşünme üzerindeki etkilerini incelemektedir. Yansıtıcı düşünme ile eleştirel düşünmenin 4 alt boyutu olan Doğruyu arama, Analitik, Sistematiklik, Kendine güven arasında, ayrıca eleştirel düşünme ile yansıtıcı düşünmenin üç alt boyutu olan sorgulama, nedenleme ve değerlendirme arasında pozitif korelasyon bulunmaktadır. Yansıtıcı düşünme becerisini yordayıcı bir regresyon modeli eleştirel düşünmenin 3 alt boyutu olan Doğruyu arama, Analitik, Kendine güven boyutları ile elde edilmiştir. Haftalık çalışma saati süresi, hem eleştirel düşünme hem de yansıtıcı düşünme becerilerini etkilemektedir. Haftalık çalışma süresi 15 saate kadar arttığında, yansıtıcı düşünmenin iki alt boyutu olan sorgulama, nedenleme boyutları ve de eleştirel düşünmenin sorgulama boyutu artmaktadır. Haftalık sosyal aktivite süresi 20 saate kadar arttığında, sadece eleştirel düşünme becerisinin değerlendirme boyutu artmaktadır. Lisans öğrencilerinin ders çalışmada aktif olması yansıtıcı düşünmenin üç alt boyutu olan sorgulama, nedenleme ve değerlendirme boyutlarını ve eleştirel düşünmenin sorgulama boyutunu etkilerken, sosyal aktivitelerde aktif olmak sadece yansıtıcı düşünmenin iki alt boyutu olan sorgulama ve değerlendirme boyutlarını etkilemiyor aynı zamanda eleştirel düşünmenin 3 alt boyutu olan Doğruyu arama, Açık Fikirlilik ve Sistematiklik, boyutlarını etkilemektedir.

Anahtar sözcükler: Eleştirel düşünme becerileri, yansıtıcı düşünme becerileri, üniversite öğrencileri, ders çalışma süresi, sosyal aktivite

Introduction

In the workplace of the future, there is a huge demand for higher cognitive skills like critical thinking and reflective thinking towards problem solving. A brainpower and a workforce fully equipped with critical thinking skills and reflective thinking skills towards problem solving is the demand of our today and future society, therefore, the development of these thinking skills is one of the main common goals in education systems. Critical thinking and reflective thinking skills are the two most important skills that college or college graduates are expected to have in order to contribute to production in the 21st Century and make effective use of the college training (Gogus 2015; Harris 2010; Shinn 2012). College education should support students' thinking skills to develop the habit of organized thinking and of rational analysis, the ability to distinguish the important concepts, and grasp the knowledge of organized solutions to perform better in any job (Gogus 2015; Harris, 2010; Williams, Zdravkovich, and Engleberg 2002). Therefore, the study of university students' critical and reflective thinking skills has become important (Gogus 2015; Demir 2015).

As a kind of thinking skills, development of reflective thinking skills by learners has been adopted in many educational systems (Kember 2010). Reflective thinking is defined as thinking on the problem, producing solutions, applying and evaluating these paths. Additionally reflective thinking leads to future behaviors (Wade and Yarbrough, 1996). Critical thinking that consists of active interpretation and evaluation of observations, effective communication, discussion concepts and the situations correctly (Ennis 1962; Fisher and Scriven 1997). Critical thinking skills are an important issue that contributes to areas such as cognitive processes, self-reflection, social reconciliation and skills on conceptual change in students, but many variables that affect gaining critical thinking skills and reflective thinking skills are not known (Manalo et al. 2013). Understanding university students' reflective thinking skills and critical thinking skills at the points of investigating relations between sub-dimensions of these two thinking skills and affecting variables such as times spending for studying and social activities is important to provide detailed information who intent to develop better thinkers in today's society and support students who have difficulty to gain these skills.

Literature of Intersections between Critical Thinking Skills and Reflecting Thinking Skills towards Problem Solving

Reflective thinking offers opportunities for students to analyze and evaluate learning processes (Ghanizadeh 2017). The first works on reflective thinking belong to John Dewey (1910, revised 1933) who sets out the principles of reflective thinking in his book "How We Think" that is first published in 1910 and revised in 1933. According to Dewey (1933), reflection is possible with the transfer of thoughts to the behavior and the repetition, therefore, Dewey (1933) emphasizes on reflection on action via using systematic research plans that provides change and professional growth during the learning process. In addition to this definition, Schön (1987) emphasizes on reflection in action that is reflection of intuitive knowledge during action. Moreover, it is stated that reflective thinking includes attitudes such as personal values and intellectual development (Carol 2002). Finally, reflective thinking is a systematic, meticulous and disciplined thought, which is also seen as the root of scientific inquiry.

Besides studies on reflective thinking, the reflective thinking skill scale towards problem solving has been developed by Kızılkaya and Aşkar (2009). The scale has three sub-dimensions as questioning, evaluation, and reasoning. These skills are major form of human thought and interpersonal communication to solve a problem. Questioning is the process of developing answers

and insight or the process of exploring an issue and an idea by employing a series of questions. Evaluation is the process of making a judgment. Reasoning is the process of developing logic for an issue. Problem solving is a process of finding a solution through main three steps: (1) problem representation, which is converting the words of the problem into an internal mental representation, (2) problem integration, which involves developing a coherent structure of information and relations, (3) problem solution, which is developing a final answer (Mayer 1992). Problem solving process is a cognitive activity involving using these three elements of reflective thinking.

There are many studies investigating the factors influencing reflective thinking. Some psychological and educational studies report that gender, being a woman (e.g. Gilstrap and Dupree 2008; Tripp 2011, Woods and Book 1995), self-expression (Woods and Book 1995), academic success (Brookfield 1996), hard-work (Gilstrap and Dupree 2008) are predictors of reflective thinking. Reflective thinking offers opportunities for students to analyze and evaluate learning processes via using portfolios, interactive journal printing, reflective papers and developing concept maps (Ghanizadeh 2017).

