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## EXAMINATION OF THE RELATIONSHIP BETWEEN REASONING STYLES AND CRITICAL THINKING SKILLS OF PRE-SERVICE SOCIAL STUDIES TEACHERS<sup>1</sup>

**Sibel ALBENİ**

Master student, Kastamonu University, Kastamonu, [sibelalben@gmail.com](mailto:sibelalben@gmail.com)

ORCID: 0000-0003-3442-4998

**Serpil RECEPOĞLU**

Assoc.Prof.Dr., Kastamonu University, Kastamonu, Türkiye, [srecepoglu@kastamonu.edu.tr](mailto:srecepoglu@kastamonu.edu.tr)

ORCID: 0000-0002-4189-4456

**Durdane ÖZTÜRK**

Assist.Prof.Dr., Kırşehir Ahi Evran University, Kırşehir, Türkiye, [durdane.ozturk@ahievran.edu.tr](mailto:durdane.ozturk@ahievran.edu.tr)

ORCID: 0000-0001-5116-7933

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### ABSTRACT

The objective of this research was to establish the correlation between the reasoning styles and critical thinking skills of pre-service social studies teachers. The participants were undergraduate students from the first to fourth years of the Departments of Social Studies Education at two distinct state universities, studied during the 2021-2022 academic year. The research methodology implemented a correlational survey model, a quantitative approach, and the participant selection was based on criterion sampling, a form of purposive sampling. The "Reasoning Styles Scale" and the "Critical Thinking Tendency Scale" served as instruments for data collection, determining pre-service teachers' reasoning styles and critical thinking skills, respectively. The findings suggest a moderately positive and significant correlation between pre-service social studies teachers' reasoning styles and their critical thinking skills. Furthermore, regression analysis indicated that their reasoning styles considerably predict their critical thinking skills. Another finding of the study was that the reasoning styles and critical thinking skills of the pre-service social studies teachers did not differ based on gender or grade level. However, it was determined that critical thinking skills change according to the variable of frequency of reading books. In light of these findings, it is recommended to undertake qualitative studies to gain a more comprehensive understanding of the correlation between pre-service social studies teachers' reasoning styles and critical thinking skills.

**Keywords:** Reasoning, reasoning styles, critical thinking skills, and pre-service social studies teachers

<sup>1</sup> This study is derived from a master's thesis named 'Examination of the relationship between reasoning styles and critical thinking skills of social studies teacher candidates' prepared by the first author under the supervision of the second and third authors.

## INTRODUCTION

From birth, every individual is in a constant endeavour to adapt to the society in which they live. This effort is crucial for an individual's survival and ease of living. In this process, each individual can also understand and enhance the society they inhabit, thus necessitating their integration into their communities.

The role of education is paramount in facilitating individuals' adaptation to their societies. Indeed, as Turan (2019) points out, the purpose of education is to enable an individual to adapt to their society and environment, and to change and improve their behaviours. Schools are the venues where various knowledge, skills, attitudes, and values necessary for individuals' social adaptation are sought to be imparted. One of the courses which this knowledge, skills, attitudes, and values are aimed to be instilled is social studies. This course, designed for individuals' socialization in primary and middle school (Kaya and Öner, 2017), deals directly with humans as members of social groups and the organization and development of human society, as Dunn (1916) highlighted (p.9). This course not only assists an individual in adapting to society but also contributes to their reasoning and critical thinking skills.

Although there is no adequate definition of the concept of reason, this concept has an abstract feature (Mithen, 1999). The concept of reason is defined by the Turkish Language Association as "the power of thinking, understanding, and reasoning" (Turkish Language Association [TLA], 2022). Emiroğlu (1998) asserts that a person, through reasoning, can discriminate and critique, comprehend the world and oneself, and make comparisons. An individual, who encounters numerous events and problems throughout their life, uses their unique reasoning skill to resolve these situations and make sense of them. Reasoning employs the processing and structuring of data obtained through sensory organs in the mind (Ateş, 2018). In other words, reasoning, also known as judgement or inference, can be defined as the process of reaching a rational conclusion by considering all factors (Umay, 2003). The purpose of reasoning is to reach a conclusion or make a new assertion based on a previous statement (Rizqi and Surya, 2017).

Associated with the concept of reasoning is the concept of thinking, as the skill to engage in the reasoning process can only be realized through thinking skills. In this context, it would be apt to discuss the concept of thinking for a better understanding of the reasoning process. Thinking is the disciplined form of processing and shaping information obtained through tools such as intuition, observation, reasoning, and experience. Thinking is composed of five dimensions: critical and creative thinking, cognitive awareness, thinking processes, basic thinking skills, and subject area knowledge (Duman, 2015). The concept that systematically incorporates these five dimensions is reasoning (Duran, 2019). Umay (2003) suggests that reasoning, or judgement, could be a skill or ability that emerges at a higher level of thinking; however, if a thought lacks a knowledge basis, logical framework, and justification, it cannot be considered as reasoning. Another concept related to reasoning is the reasoning style.

According to Bueno (2012), a "reasoning style is a model of inferential relationships used to select, interpret, and support evidence for specific outcomes." To understand the reasoning style, one must also examine reasoning strategies. Reasoning strategies involve individual preferences for the options to use during the reasoning process. For an individual in the reasoning process, seeking others' support and consulting their opinion is a strategy. However, if the individual carries out this process based on observation and experience, it is a style (Duran, 2019). There are three types of reasoning: deduction, induction, and analogy (Özlem, 2004). The first one, deductive reasoning, is based on the assumption that one can reach a valid conclusion by progressing under the light of logical inference from general to specific (Ateş, 2018). Kamer (2014) describes induction as the process of making inferences about unobserved objects or types based on observations. Analogy, the third type of reasoning, can be considered a combination of induction and deduction (Özlem, 2004). In this context, analogy can lead to the conclusion that another characteristic present in both systems is likely present in both, based on one or more common features in both systems (Çelik, 2021). It can be said that analogy is a type of reasoning that is widely used in natural sciences such as astronomy, which are largely based on observation, and in social studies.

Critical thinking, on the other hand, is a cognitive process where an individual aims to understand themselves, the events, situations, and thoughts around them, taking into account not only their own thoughts but also the ideas of the individuals they interact with (Özden, 2021). In addition, Aydın and Muratoğlu Pehlivan (2019) have described critical thinking as a reasoning process with unquestionably true premises. Through education received in a school environment, individuals can effectively utilize critical thinking skills (Kazu and Şentürk, 2010). Teachers who possess effective critical thinking skills should create an environment conducive to discussion and questioning in the classroom (Özden, 2021). As a matter of fact, inclusion of controversial topics in the classroom may contribute to students' critical thinking skills (Öztürk, 2017). On the other hand, critical thinking should not be understood as a single skill (Eğmir, 2020). According to Facione (2015), critical thinking skills can be categorized into six subgroups: analysis, interpretation, self-regulation, inference, explanation, and evaluation.

Critical thinking is not genetically transferred to an individual; however, it can be learned and developed. Therefore, from basic education onwards, emphasis should be placed on cultivating critical thinking skills in individuals (Yıldırım and Şensoy, 2011). In this context, teachers have a significant role in instilling critical thinking skills. The teacher must possess comprehensive knowledge of the subject and maintain a classroom atmosphere that supports this skill. With critical thinking skills, an individual becomes open to different knowledge and ideas (Çalışkan, 2009).

Reasoning and critical thinking skills are essential for education and teaching at all levels and for teacher training. In our age, the most critical requirement for nurturing individuals who can question, approach events with a critical perspective, possess a broad viewpoint, and be creative, is for teachers to embody these qualities

(Duran, 2019). Because, one of the special aims of the Social Studies Curriculum is that students; “As individuals who know the ways to reach accurate and reliable information, they want them to have critical thinking skills” (Ministry of National Education [MoNE], 2018). To effectively convey critical thinking, a process of reasoning, to students, a social studies teacher must possess strong reasoning and critical thinking skills and be able to use these skills effectively. In this context, it is deemed important to ascertain the level of reasoning styles and critical thinking skills among pre-service social studies teachers who are yet to begin their professional careers. Accordingly, the aim of this research is to reveal the relationship between the reasoning styles and critical thinking skills of pre-service social studies teachers. Based on this, the research problem statement has been determined as: ‘Is there a significant relationship between the reasoning styles and critical thinking skills of pre-service teachers?’ From this problem statement, the following sub-problems have been identified:

Do pre-service social studies teachers:

- Have a relationship between their reasoning styles and critical thinking skills?
- Use reasoning styles as a significant predictor of critical thinking skills?
- Vary their reasoning styles according to gender, grade level, and frequency of reading?
- Vary their critical thinking levels according to gender, grade level, and frequency of reading?

## **METHOD**

### **Research Model**

This research employs a correlational survey model, which is among the quantitative research models. A correlational survey model can be defined as a statistical research model aiming to discover the existence or level of change occurring between at least two variables (Karasar, 2013). This research model was chosen to determine the relationship between the variables of reasoning styles and critical thinking skills.

### **Study Group**

The research sample comprises pre-service teachers from the 1st, 2nd, 3rd, and 4th-year levels, studying in the Department of Social Studies Education within the Education Faculties at two distinct state universities during the 2021-2022 academic year. The sample selection employed criterion sampling, a form of purposive sampling. It was taken as a criterion that the teacher candidates should be educated in the Department of Social Studies Education, be chosen from different universities, and be from different grade levels. Following the deployment of a survey across the Education Faculties at both universities, a total of 441 pre-service teachers were reached.