Researches on reflective thinking practice are based on education work of Mezirow (1991, 1998) categorize reflective thinking practice into four distinct phases (Kember, 2000; Leung and Kember, 2003; Phan, 2007; 2009) in order of importance: habitual action, understanding, reflection, and critical thinking. Critical thinking is considered a higher level of reflective thinking that involves us becoming more aware of why we perceive things, the way we feel, the way we act, and what we do (Phan, 2009). Leung and Kember (2003) found that a surface approach to learning is in line with habitual action, whereas a deep approach to learning is more associated with understanding, reflection, and critical thinking. Phan (2007) emphasizes that a deep learning approach is predictive of understanding and critical thinking. The previous studies have shown that those who have reflective thinking skills develop critical thinking skills and reflective thinking positively affects critical thinking (Erdoğan 2019; Tican and Taşpınar 2015; Aryani, Rais and Wirawan, 2017).

Along with reflective thinking skills, critical thinking skills are concepts that can be supported in most of the learning strategies and methods (Angelo 1995; Cooper 1995; McDade 1995). Critical thinking is the ability to ask questions by analyzing solutions in the light of the pros and cons of a situation (Profetto-McGrath 2003). In critical thinking, the individual understands, interprets, and makes logical conclusions on her thoughts (Cansoy and Türkoğlu 2017). Critical thinking that consists of active interpretation, evaluation of observations, communication, discussion concepts, and other situations correctly (Ennis 1962; Fisher and Scriven 1997). Critical thinking goes back to Socrates and the Socratic Questioning is a technique that is frequently used by students to gain critical thinking skills (Yang, Newby, and Bill 2005). Kuhn (1999) proposes a model of the critical thinking development of all age groups from 15 young children to the elderly. Critical thinking can be taught as evaluating the outcomes of our thought processes—how good a decision is or how well a problem is solved (Halpern 1999), argument analysis (e.g., Kahane 1997), problem solving (Mayer 1992), decision making (Dawes 1988), or cognitive process (Rabinowitz 1993). The intersection of reflective thinking and critical thinking can be interpreted from the definition of critical thinking as the capability of thinkers to be aware and responsible of their own thinking process and to develop reasonable criteria for monitoring and evaluating their own thinking (Ennis 1996; Paul 1993). Critical thinking is the intellectually disciplined process of skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information by observation, experience, reflection, reasoning, or communication, as a guide to belief and action (Petress, 2004; Phan, 2011). Furthermore, critical thinking enables individuals to use analytical and evaluative processes to interpret evidence and

arguments independently of one's prior beliefs and opinions and to avoid interpreting information that may be misconstrued and biased based on prior opinion and belief (Norris & Ennis, 1989; Phan, 2011; West, Toplak, & Stanovich, 2008). Based on Mezirow's (1991, 1998) work involving transformative adult learning, empirical research categorize reflective thinking practice into four distinct phases, in their order of complexity—habitual action, understanding, reflection, and critical thinking (Kember, 2000; Leung & Kember, 2003; Phan, 2007); therefore, critical thinking is considered a higher level of reflective thinking (Phan, 2009; 2011).

For identifying critical thinking skill components, Ennis (1996) summarizes the components of critical thinking as FRISCO, the letters stand for Focus, Reasons, Inference, Situation, Clarity and Overview. Garrison, Anderson and Archer (2001) propose to use six constructs of critical thinking: problem definition, exploration, integration, verification, and resolution, while Yeh (2003) suggests using five major dimensions: hypothesis identification, induction, deduction, explanation, and evaluation. In addition to these classifications, Facione, Facione and Giancarlo (1998) develop the scale California Critical Thinking Disposition Inventory and proposed seven classifications of critical thinking as truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and cognitive maturity. Turkish adaptation study of this scale (Facione, Facione and Giancarlo 1998) done by Kökdemir (2003) suggests to use six classifications as truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness. In these classification, critical thinking skills refer to higher order thinking skills (Halpern 1999) as well as a kind of self-directed, self-monitored, and self-corrective form of thinking (Paul and Elder 2001). To sum up, critical thinking skills refer to the use of cognitive skills or strategies that contributes to areas such as self-reflection, social reconciliation and skills on conceptual change in students (Halpern 1999).

Critical thinking skills of university students especially teacher candidates are commonly examined in the studies in Turkish cultures (Alkın-Şahin, Tunca and Ulubey, 2014; Alper, 2010; Ay, 2005; Cansoy and Tütkoğlu, 2017; Demir, 2015; Erdogan, 2019; Tican and Taspinar, 2015); however, university students other than teacher candidates are not studied in the context of the Turkish culture, also, the prediction of reflective thinking skills towards problem solving with the combinations of dimensions of critical thinking, study time and social activities is not studies in the previous studies. Critical thinking is a necessary skill for academic success (Scott and Markett 1994; Siller 2001) and also it is emphasized that for students to reach their fullest potential in today's society, university students must learn to think and reason critically and apply these thinking skills appropriately (Gogus 2015; Harris 2010; Meyers 1986). In order to use thinking skills to perform any job better, college education should support students to develop the habit of organized thinking, rational analysis, to develop the ability to follow arguments and distinguish the important concepts, and to grasp the knowledge of organized solutions, hierarchical procedures, and rational sequences (Gogus 2015; Harris 2010; Williams, Zdravkovich, and Engleberg 2002). Increasing the number of graduates with critical thinking skills and their problem solving skills is important for the future educational goals (Halpern 1999). In this study, it is aimed to examine the relation between critical thinking and reflective thinking in detail. Additionally, comparisons were made between the duration of the study and the duration of the social activity, which are thought to be influenced by critical thinking and reflective thinking.

Method

This quantitative research study aims to investigate the relationship between reflective thinking and critical thinking and the level of reflective thinking predicted by critical thinking components. In addition, the effects of duration of study and social activity on reflective and critical thinking skills are examined. The research questions include:

　　1. How well we can predict reflective thinking skills towards problem solving with the combinations of dimensions of critical thinking, study time and social activities?