**Findings Related to the Demographic Characteristics of the Participants**

**Table 1.** Demographic characteristics and percentages of the participants

Variables	Categories	f	%
Gender	Female	325	74,9
	Male	109	25,1
Grade Level	1st Year	84	19,4
	2nd Year	104	24,0
	3rd Year	107	24,7
	4th Year	139	32,0
<b>TOTAL</b>		<b>434</b>	<b>100</b>

As per Table 1, when scrutinizing gender distribution, over half of the participating pre-service teachers were female (74.9%), while the remaining portion was male (25.1%). In terms of class level distribution, there were 84 (19.4%) participants in the 1st year, 104 (24.0%) in the 2nd year, 107 (24.7%) in the 3rd year, and 139 (32.0%) in the 4th year.

**Data Collection Tools**

The data collection instrument for this study is comprised of three distinct sections. The first section gathers personal data pertaining to demographic characteristics of the pre-service teachers, such as gender, grade level. The second part employs the "Reasoning Styles Scale" to ascertain the reasoning styles of the pre-service teachers. Lastly, the third section uses the "Critical Thinking Tendency Scale" to determine the critical thinking skills of the pre-service social studies teachers.

**Reasoning Styles Scale**

The "Reasoning Styles Scale" was developed by Duran (2019). The scale, following revisions, consists of 17 items, 4 sub-dimensions, and adopts a Likert-type 5-option format. The sub-dimensions of the scale include metaphoric-deductive reasoning, empirical inference, analogical-inductive reasoning, and hypothetical inference. There are six items in metaphoric-deductive reasoning, three in empirical inference, five in analogical-inductive reasoning, and three in hypothetical inference. The statements in the scale range from "Strongly disagree (5)", "Disagree (4)", "Somewhat agree (3)", "Agree (2)" to "Strongly agree (1)", with no negative items present. Duran (2019), who developed the scale, computed the Cronbach's Alpha reliability coefficient for the Reasoning Styles Scale based on 280 individuals and obtained a result of .90.

In this study, the Cronbach's Alpha coefficient for the entire scale, based on 434 participants, was found to be .86. Additionally, the Cronbach's Alpha values calculated for each sub-dimension were .82 for metaphoric-deductive reasoning, .53 for empirical inference, .80 for analogical-inductive reasoning, and .56 for hypothetical inference.

### **Critical Thinking Tendency Scale**

The "Critical Thinking Scale" was developed by Semerci (2000) and later revised by Semerci (2016), who renamed it the "Critical Thinking Tendency Scale". The scale comprises 49 items, 5 sub-dimensions, and a Likert-type 5-option format. The sub-dimensions of the scale include metacognition, flexibility, systematicity, perseverance and patience, and open-mindedness. There are 14 items under metacognition, 11 under flexibility, 13 under systematicity, 8 under perseverance-patience, and 3 under open-mindedness. The statements in the scale range from "Strongly agree (5)", "Mostly agree (4)", "Somewhat agree (3)", "Mostly disagree (2)" to "Strongly disagree (1)", with no negative items present. Semerci (2016), who developed the scale, computed the Cronbach's Alpha reliability coefficient for the Critical Thinking Tendency Scale based on 1081 individuals and obtained a result of .96. The Cronbach's Alpha values for the sub-dimensions were found to be .89 for metacognition, .89 for flexibility, .90 for systematicity, .83 for perseverance-patience, and .67 for open-mindedness.

In this study, the Cronbach's Alpha coefficient for the entire scale, based on 434 participants, was found to be .96. Additionally, the Cronbach's Alpha values calculated for each sub-dimension were .90 for metacognition, .91 for flexibility, .90 for systematicity, .86 for perseverance-patience, and .70 for open-mindedness.

### **Data Analysis**

To facilitate the statistical analysis of the data collected in alignment with the study's objectives, SPSS 23 statistical analysis which is widely used software in social sciences was used. The Pearson's correlation coefficient ( $r$ ) was used to calculate the relationship between two variables. Additionally, to ascertain the predictive levels of the variables, a Regression Analysis was conducted. The standardized Beta ( $\beta$ ) coefficients and the significance of these through t-test results were examined to interpret the regression data. T-test and anova were also employed to discern whether reasoning styles and critical thinking skills varied according to gender and grade level.

To determine the normality of the groups in the study, Skewness and Kurtosis values were examined. In the review for reasoning styles, the Skewness value was found to be -0.429, and the Kurtosis value was 1.001. For critical thinking skills, the Skewness value was -0.260, and the Kurtosis value was 0.336. These values are considered to be normally distributed when they range from -1.5 to +1.5 (Tabachnick & Fidell, 2013). Based on this, it can be inferred that the data is normally distributed.

### **FINDINGS**

This section contains the statistical analyses related to the sub-problems and the findings obtained as a result of these analyses.