　　2. Do students who differ in study time and social activities differ on a linear combination of two dependent variables (reflective thinking skills towards problem solving and critical thinking)?

Participants and Procedure

This survey study was conducted at a small, private international university in Turkey. The university has 3000 students, and has only three faculties from three areas, engineering and natural sciences, social sciences, and management sciences. The survey instrument, the aim of the research and the consent form were mentioned to undergraduate students via e-mail. The survey conducted as online via e-mail and hard copy surveys. A self-report measure with three parts was administered: Reflective Thinking Skill Scale towards Problem Solving (Kızılkaya &Aşkar, 2009), California Critical Thinking Disposition Inventory (Facione, Facione, & Giancarlo, 1998) and a questionnaire about time spent on studying for courses and social activities, and demographics.

567 volunteer students (269 females, 299 males) were participated in this study in 2013-2014 academic years.　Participants' distributions according to the faculty enrolled included %61 engineering and natural sciences, %21 social sciences, and %18 management sciences. The mean age of participants was 20.88 (SD = 1.52). Participants' classes included % 43 freshmen, %27 sophomores, %16 junior, and % 14 senior classes. %36 of participants reported a GPA within the range from 3.01 to 5.00; %48 of participants' GPA within the range from 2.01 to 3.00, %16 of participants' GPA within the range under 2.00. Frequency distributions for gender, age, time spent on study in one week and time spent on social activity in one week are given in Table 1.

Table 1. Frequency Distribution of Demographic Information

Variables	n	$\%$	$\bar{x}$	sd
Gender				
Female	268	47.3		
Male	299	52.7		
Age			20.88	1.52
Time spent for studying				
1-5	290	51.1		
6-10	174	30.7		
11-15	68	12.0		
16-20	35	6.2		
Time spent for sport activities				
1-5	182	32.1		
6-10	188	33.2		
11-15	85	15.0		
16-20	60	10.6		
21 and above	52	9.2		

Data Collection Tools

Demographic Data Form

A questionnaire was developed by the authors to collect demographic information about the participants' gender, GPA, age, type of faculty, class level, time spent on studying for courses and social activities.

Reflective Thinking Skill Scale towards Problem Solving

The scale developed by Kızılkaya and Aşkar (2009) consists of 14 questions with a 5-point Likert scale that measure three dimensions of reflective thinking as questioning (5 items), reasoning (4 items), and evaluation (5 items). In the original study, the Cronbach Alpha value was found 0.87 for the general scale, 0.73 for questioning, 0.71 for reasoning, 0.69 for evaluation. In this study, the Cronbach Alpha value was found 0.83 for the general scale, 0.71 for questioning, 0.70 for reasoning, 0.73 for evaluation. Confirmatory Factor Analysis (CFA) has been carried out in the frame of the validity of the study. Goodness of fit indexes calculated as ($\chi2$=353.00; SD=73; $\chi2$/sd=4.84; GFI=.91; AGFI=.87; CFI=.88; RMSEA=.08) provided satisfactory CFA results, which ensured original factor structure for this Turkish sample as well.

California Critical Thinking Disposition Inventory

The scale developed by Facione, Facione and Giancarlo (1998) consisting of 75 questions with a 5-point Likert scale that measure 7 scales of critical thinking as truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness, and cognitive maturity. Adaptation study of the scale to Turkish was done by Kökdemir (2003) consisting of 51 items with 6 subscales as truth-seeking, open-mindedness, analyticity, systematicity, self-confidence, inquisitiveness. The Cronbach Alpha coefficient was found 0.88 in Turkish adaptation study. In our study, the Cronbach Alpha coefficient was 0.87 for the whole scale. In this study, Confirmatory Factor Analysis (CFA) has been carried out for compatibility with the original scale. As a result of the analysis, questions 4,7,10, and 27 were discarded from the model because of their low regression loads and that did not have statistically significant means. In the revised model, Goodness of fit indexes calculated and the dataset was found to be compatible with the original scale ($\chi2$=2101.12; SD=1015; $\chi2$/sd=2.07; GFI=.86; AGFI=.84; CFI=.84; RMSEA=.04).

The seven constructs of critical thinking are defined as follow (Facione and Facione, 1992; May et al. 1999):

1. Truth-seeking: Seek the truth; courageous about asking questions; honest and objective about pursuing inquiry.
2. Open-mindedness: Tolerance to divergent views; self-monitoring for possible bias.
3. Analyticity: Alert to potentially problematic situations; inclined to anticipate possible results or consequences; demanding the application of reason and evidence.
4. Systematicity: Organized; focused; diligent in inquiry and diligent to approach problems of all levels of complexity.
5. Self-confidence: Trust in own reasoning processes and seeing oneself as a good thinker.
6. Inquisitiveness: Have intellectual curiosity; value being informed; eager to know how things work; value learning for learning's sake.

7. Cognitive Maturity: Reflective in own judgments; possess cognitive maturity, an awareness that multiple solutions can be acceptable; strive for epistemic development, an appreciation of the need to reach closure even in the absence of complete knowledge.

Since cognitive maturity dimension could not be obtained in the Turkish version of the scale, this study investigate the effects of only six constructs of critical thinking on reflective thinking skills toward problem solving. In this study, it is aimed to examine the relation between critical thinking and reflective thinking in detail. Additionally, comparisons were made between the duration of the study and the duration of the social activity, which are thought to be influenced by critical thinking and reflective thinking.

Data Analysis

Descriptive statistics, correlation analysis, Multivariate Analysis of Variance (MANOVA) and multiple linear regressions analyzes were conducted with the use of SPSS 21 software and also the use of Analysis of a Moment Structures (AMOS) 21 software. $p = .05$ was taken as the criterion for statistically significant difference.

Results

Correlation analysis between reflective thinking skills towards problem solving and critical thinking

The correlation analysis between reflective thinking and critical thinking and sub-dimensions of two scales are given in Table 2. There is a positive correlation between reflective thinking skills towards problem solving and critical thinking, $r = .34$, $p = < .01$. There are positive correlations between reflective thinking and four sub-dimensions of critical thinking: analyticity, systematicity, self-confidence, inquisitiveness. There are positive correlations between critical thinking skills and all three sub-dimensions of reflective thinking. There are positive correlations between analyticity and all three sub-dimensions of reflective thinking. There are positive correlations between inquisitiveness and all three sub-dimensions of reflective thinking. There are positive correlations between self-confidence and all three sub-dimensions of reflective thinking. In addition, only evaluation is positive correlated with systematicity and with open-mindedness.

Table 2. Correlation Analysis between Scales and Sub-Dimensions Used in Research

Scale/Size	Reflective Thinking	Questioning	Evaluation	Reasoning
Critical Thinking	.34**	.30**	.32**	.28**
Truth-seeking	.02	-.02	.07	-.00
Open-mindedness	.05	.01	.18**	-.08
Analyticity	.37**	.35**	.22**	.43**
Systematicity	.12*	.08	.20**	.02
Self confidence	.38**	.34**	.32**	.34**
Inquisitiveness	.38**	.38**	.23**	.40**

*$p < .05$, **$p < .01$

Two-way MANOVA results - Main analysis

A two-way multiple variance analysis (MANOVA) was conducted on two dependent variables: reflective thinking skills towards problem solving and critical thinking skills. The independent variables were study hours and social activity hours (time spent in a week, 1-5; 6-10; 11-15;16-20, 21 and above). Time spent on studying (study hours) and time spent on social activities (social activity hours) variants and the common influence on reflective thinking and critical thinking were examined by two-way MANOVA (Table 3). Study hours has a significant effect on both reflective thinking ($F_{(4)}$=6.89, p=.00, η^2=.05) and critical thinking ($F_{(4)}$=3.92, p=.00, η^2=.03). On the other hand, social activity hours does not have a significant effect on reflective thinking ($F_{(4)}$=2.09, p=.08, η^2=.02) while social activity hours has a significant effect on critical thinking ($F_{(4)}$=4.31, p=.00, η^2=.04). However, connection of study hours and social activity hours variables didn't have significant effect both on reflective thinking ($F_{(16)}$=1.34, p=.17, η^2=.03) and critical thinking ($F_{(16)}$=1.08, p=.37, η^2=.03). Moreover, these two variables did not have a common effect on the two combined dependent variables ($F_{(32)}$=1.12, p=.30, η^2=.03).

Table 3. Common Effect of Reflective Thinking towards Problem Solving and Critical Thinking on the Variable of Study Hours and Social Activity Hours

	F	p	η^2
Study hours × RT	6.89	.00	.05
Study hours × CT	3.92	.00	.03
Social activity hours × RT	2.09	.08	.02
Social activity hours × CT	4.31	.00	.03
(Study hours + Social activity hours) × RT	1.34	.17	.04
(Study hours + Social activity hours) × CT	1.08	.37	.03
(Study hours + Social activity hours)×(RT + CT)*	1.12	.30	.03

*Pillai's Trace test results

RT= Reflective Thinking; CT=Critical Thinking

Determining the predictors of reflective thinking skills towards problem solving

A series of multiple regression analyzes were performed to determine the predictors of the reflective thinking skills towards problem solving total scores, and only three dimensions of critical thinking (self-confidence, analyticity, inquisitiveness) are found to be statistically significant; self-confidence (p=.00), analytical thinking (p=.00), inquisitiveness (p=.04) (see Table 4). The multiple regression model with all three predictors produced, R^2 = .18, $F_{(2,564)}$=42.36, p=.00. That is, 3 sub-dimensions explain for 18% of the variance of reflective thinking. The regression coefficient between reflective thinking and self-confidence was .20, with analytic thinking .16 and with intellectual logic .12. Regression model for reflective thinking skills towards problem solving with three dimensions of critical thinking is written as the above formula:

$$Reflective\ thinking\ skills\ towards\ problem\ solving$$
$$= 0.34 * self\ confidence + 0.19 * analyticity + 0.16 * inquisitiveness$$
$$+ 26.78$$

Table 4. Regression Model for Reflective Thinking Skills towards Problem Solving with three Dimensions of Critical Thinking

Predictors	B(b)	Standard error of B	Beta	t	p	$F_{(2,564)}$	p
Constant	26.78	2.06		12.96	.00	42.36	.00
Self Confidence	.34	.08	.20	4.03	.00		
Analyticity	.19	.07	.16	2.74	.00		
Inquisitiveness	.16	.08	.12	2.02	.04		

Discussions and Conclusions

The relationships between the critical thinking and the reflective thinking skills toward problem solving and the variables affecting these two thinking skills are examined in this study. According to correlation analysis results, it is seen that there is a moderate relation between critical thinking and reflective thinking and their sub-dimensions. Theoretically, there are similarities for two forms of thinking skills, supporting the findings of correlation analysis, although there are different points of view these two thinking skills. According to results, there are positive correlations between reflective thinking and four sub-dimensions of critical thinking: analyticity, systematicity, self-confidence, inquisitiveness. Also, there are positive correlations between critical thinking skills and all three sub-dimensions of reflective thinking: questioning, reasoning, and evaluation. The results of the correlation analysis support the theoretical definitions and discussions of the critical thinking and the reflective thinking skills (Ghanizadeh 2017; Leung & Kember, 2003; Mezirow, 1991; Phan 2009; 2011). Critical thinking is considered a higher level of reflective thinking that involves individuals becoming more aware of why they perceive things, the way they feel, the way they act, and what they do (Phan, 2009; 2011) and focuses on deciding what to do and what to believe (Erdoğan 2019).