**Results Concerning the Relationship between Pre-service Teachers' Reasoning Styles and Critical Thinking Skills**

**Table 2.** Findings concerning the correlation between reasoning styles and critical thinking skills

Variables *	1	2	3	4	5	6	7	8	9	10	11
Metaphoric-Deductive		1,461**	0,584**	0,264**	0,484**	0,442**	0,397**	0,284**	0,339**	0,815**	0,452**
Empirical Inference		1	0,518**	0,424**	0,396**	0,363**	0,368**	0,317**	0,320**	0,730**	0,402**
Analogical-Inductive			1	0,459**	0,618**	0,582**	0,591**	0,505**	0,512**	0,857**	0,639**
Hypothetical Inference				1	0,378**	0,337**	0,389**	0,330**	0,315**	0,642**	0,398**
Metacognition					1	0,853**	0,807**	0,700**	0,629**	0,625**	0,930**
Flexibility						1	0,824**	0,676**	0,627**	0,575**	0,924**
Systematicity							1	0,749**	0,685**	0,574**	0,935**
Perseverance and Patience								1	0,672**	0,467**	0,839**
Open-mindedness									1	0,490**	0,750**
Reasoning Total										1	0,625**
Critical Thinking Total											1

\*\*p < 0,01

Upon examining Table 2, a moderate, positively significant correlation ( $r=0.625$ ;  $p<0.01$ ) was found between pre-service teachers' reasoning styles and critical thinking skills. A moderate, positively significant correlation was detected between the total score of reasoning and metacognition ( $r=0.625$ ;  $p<0.01$ ), flexibility ( $r=0.575$ ;  $p<0.01$ ), systematicity ( $r=0.574$ ;  $p<0.01$ ), perseverance and patience ( $r=0.467$ ;  $p<0.01$ ), and open-mindedness ( $r=0.490$ ,  $p<0.01$ ) dimensions.

When examining the correlation between the total score of critical thinking and the metaphoric-deductive dimension, a moderate significant relationship ( $r=0.452$ ;  $p<0.01$ ) was found. Similarly, moderate and significant relationships were found between the total score of critical thinking and empirical inference ( $r=0.402$ ;  $p<0.01$ ), analogical- inductive ( $r=0.639$ ;  $p<0.01$ ), and hypothetical inference ( $r=0.398$ ;  $p<0.01$ ) dimensions.

Significant relationships were also found among the sub-dimensions according to the reasoning styles scale. A moderate, positively significant relationship was found between the metaphoric-deductive dimension and empirical inference ( $r=0.461$ ;  $p<0.01$ ), analogical-inductive ( $r=0.584$ ;  $p<0.01$ ) dimensions. A weak significant relationship was found between the metaphoric-deductive dimension and hypothetical inference ( $r=0.264$ ;  $p<0.01$ ). A moderate, positively significant relationship was detected between empirical inference and analogical-inductive ( $r=0.518$ ;  $p<0.01$ ), hypothetical inference ( $r=0.424$ ;  $p<0.01$ ) dimensions. A moderate, positively significant relationship was also detected in the analogical-inductive and hypothetical inference ( $r=0.459$ ;  $p<0.01$ ) dimensions.

Significant relationships were observed among the sub-dimensions according to the critical thinking tendencies scale. A high-level, positively significant relationship was detected between metacognition and flexibility

( $r=0.853$ ;  $p<0.01$ ), systematicity ( $r=0.807$ ;  $p<0.01$ ) dimensions. A moderate, positively significant relationship was found between metacognition and perseverance and patience ( $r=0.700$ ;  $p<0.01$ ), open-mindedness ( $r=0.629$ ;  $p<0.01$ ) dimensions. A high-level, positively significant relationship was detected between flexibility and systematicity ( $r=0.824$ ;  $p<0.01$ ) dimensions. A moderate, positively significant relationship was found between flexibility and perseverance and patience ( $r=0.676$ ;  $p<0.01$ ), open-mindedness ( $r=0.627$ ;  $p<0.01$ ) dimensions. A high-level, positively significant relationship was observed between systematicity and perseverance and patience ( $r=0.749$ ;  $p<0.01$ ) dimension. A moderate significant relationship was found in the systematicity and open-mindedness ( $r=0.685$ ;  $p<0.01$ ) dimension. A moderate significant relationship was also detected between perseverance and patience and open-mindedness ( $r=0.672$ ;  $p<0.01$ ) dimension.

**Results of the Regression Analysis Conducted to Determine the Level at Which Pre-service Teachers' Reasoning Styles Predict Critical Thinking Skills**

**Table 3.** The level at which reasoning styles predict critical thinking skills

	B	Standard Error	$\beta$	t	p
Constant	2,01	0,127		15,82	0,000
Critical Thinking Total	0,526	0,032	0,625	16,645	0,000

R = 0,62,  
 $R^2 = 0,39$ ; F (1-433)=277.040  $p<0,01$

Reviewing Table 3, it is observed that critical thinking skills are a significant predictor of reasoning styles (R = 0.62;  $R^2 = 0.39$ ; F (1-433)=277.040  $p<0.01$ ). 39% of the total variance related to reasoning style is explained by critical thinking skills.

**T-Test Results of Reasoning Styles by Gender**

**Table 4.** T-test results of reasoning styles by gender

Dimensions	Gender	N	M	Sd	df	t	p
Metaphorical-deductive	Female	325	4,36	0,50	432	2,825	0,005
	Male	109	4,20	0,56			
Empirical inference	Female	325	4,03	0,55	432	0,861	0,389
	Male	109	3,97	0,64			
Analogical-inductive	Female	325	4,12	0,55	432	0,082	0,934
	Male	109	4,12	0,55			
Hypothetical inference	Female	325	3,72	0,62	432	-0,613	0,540
	Male	109	3,77	0,72			
Reasoning Total	Female	325	4,12	0,42	432	1,256	0,210
	Male	109	4,06	0,48			

\* $p<0,05$

Upon examining Table 4, no significant gender difference is found in the reasoning total score [ $t_{(432)} = 1.256$ ,  $p>0.05$ ], empirical inference [ $t_{(432)} = 0.861$ ;  $p>0.05$ ], analogical-inductive [ $t_{(432)} = 0.082$ ;  $p>0.05$ ], and hypothetical inference [ $t_{(432)} = -0.613$   $p>0.05$ ] dimensions of the reasoning styles scale. There is a significant difference in the metaphorical-deductive dimension [ $t_{(432)} = 2.825$ ;  $p<0.05$ ].



**ANOVA Results of Reasoning Styles by Grade Level**

**Table 5.** ANOVA results of reasoning styles by grade level

Dimensions	Grade Level	N	M	Sd	df	F	p	Significant Difference
Metaphorical-deductive	1st year	84	4,38	0,52			0,582	--
	2nd year	104	4,31	0,49				
	3rd year	107	4,27	0,49	3	0,652		
	4th year	139	4,33	0,57	433			
	Total	434	4,32	0,52				
Empirical inference	1st year	84	3,94	0,52			0,324	--
	2nd year	104	4,02	0,59				
	3rd year	107	3,98	0,53	3	1,161		
	4th year	139	4,08	0,63	433			
	Total	434	4,01	0,57				
Analogical-inductive	1st year	84	4,09	0,58			0,696	--
	2nd year	104	4,17	0,51				
	3rd year	107	4,08	0,49	3	0,481		
	4th year	139	4,13	0,60	433			
	Total	434	4,12	0,55				
Hypothetical inference	1st year	84	3,74	0,61			0,272	--
	2nd year	104	3,70	0,67				
	3rd year	107	3,66	0,66	3	1.307		
	4th year	139	3,82	0,65	433			
	Total	434	3,74	0,65			0,615	--
Reasoning Total	1st year	84	4,10	40				
	2nd year	104	4,11	43				
	3rd year	107	4,06	40	3	0,601		
	4th year	139	4,13	48	433			
	Total	434	4,10	44				

\*p<0,05

According to Table 5, among the dimensions of the pre-service teachers' reasoning styles scale, the reasoning total score [ $F_{(3-433)} = 0.601$ ;  $p > 0.05$ ], metaphorical-deductive [ $F_{(3-433)} = 0.652$ ;  $p > 0.05$ ], empirical inference [ $F_{(3-433)} = 1.161$ ;  $p > 0.05$ ], analogical-inductive [ $F_{(3-433)} = 0.481$ ;  $p > 0.05$ ], and hypothetical inference [ $F_{(3-433)} = 1.307$ ;  $p > 0.05$ ] dimensions do not indicate a significant difference based on the class level.

**Results of ANOVA According to the Frequency of Book Reading for Reasoning Styles**

**Table 6.** Results of ANOVA for reasoning styles according to the frequency of book reading

Dimensions	Frequency of Book Reading	N	M	Sd	df	F	p	Significant Difference
Metaphorical-deductive	1. I always read	33	4,34	0,53			0,866	--
	2. I Frequently read	111	4,34	0,55	2			
	3. I Occasionally read	290	4,31	0,51	433	0,144		
	Total	434	4,32	0,52				
Empirical inference	1. I always read	33	4,15	0,62			0,154	--
	2. I Frequently read	111	3,94	0,58	2			
	3. I Occasionally read	290	4,02	0,56	433	1,877		
	Total	434	4,01	0,57				
Analogical-inductive	1. I always read	33	4,27	0,56			0,030	2-3*
	2. I Frequently read	111	4,20	0,55	2			

	3. I Occasionally read	290	4,07	0,54	433	3.546	
	Total	434	4,12	0,55			
Hypothetical inference	1. I always read	33	4,03	0,67		0,020	1-3*
	2. I Frequently read	111	3,76	0,67	2		
	3. I Occasionally read Total	290	3,69	0,63	433	3,936	
		434	3,74	0,65			
Reasoning Total	1. I always read	33	4,23	44		0,152	
	2. I Frequently read	111	4,12	46	2		
	3. I Occasionally read Total	290	4,08	42	433	1,891	
		434	4,10	44			