A regression model is obtained to predict the reflective thinking skills toward problem solving with three dimensions of critical thinking skills; self-confidence, analyticity, inquisitiveness. Organization in reflective thinking, finding reasons, hypothesis development and prediction skills are concepts that overlap with the abilities of questioning, analyzing and evaluating of critical thinking (Wilson and Jan 1993), but self-confidence, analyticity, inquisitiveness of critical thinking are the predictors of the reflective thinking skills towards problem solving. As a highlight of this study, critical thinking guides and enriches reflective thinking, however, Ghanizadeh (2017), contrary to our work, shows that reflective thinking is the predictive feature of critical thinking. Ghanizadeh (2017) found a high and meaningful relationship of 0.68 between critical thinking and reflective thinking in his work. In the study of Junsay (2016), it was shown that the teachers with reflective thinking ability had higher critical thinking point averages. The previous studies have shown that those who have reflective thinking skills develop critical thinking skills and reflective thinking positively affects critical thinking (Tican and Taşpınar 2015; Aryani, Rais and Wirawan, 2017). Critical thinking, according to some researchers (Kember et al., 2000; Leung & Kember, 2003; Mezirow, 1998; Phan, 2009; 2011) is a high-order phase or level of reflective thinking practice; therefore, the literature suggest to explain the feature of critical thinking help to predict the level of reflective thinking.

Additionally, the influence of being an active undergraduate in studying and social activities on reflective thinking and critical thinking were examined. Weekly study hours have a significant effect on both reflective thinking and critical thinking. As time spending on studying increases, three

dimensions of reflective thinking, questioning, reasoning, and evaluation and also inquisitiveness dimension of the critical thinking are increasing. In all sub-dimensions of reflective thinking, the weekly average of studying 1-5 hours per week has the lowest mean among weekly study hours. In addition, the weekly average of 11-15 hours per week has the highest mean for questioning and reasoning dimensions and while the weekly average of 16-20 hours per week has the highest mean for evaluation dimension. For inquisitiveness dimension of the critical thinking,   participants studying 16-20 hours have the highest mean for inquisitiveness, while participants studying under 15 hours have lower mean. Overall, time spent on studying and social activities effects were seen on critical thinking and reflective thinking. In our study, as the time spent on studying and social activity increased critical thinking and reflective thinking scores increased. Multivariate analysis revealed that the two variables had independent effects of critical thinking and reflective thinking, but no significant total effect was seen. The detailed investigation of the effects of study hours and social activity hours on two thinking is a helpful finding for educators in the development of critical thinking and reflective thinking. In educational psychology research, interest has emerged in the study of reflective thinking and critical thinking as an antecedent of academic performance (Leung & Kember, 2003; Phan, 2007; 2009), and these skills are required skills for academic success (Gogus 2015; Harris 2010; Lee and Loughran, 2000; Meyers 1986; Scott and Markett 1994; Siller 2001). Ghanizadeh (2017) also state the importance of two ways of thinking for the development of personal, academic and social life. Reflective thinking practice is concerned with the consequences of ideas and the possibility that future physical actions may be used to solve a variety of personal and professional problems (Phan, 2009). This study findings presents that time spent on studying has a significant effect on both reflective thinking and critical thinking while time spent on social activities does not have a significant effect on reflective thinking, only has a significant effect on critical thinking.

Empirical research has emphasized the importance of the phases of reflective thinking practice and critical thinking skills in teaching and learning (Ghanizadeh 2017; Leung & Kember, 2003; Mezirow, 1991; Phan 2009; 2011). In the literature, college education should support students' thinking skills to develop the habit of organized thinking and of rational analysis, the ability to distinguish the important concepts, and grasp the knowledge of organized solutions to perform better in any job (Gogus 2015; Harris, 2010; Williams, Zdravkovich, and Engleberg 2002). Therefore, the study of university students' critical and reflective thinking skills has become important (Gogus 2015; Demir 2015).

Having many variables that affect critical thinking and reflective thinking and that these variables are not known exactly makes it difficult for students to gain these skills (Manalo et al. 2013). Therefore, this study is important at the points of investigating sub-dimensions and affecting variables, and relation between critical thinking and reflective thinking. In subsequent studies, critical thinking and examination of other variables that influence reflective thinking can enrich the sequence and contribute to a better understanding of the two ways of thinking.

Researches on reflective thinking practice can benefit from the results of the predictors of reflecting thinking styles toward problem solving. Also, the results suggest that time spent for study and social activities are predictive of understanding critical thinking skills and reflective thinking skills separately. Researches and practitioners can benefit from this study results that support that university students should active cognitively by spending time with both social activities and study in order to develop a deep approach to learning in higher education. Having three dimensions of critical thinking skills; self-confidence, analyticity, inquisitiveness positively affects reflective thinking skills towards problem solving. Developing reflective thinking skills towards problem solving are key skills

based on Mezirow's (1991, 1998) work involving transformative adult learning. The previous studies empirical research categorize reflective thinking practice into four distinct phases, in their order of complexity—habitual action, understanding, reflection, and critical thinking (Kember, 2000; Leung & Kember, 2003; Phan, 2007; 2009; 2011); and critical thinking is considered a higher level of reflective thinking (Phan, 2009; 2011), however, this study contributes to this categorization by informing the effects of the sub dimensions of critical thinking skills for developing reflective thinking skills towards problem solving. In addition, the previous studies in Turkey focus on positively affects critical thinking (Erdoğan 2019; Tican and Taşpınar 2015; Aryani, Rais and Wirawan, 2017), but not studied the predictors of reflecting thinking skills with the combinations of dimensions of critical thinking, study time and social activities. Therefore, researches can benefit this study results and develop further studies to understand the different variables can contribute to develop reflective thinking skills and critical thinking skills. Researches and practitioners can also the effects of the duration on study time and social activities to guide university students for academic success and perform better in any job by gaining critical thinking and reflective thinking skills to solve the complex problems.

The study limitation includes having a small effect size since the study is conducted at a small, private international university in Turkey. The university has only three faculty and 3000 students. Participants were 567 volunteer students, 18 percent of the all student population.

Intersections between critical thinking skills and reflective thinking skills toward problem solving başlıklı çalışmanın yazım sürecinde bilimsel, etik ve alıntı kurallarına uyulmuş; toplanan veriler üzerinde herhangi bir tahrifat yapılmamış, karşılaşılacak tüm etik ihlallerde "**Pamukkale Üniversitesi Eğitim Fakültesi Dergisi Yayın Kurulunun**" hiçbir sorumluluğunun olmadığı, tüm sorumluluğun Sorumlu Yazara ait olduğu ve bu çalışmanın herhangi başka bir akademik yayın ortamına değerlendirme için gönderilmemiş olduğunu taahhüt ederim.

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Genişletilmiş Özet

Giriş

Üniversite öğrencilerinin geliştirmesi hedeflenen düşünme becerilerinin içinde yansıtıcı düşünme, problem çözme ve eleştirel düşünme becerileri en önemli geliştirilmesi gereken beceriler olarak birçok sistemce benimsenmiştir (Kember, 2010). Yansıtıcı düşünme ve eleştirel düşünme becerisi öğrencilerde bilişsel süreçler, kendini yansıtma, gözden geçirme, toplumsal uzlaşma ve kavramsal değişim becerileri gibi alanlara katkısı olan ve akademik başarı için gerekli, iş hayatında aranan bir özelliklerdir (Scott ve Markett, 1994; Siller, 2001). Eleştirel düşünme bir durumun iyi ve kötü yanlarının düşünülerek uygun soruların sorulması ve çözümlerin analiz edilmesi becerisidir (Profetto-McGrath, 2003). Yansıtıcı düşünme sistematik bir düşünmedir ve öğrencilere öğrenme süreçlerini analiz etme ve değerlendirme fırsatı sunmaktadır (Ghanizadeh, 2017). Yansıtıcı düşünmeyi etkileyen faktörler arasında cinsiyet (Tripp, 2011; Gilstrap ve Dupree, 2008; Woods ve Book, 1995), akademik başarı ve ders çalışmanın (Brookfield, 1996; Gilstrap ve Dupree, 2008) da yansıtıcı düşünmeye etkilerini belirtmiştir.

Yansıtıcı düşünme pratiği üzerine yapılan araştırmalar, Mezirow'un (1991, 1998) eğitim çalışmalarına dayanmaktadır. Yansıtıcı düşünme pratiğini, önem sırasına göre, dört ayrı aşamada sınıflandırmaktadır (Kember, 2000; Leung ve Kember, 2003; Phan, 2007; 2009): Alışılmış eylem, anlama, yansıtma ve eleştirel düşünme. Eleştirel düşünme, bir şeyi neden algıladığımızı, nasıl hissettiğimizi, nasıl davrandığımızı ve ne yaptığımızı daha fazla fark etmemizi içeren daha yüksek düzeyde yansıtıcı düşünme olarak kabul edilir (Phan, 2009). Leung ve Kember (2003), öğrenmeye yönelik yüzeysel bir yaklaşımın alışılmış eylemle paralel olduğunu, oysa öğrenmeye yönelik derin bir yaklaşımın anlama, yansıtma ve eleştirel düşünme ile daha ilişkili olduğunu bulmuştur. Phan (2007), derin öğrenme yaklaşımının anlayışın ve eleştirel düşünmenin yordayıcısı olduğunu vurgulamaktadır. Önceki çalışmalar, yansıtıcı düşünme becerisine sahip olanların eleştirel düşünme becerileri geliştirdiğini ve yansıtıcı düşüncenin eleştirel düşünceyi olumlu yönde etkilediğini göstermiştir, ama problem çözmeye yönelik yansıtıcı düşünme becerisinin belirleyicilerini eleştirel düşünme, çalışma zamanı ve sosyal faaliyetlerin boyutlarının birleşimiyle çalışmamıştır (Erdoğan 2019; Tican ve Taşpınar 2015; Aryani, Rais ve Wirawan, 2017; Kember, 2000; Leung ve Kember, 2003; Phan, 2007; 2009; 2011).

Bu çalışmada eleştirel düşünme ve yansıtıcı düşünme arasındaki ilişkinin ayrıntılı bir şekilde incelenmesi amaçlanmıştır. Ayrıca eleştirel düşünme ve yansıtıcı düşünmeye etkisi olacağı düşünülen ders çalışma süresi ve sosyal aktivite süresi değişkenlerine göre karşılaştırmalar yapılmıştır. Yapılan çalışmanın amacı doğrultusunda yansıtıcı düşünce ve eleştirel düşünce arasındaki ilişkiler ve yansıtıcı düşüncenin eleştirel düşünceyi ne düzeyde yordadığını incelenmiştir. Bu problem durumunun yanında, alt problem olarak ders çalışma ve sosyal aktivite sürelerinin yansıtıcı ve eleştirel düşünce becerilerine etkisi incelenmiştir. Araştırma soruları şu şekildedir: 1) Eleştirel düşünme, çalışma süresi ve sosyal faaliyetlerin boyutlarının birleşimi ile problem çözmeye yönelik yansıtıcı düşünme becerilerini ne kadar iyi tahmin edebiliriz? Eleştirel düşünce alt boyutları yansıtıcı düşünceyi yordamakta mıdır? 2) Çalışma süresi ve sosyal aktivitede farklılık gösteren öğrenciler, iki bağımlı değişkenin (problem çözme ve eleştirel düşünmeye yönelik yansıtıcı düşünme becerileri) doğrusal bir kombinasyonunda farklılık gösterir mi?