\*p<0,05

In Table 6, no significant difference was observed according to the frequency of book reading in the total score of reasoning styles [ $F_{(2-433)} = 1.891$ ;  $p > 0.05$ ]. When examining the sub-dimensions of the reasoning styles scale, no significant difference was seen in the frequency of book reading in the metaphoric-deductive [ $F_{(2-433)} = 0.144$ ;  $p > 0.05$ ] and empirical inference [ $F_{(2-433)} = 1.877$ ;  $p > 0.05$ ] dimensions. Outside of these sub-dimensions, significant differences were found in the analogic-inductive [ $F_{(2-433)} = 3.546$ ;  $p < 0.05$ ] and hypothetical inference [ $F_{(2-433)} = 3.936$ ;  $p < 0.05$ ] dimensions according to the frequency of book reading. In other words, the variable of book reading frequency is a determinant in the analogic-inductive and hypothetical inference dimensions of reasoning styles.

Looking at the Levene findings for the analogic-inductive dimension of reasoning styles, it was determined as  $L_F = .439$  and  $Sig(p) = .645$ , and since  $p > .05$ , the variance shows homogeneous distribution. According to the results of the LSD test, there is a significant difference between the pre-service teachers who frequently read books ( $M = 4.20$ ) and those who occasionally read ( $M = 4.07$ ). The scores of the occasionally reading pre-service teachers are lower than those of the frequent readers.

For the hypothetical inference dimension, looking at the findings of the Levene test, it was determined as  $L_F = .959$  and  $Sig(p) = .384$ . According to the results of the Scheffe test, there is a significant difference between the pre-service teachers who always read books ( $M = 4.03$ ) and those who occasionally read ( $M = 3.69$ ). The scores of the occasionally reading pre-service teachers are lower than those who always read.

**Results of the T-Test by Gender for Critical Thinking Skills**

**Table 7.** Results of the T-test for critical thinking skills by gender

Dimensions	Gender	N	M	Sd	df	t	p
Metacognition	Female	325	3,97	0,52	432	-0,850	0,396
	Male	109	4,02	0,59			
Flexibility	Female	325	4,02	0,56	164,758	-0,463	0,644
	Male	109	4,05	0,65			
Systematicity	Female	325	3,94	0,53	158,731	-0,826	0,410
	Male	109	4,00	0,66			
Persistence and patience	Female	325	3,96	0,60	432	0,087	0,931

	Male	109	3,95	0,64			
Open-mindedness	Female	325	3,96	0,64	432	-1,155	0,249
	Male	109	4,04	0,70			
Critical Thinking Total	Female	325	3,97	0,49	161,268	-0,655	0,513
	Male	109	4,01	0,59			

\*p<0,05

In Table 7, no significant difference was found in the overall score for critical thinking skills according to gender [ $t_{(161,268)} = -0.655$ ;  $p > 0.05$ ]. Furthermore, there were no significant differences based on gender in the subcategories of metacognition [ $t_{(432)} = -0.850$ ;  $p > 0.05$ ], flexibility [ $t_{(164,758)} = -0.463$ ;  $p > 0.05$ ], systematicity [ $t_{(158,731)} = -0.826$ ;  $p > 0.05$ ], persistence and patience [ $t_{(432)} = 0.087$ ;  $p > 0.05$ ], and open-mindedness [ $t_{(432)} = 1,155$ ;  $p > 0.05$ ].

**ANOVA Results of Critical Thinking Skills Based on Grade Level**

**Table 8.** ANOVA results for critical thinking skills according to grade level

Dimensions	Class Level	N	M	Sd	df	F	p	Significant Difference
Metacognition	1st year	84	3,88	0,47			0,069	--
	2nd year	104	4,05	0,55	3			
	3rd year	107	3,93	0,55	433	2,385		
	4th year	139	4,03	0,56				
	Total	434	3,98	0,54				
Flexibility	1st year	84	3,95	0,51			0,331	--
	2nd year	104	4,06	0,61	3			
	3rd year	107	3,99	0,62	433	1,144		
	4th year	139	4,08	0,58				
	Total	434	4,03	0,59				
Systematicity	1st year	84	3,85	0,52			0,125	--
	2nd year	104	3,97	0,58	3			
	3rd year	107	3,92	0,58	433	1,921		
	4th year	139	4,03	0,57				
	Total	434	3,95	0,57				
Persistence and patience	1st year	84	3,81	0,64			0,116	--
	2nd year	104	3,98	0,60	3			
	3rd year	107	3,97	0,59	433	1,984		
	4th year	139	4,01	0,59				
	Total	434	3,95	0,61				
Open-mindedness	1st year	84	3,84	0,63			0,213	--
	2nd year	104	3,98	0,63	3			
	3rd year	107	4,02	0,69	433	1,504		
	4th year	139	4,02	0,67				
	Total	434	3,98	0,66				
Critical Thinking Total	1st year	84	3,87	0,46			0,112	--
	2nd year	104	4,02	0,53	3			
	3rd year	107	3,95	0,53	433	2,008		
	4th year	139	4,04	0,52				
	Total	434	3,98	0,52				

\*p<0,05

Upon examining Table 8, no significant differences were found in the overall score for critical thinking [ $F_{(3-433)} = 2,008$ ;  $p > 0.05$ ] and in the dimensions of metacognition [ $F_{(3-433)} = 2,385$ ;  $p > 0.05$ ], flexibility [ $F_{(3-433)} = 1,144$ ;  $p > 0.05$ ], systematicity [ $F_{(3-433)} = 1,921$ ;  $p > 0.05$ ], persistence and patience [ $F_{(3-433)} = 1,984$ ;  $p > 0.05$ ], and open-mindedness [ $F_{(3-433)} = 1,504$ ;  $p > 0.05$ ].

**Analysis of Critical Thinking Skills Based on Frequency of Reading Books: ANOVA Results**

**Table 9.** ANOVA results of critical thinking skills according to the frequency of reading books

Dimensions	Frequency of Book Reading	N	M	Sd	df	F	p	Significant Difference
Metacognition	1. I always read	33	4,15	0,64			0,118	--
	2. I Frequently read	111	4,01	0,54	2			
	3. I Occasionally read	290	3,95	0,52	433	2,148		
	Total	434	3,98	0,54				
Flexibility	1. I always read	33	4,18	0,70			0,093	--
	2. I Frequently read	111	4,09	0,57	2			
	3. I Occasionally read	290	3,99	0,58	433	2,390		
	Total	434	4,03	0,59				
Systematicity	1. I always read	33	4,10	0,67			0,016	2-3*
	2. I Frequently read	111	4,05	0,51	2			
	3. I Occasionally read	290	3,90	0,57	433	4,194		
	Total	434	3,95	0,57				
Persistence and patience	1. I always read	33	4,14	0,63			0,080	--
	2. I Frequently read	111	4,00	0,53	2			
	3. I Occasionally read	290	3,91	0,63	433	2,542		
	Total	434	3,95	0,61				
Open-mindedness	1. I always read	33	4,07	0,72			0,267	
	2. I Frequently read	111	4,05	0,60	2			
	3. I Occasionally read	290	3,94	0,67	433	1,324		
	Total	434	3,98	0,66				
Critical Thinking Total	1. I always read	33	4,14	0,60			0,044	1-3*
	2. I Frequently read	111	4,04	0,48	2			
	3. I Occasionally read	290	3,94	0,52	433	3,137		
	Total	434	3,98	0,52				

\* $p < 0,05$

When Table 9 is examined, it shows a difference in critical thinking total and systematicity scores. However, no significant difference was detected in the dimensions of metacognition, flexibility, perseverance and patience, and open-mindedness. In other words, the frequency of reading books has a defining effect on the Critical Thinking Total and systematicity dimensions of critical thinking skills.

The systematicity dimension was determined as  $L_F = 3.923$  and Sig (p) = .020 according to Levene's findings. According to Dunnet C results, there is a significant difference between pre-service teachers who frequently read books (M = 4.05) and those who occasionally read books (Mean = 3.90). The scores of those who frequently read books are higher than those who read occasionally. No significant differences were found between other groups.

According to the results of the test conducted for the critical thinking total, there is a significant difference between those who always read books ( $M = 4.14$ ) and those who occasionally read books ( $M = 3.94$ ). The scores of those who occasionally read books are lower than those who always read.

## **CONCLUSION and DISCUSSION**

This study aims to determine the relationship between pre-service teachers' reasoning styles and critical thinking skills. According to the research findings, a moderate, positively significant relationship has been observed between pre-service teachers' reasoning styles and critical thinking skills. As such, as pre-service teachers' reasoning styles increase, their critical thinking skills also improve. It is typical that the process of critical thinking, a reasoning method, results in increased critical thinking skills as the level of pre-service teachers' reasoning styles improve. Cognitive skill training, utilizing each aspect of reasoning styles, is thought to play a crucial role in teacher education and in enhancing the quality of teacher competence (Duran, 2019). In this context, Büyükşahin and Kingir (2021) emphasized the importance of using reasoning processes in education to foster individuals capable of critical thinking.

The regression analysis conducted to determine the predictive level of pre-service teachers' reasoning styles and critical thinking skills revealed that critical thinking skills are a significant predictor of reasoning styles. In another study, Emir (2013) found that thinking styles predicted tendencies toward critical thinking.