Yöntem

Nicel araştırma yöntemi doğrultusunda hazırlanan bu araştırmada ilişkisel tarama modeli kullanılmıştır. Yapılan çalışmaya uluslararası 3000 lisans öğrencisi olan metropol bir üniversitenin mühendislik ve sosyal bilimler fakültelerinden yaş ortalaması 20,88 olan 268 kız ve 299 erkek olmak üzere toplam 567 gönüllü lisans öğrencisi katılmıştır. Veri toplama aracı 3 bölümden oluşmaktadır: Demografik Veri Formu, Problem Çözmeye Yönelik Yansıtıcı Düşünme Becerisi Ölçeği (Kızılkaya ve Aşkar, 2009), ve California Eleştirel Düşünme Eğilimi Ölçeği (Facione, Facione ve Giancarlo, 1998; uyarlayan Kökdemir, 2003). Bu araştırmada Problem Çözmeye Yönelik Yansıtıcı Düşünme Becerisi Ölçeği (Kızılkaya ve Aşkar, 2009) ölçek bütünü için 0,87, sorgulama için 0,71, nedenleme için 0,70 ve değerlendirme için 0,73 değerinde Cronbach Alpha katsayısı bulunmuştur. Çalışmada kullanılan veri setinin orijinal ölçek faktörlerine uyumu için doğrulayıcı faktör analizi sonucunda elde edilen uyum iyiliği indeksleri sonucunda modelin kabul edilebilir uyum gösterdiği görülmüştür ($\chi2$=353.00; SD=73; $\chi2$/sd=4.84; GFI=.91; AGFI=.87; CFI=.88; RMSEA=.08). California Eleştirel Düşünme Eğilimi Ölçeği (Facione, Facione ve Giancarlo, 1998; uyarlayan Kökdemir, 2003) için Cronbach Alpha katsayısı ölçeğin tamamı için 0,87 olarak elde edilmiştir. Doğruyu arama, Açık Fikirlilik, Analitik, Sistematiklik, Kendine güven, Entelektüel meraklılık olmak üzere 6 alt boyuttan oluşan modelde veri setinin orijinal ölçekle uyumlu olduğu görülmüştür ($\chi2$=2101,12; SD=1015; $\chi2$/sd=2.07; GFI=.86; AGFI=.84; CFI=.84; RMSEA=.04).). Verilerin analiz kısmında betimleyici istatistikler, korelasyon analizi, doğrulayıcı faktör analizi, tek yönlü varyans analizi (ANOVA), çift yönlü çoklu varyans analizi (MANOVA) ve çoklu doğrusal regresyon analizleri kullanılmıştır.

Bulgular

Ders çalışma süresi değişkeni için katılımcıların sorgulama boyutu (F (3,563)=8.99, p=.00), değerlendirme boyutu (F (3,563)=5.96, p=.00) ve nedenleme alt boyutu (F (3,563)=5.82, p=.00) toplam puan ortalamaları arasında istatistiksel olarak anlamlı farklılık bulunmuştur. Bütün alt boyutlarda haftada 11-15 saat ders çalışanların puan ortalamaları en yüksekken 1-5 saat çalışanların en düşüktür. Ders çalışma süresi değişkeni için katılımcıların entelektüel meraklılık boyutu (F (3,563)=4.04, p=.00) toplam puan ortalamaları arasında istatistiksel olarak anlamlı farklılık bulunmuştur. 16-20 saat çalışanların entelektüel meraklılık puan ortalaması en yüksekken 11-15 saat çalışanların en düşüktür.

Sosyal aktivite süresi değişkeni için Problem Çözmeye Yönelik Yansıtıcı Düşünme Becerisi ve Eleştirel Düşünme Eğilimi incelendiğinde, sosyal aktivite süresi arttıkça hem problem çözmeye yönelik yansıtıcı düşünme becerisi hem de eleştirel düşünme eğilimi artmaktadır. Sosyal aktivite süresi değişkeni için katılımcıların sorgulama boyutu (F (4,562)=3.80, p=.00) ve değerlendirme boyutu (F(4,562)=2.98, p=.02) toplam puan ortalamaları arasında istatistiksel olarak anlamlı farklılık bulunmuştur. İki boyut için de 16-20 saat sosyal aktivitesi olanların puan ortalamaları en yüksekken 1-5 saat sosyal aktivitesi olanların en düşüktür. Sosyal aktivite süresi değişkeni için katılımcıların doğruyu arama boyutu (F(4,562)=3.88, p=.00), açık fikirlilik boyutu (F(4,562)=6.49, p=.00) ve sistematiklik boyutu (F(4,562)=5.06, p=.00) toplam puan ortalamaları arasında istatistiksel olarak anlamlı farklılık bulunmuştur. Üç boyut için de 21 saat ve üzeri sosyal aktivitesi olanların puan ortalamaları en yüksekken 1-5 saat sosyal aktivitesi olanların en düşüktür.

Ders çalışma süresi ve sosyal aktivite süresi değişkeninin yansıtıcı düşünme ve eleştirel düşünme üzerindeki ortak etkisi çift yönlü çoklu varyans analizi (MANOVA) ile incelenmiştir. Ders çalışma süresi hem yansıtıcı düşünme (F=8,76, p=,00, η^2= .05) hem de eleştirel düşünme (F=5,70, p=,00, η^2= .03) üzerinde anlamlı etkiye sahiptir. Aynı şekilde sosyal aktivite süresi değişkeni de hem

yansıtıcı düşünme (F=3,11, p=,02, η^2= .02) hem de eleştirel düşünme (F=6,15, p=,00, η^2= .04) üzerinde anlamlı etkiye sahiptir. Ancak ders çalışma süresi ve sosyal aktivite süresi değişkenlerinin birleşimi ayrı ayrı hem yansıtıcı düşünme (F=1,37, p=,17, η^2= .03) hem de eleştirel düşünme (F=1,39, p=,17, η^2= .03) üzerinde anlamlı etkisi bulunmamıştır. Ayrıca bu iki değişkenin iki bağımlı değişkenin üzerinde ortak bir etkisi görülmemiştir (F=1,25, p=,19, η^2= .03).

Yansıtıcı düşünme toplam puanının yordayıcılarının belirlenmesi için bir dizi çoklu regresyon analizi yapılmış ve sadece kendine güven (p=.00), analitik (p=.00) ve entelektüel meraklılık (p=.04) istatistiksel olarak anlamlı bulunmuştur (Tablo 8). Kurulan regresyon modeli istatistiksel olarak anlamlıdır (F(2,564)=42.36, p=.00). Yansıtıcı düşünme ve kendine güven arasındaki regresyon katsayısı .20, analitik ile .16 ve entelektüel mantık ile .12 olarak bulunmuş. Ayrıca 3 alt boyut yansıtıcı düşünme varyansının %18'lik bir kısmını açıklamaktadır.

Sonuç ve Tartışma

Eleştirel düşünme ve yansıtıcı düşünme arasındaki orta düzeyde ilişki olduğu görülmüştür. Bu bulgu, kuramsal olarak iki düşünme biçimi için olan benzerlikleri destekler niteliktedir. Yansıtıcı düşünmedeki örgütleme, neden bulma, varsayım geliştirme ve yordama becerileri eleştirel düşünmenin soru sorma, analiz etme ve değerlendirme becerileri ile örtüşen kavramlardır (Wilson ve Jan, 1993). Bu çalışma sonuçları da destekliyor ki, eleştirel düşünme yansıtıcı düşünmeyi zenginleştirir (Leung & Kember, 2003; Mezirow, 1991; Phan 2009; 2011). Diğer taraftan, Ghanizadeh (2017) bizim çalışmamızın aksine yansıtıcı düşünmenin eleştirel düşünmeyi yordayıcı özelliğini göstermektedir.

Ders ve sosyal aktivite için harcanan sürenin iki düşünme biçimine etkisinin de anlamlı olduğu görülmüştür. Ancak her iki değişkenin ortak etkisinin anlamlı olmadığı diğer bir önemli bulgudur. Ghanizadeh (2017) kişisel, akademik ve sosyal hayatın gelişimi için iki düşünme biçiminin önemini belirtmiştir. Bizim çalışmamızda da ders çalışma ve sosyal aktivite süresi arttıkça eleştirel düşünme ve yansıtıcı düşünme puanlarının arttığı görülmüştür. Lee ve Loughran (2000)'in yüksek eleştirel düşünme ve yansıtıcı düşünme becerisine sahip kişilerin akademik başarılarının yüksek olduğunu belirtmesi ders çalışma süresi için elde edilen bulguları destekler niteliktedir. Eleştirel düşünme ve yansıtıcı düşünmeyi etkileyen birçok değişkenin olması ve bu değişkenlerin tam olarak bilinmemesi becerilerin öğrencilere kazandırılmasını zorlaştırmaktadır (Manalo, Kusumi, Koyasu, Michita ve Tanaka, 2013).

Yansıtıcı düşünme pratiği üzerine yapılan araştırmalar, düşünme stillerini problem çözme yönünde yansıtmaya yönelik tahmincilerin sonuçlarından faydalanabilir. Ayrıca, sonuçlar çalışma ve sosyal aktiviteler için harcanan zamanın eleştirel düşünme becerilerini ve yansıtıcı düşünme becerilerini ayrı ayrı anlamda yordayıcı olduğunu göstermektedir. Araştırmacılar ve uygulamada çalışanlar, yüksek öğrenimde öğrenmeye derin bir yaklaşım geliştirmek için, üniversite öğrencilerinin hem sosyal faaliyetlerle hem de ders çalışarak vakit geçirerek bilişsel olarak aktif olmalarını destekleyen bu çalışma sonuçlarından yararlanabilir. Bu çalışmanın sonucuna göre, eleştirel düşünme becerilerinin üç boyutuna sahip; özgüven, analitiklik, meraklılık, problem çözme yönünde yansıtıcı düşünme becerilerini olumlu yönde etkiler. Problem çözme yolunda yansıtıcı düşünme becerilerini geliştirmek, Mezirow'un dönüştürücü yetişkin öğrenmesini içeren (1991, 1998) çalışmalarına dayanan temel becerilerdir. Daha önce yapılan deneysel deneysel araştırmalar, yansıtıcı düşünme pratiğini karmaşıklık derecelerine göre (alışılmış eylem, anlama, yansıtma ve eleştirel düşünme gibi) dört ayrı aşamada sınıflandırmaktadır (Kember, 2000; Leung ve Kember, 2003; Phan, 2007; 2009; 2011); ve eleştirel düşünme, yansıtıcı düşünme düzeyinin daha yüksek olduğu düşünülür (Phan, 2009; 2011),

ancak, bu çalışma, eleştirel düşünme becerilerinin alt boyutlarının yansıtıcı düşünme becerilerini geliştirmeye yönelik sorun çözme konusundaki etkilerini bilgilendirerek, bu kategorizasyona katkıda bulunur. Ayrıca, Türkiye'deki önceki çalışmalar eleştirel düşünmeyi olumlu yönde etkilemeye odaklanmaktadır (Erdoğan 2019; Tican ve Taşpınar 2015; Aryani, Rais ve Wirawan, 2017), ancak düşünme becerilerini eleştirel düşünme boyutlarının birleşimi ile yansıtmayı öngörenleri incelememişlerdir. Bu nedenle, araştırmalar bu çalışma sonuçlarından yararlanabilir ve farklı değişkenleri anlamak için daha fazla araştırma geliştirebilir ve yansıtıcı düşünme becerileri ve eleştirel düşünme becerileri geliştirilmesine katkıda bulunabilir. Gelecek çalışmalarda ve uygulamalarda, araştırmacılar ve yüksek eğitim alanında çalışanlar, üniversite öğrencilerine akademik başarı için rehberlik etmek ve hem öğrenimleri sürecinde ve hem mesleklerini yaparken karmaşık problemleri çözme becerilerine sahip olmaları için üniversite öğrencilerinin eleştirel düşünme ve yansıtıcı düşünme becerileri kazanmalarının önemi öne çıkartılmalı ve bu becerileri etkileyen farklı değişkenlerin önemi araştırılmalıdır.