No significant gender-based differences were found in pre-service teachers' reasoning styles. However, differences are seen in the metaphorical-deductive sub-dimension. In this dimension, female pre-service teachers scored higher than male pre-service teachers. Yet, in general terms, it can be stated that gender is not a determinant in reasoning styles. In a study by Duran and Ekici (2020), metaphorical-deductive reasoning style scores were higher for female students among the dimensions of pre-service teachers' reasoning styles. No other significant differences were found. This study arrived at a similar conclusion. In another study conducted by Duran (2019) on pre-service teachers, it was determined that there was generally no significant difference in reasoning styles according to the gender variable, but there were differences in the empirical inference sub-dimension. In the literature, studies that reasoning does not differentiate according to gender are encountered (Acar et al., 2015; Duran, 2014; Duran et al., 2017; Duran and Mertol, 2019; Kocagül Sağlam, 2019; Piraksa et al., 2014; Valanides, 1996). Açıslı (2016) found in his study that there was no significant difference between pre-service teachers' learning styles and their genders. Contrary to these results, Yakıt (2022) concluded in his study on teachers and pre-service teachers that reasoning methods vary according to gender. Kılıç and Sağlam (2009) stated in their study that students' rational thinking skills differed according to gender.

In another finding of this study, it was determined that the critical thinking skills of pre-service teachers do not differ by gender. This result parallels the outcomes of other studies in the literature (Açıslı, 2015; Akar, 2007; Aksu Demirtaş, 2019; Aslan, 2019; Çetin, 2008; Duran, 2019; Gündüz, 2015; Hazer, 2011; Karalı, 2012; Kiriş

Avaroğulları and Şaman, 2020; Koçak et al., 2015; Korkmaz, 2009; Kürüm, 2002; Narin and Aybek 2010; Özdemir, 2005; Öztürk, 2006; Öztürk, 2020; Polat, 2022; Şen, 2009; Tartuk, 2015; Tural and Seğgin 2012). In contrast, studies of Ateş (2018), Altıntaş (2019), Karakuş (2019), Özgün (2019) and Elçi's (2022) indicate that pre-service social studies teachers demonstrate critical thinking tendencies that are more favorable towards women. Çokluk Bökeoğlu and Yılmaz's (2005) study with university students found that male students' attitudes towards critical thinking were higher than female students. The results of this research generally align with those of studies reviewed in the literature.

Another result of the study showed that there was no significant difference in students' reasoning styles according to their class level. This could be attributed to the fact that the pre-service teachers are in similar age groups. Açıslı (2016), who conducted a study related to learning styles, found that the learning styles of pre-service elementary school teachers varied significantly according to class level.

The critical thinking skills of pre-service teachers do not show a significant difference based on class level. This could be attributed to the fact that the pre-service teachers are in similar age groups. This result is supported by the results of Aksu Demirtaş (2019); Altıntaş (2019); Kiriş Avaroğulları and Şaman (2020) and Elçi's (2022). However, this result contradicts the research results of Kürüm (2002), Öztürk (2006), Akar (2007), Deniz (2009), Karalı (2012), Koçak et al. (2015), Tartuk (2015), Ateş (2018), Karakuş (2019) and Öztürk (2020). While this result of the research is supported by some studies in the literature, it is not supported by others. In summary, this study and various studies in the literature found that critical thinking does not differ according to class level. The differences found in the studies could be attributed to variations in the sample and the data collection tools used.

In another result of the research, it was found that pre-service teachers' critical thinking skills show a significant difference according to the frequency of reading books. Looking at the total score, those who always read books score higher than those pre-service teachers who only occasionally read books. In other words, students who read books all the time can be said to have strong critical thinking skills. Reading books enhances individuals' skills to analyze, critically think, and draw conclusions. A critical thinker is interested in the ideas of others, which may influence the frequency of reading books. According to the results of Karakuş's (2019) study with pre-service teachers, those who read seven or more books a year have higher critical thinking standards than those who read one to three books a year. Şen (2009), however, found that the critical thinking skills of pre-service Turkish teachers did not significantly differ according to the frequency of reading books and newspapers. Pre-service teachers' reasoning styles do not show a significant difference according to the frequency of reading books. Differences are observed in the analogical-inductive and hypothetical inference dimensions. In the analogical-inductive sub-dimension, the scores of pre-service social studies teachers who frequently read books are higher than those who occasionally read books. In the hypothetical inference sub-dimension, those who always read books score higher than those pre-service teachers who occasionally read

books. However, it can be generally stated that the frequency of reading books is not a determinant on reasoning styles.

### RECOMMENDATIONS

Based on the results of the study, the following recommendations are suggested:

1. A mixed-methods, qualitative study, or action research could be conducted to examine the relationship between pre-service teachers' reasoning styles and their critical thinking skills.
2. Another result of the study revealed that those who always read books have higher critical thinking skills. Initiatives can be undertaken to enhance the critical thinking skills of students who only read books occasionally. Project studies can be prepared to encourage students to read books
3. The reasoning styles and critical thinking skills of teacher candidates can be examined with different scales and different variables.
4. Compulsory courses that develop reasoning and critical thinking skills can be added to the Social Studies teaching undergraduate program.

### ETHICAL TEXT

"In this article, the journal writing rules, publication principles, research and publication ethics, and journal ethical rules were followed. The responsibility belongs to the author (s) for any violations that may arise regarding the article. "

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