

Research Article

An examination of high school students' critical thinking dispositions and analytical thinking skills

Engin Demir

Bandırma Onyedi Eylül University, Turkey (ORCID: 0000-0002-6280-5467)

The purpose of this correlational survey study is to examine the critical thinking dispositions and analytical thinking skills of high school students. Using a multistage cluster sampling plan, 433 students from different types of high schools completed the critical thinking disposition, and the analytical thinking skills scales. Descriptive analysis, regression analysis, and MANOVA were used to analyze the data. Research results indicated that high school students had high levels of analytical thinking skills and critical thinking dispositions. Analytical thinking skills explained 57% of the variance in critical thinking dispositions. The results suggested that having high analytical thinking skills had an impact on students' critical thinking dispositions. The results also showed that the critical thinking dispositions and analytical thinking skills of students in high performing schools were higher than those in low performing schools. Finally, mothers with higher level of education had a greater impact on students' critical thinking dispositions and analytical thinking skills.

Keywords: Critical thinking; Analytical thinking; Skills; High school students

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1. Introduction

In its most basic sense, thinking refers to the ultimate cognitive activity used by our brain to interpret the world around us and make decisions about how to react to it. The importance of thinking to many human behaviors and interactions has led to extensive research across numerous academic disciplines, such as philosophy, linguistics, psychology, neurology, sociology, and educational sciences, mainly to gain a deeper understanding of historical roots of thinking and understand its impacts. Critical thinking, on the other hand, involves thinking more deeply about complex situations.

Scriven and Paul (1987) define critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action." (p. 1). More concisely, it is a way of thinking by which an individual organizes, analyzes, and evaluates information (Johnson, 2000). According to Johnson (2000), it is a way of thinking that organizes, analyzes, and evaluates information. Based on the definitions of critical thinking, we can conclude that thinking and critical thinking differ.

Address of Corresponding Author

Engin Demir, PhD, Vocational School of Health Services, Bandırma Onyedi Eylül University, 10200 Bandırma, Balıkesir, Turkey.

✉ edemirakademik@gmail.com

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Critical thinking consists of skills and dispositions. According to Ennis (1985), critical thinking is a metacognitive skill that requires less advanced skills, such as basic reading and comprehension before reading a text critically. Critical thinking is a thought process wherein such sub-skills are accurately and purposefully drawn together and utilized (Gelder 2005). In his Taxonomy of Educational Objectives, Bloom categorizes educational objectives into domains to understand the achievement level of the students (Bloom et al., 1956). The evaluation domain of the taxonomy encompassed critical thinking skills. The analysis, synthesis, and evaluation domains began to be referred to as *higher order thinking skills* (Tankersley, 2005). Brookfield et al. (2005) argues that, without the ability to think and respond critically, we could never go beyond the assumptions that we automatically adopt in childhood. Therefore, it should be the primary aim of educational institutions to teach critical thinking and reflection. Indeed, students might be equipped with the knowledge, which does not necessarily mean that they have mastered analytical thinking skills, so they may become vulnerable to misguidance and wrong information from various sources; i.e. the media, advertisements, and their immediate environment. Students need to have critical thinking skills for higher academic performance. Researchers also revealed that the outstanding ability to think critically contributes to success at work and in daily life (Butler, 2012; Nirmala & Kumar, 2018). According to Siegel (1999), formal education in critical thinking can affect students' critical thinking dispositions, and this is an indication of individuals' willingness to think and develop their critical thinking skills (Murphy et al., 2014).

Facione et al. (2000) and Profetto-McGrath (2003) state that one of the critical thinking dispositions is the ability to analyze. The process of thinking starts with analytical thinking (identifying the problem). Amer (2005) defines analytical thinking, a higher order thinking skill, as the ability to differentiate between existing facts and opinions by analyzing their strengths and weaknesses, to analyze data, and to develop thinking capacity and use information effectively by reasoning. The researcher highlights that analytical thinking is a component of critical thinking, and to provide evidence for this, he proposes some critical thinking definitions. For example, in Chance's (1986, p.6) definition, critical thinking is the ability to analyze facts, generate and organize ideas, support opinions, make inferences, evaluate arguments, and solve problems, and it is a process of application, analysis, synthesis, and/or evaluation (Scriven & Paul, 1987, p. 1). Although there has been an ongoing debate about which skills constitute higher order thinking skills, some researchers have determined that they are analytical thinking (Swartz & Parks, 1994), problem solving, decision making, critical thinking, and creative thinking (Costa, 2001). Some of the existing studies in the literature focused on the difference between critical thinking and creative thinking (Gök & Erdoğan, 2011; Durnacı & Ültay, 2020) and the difference between critical thinking and problem solving (Kanbay et al., 2013; Koçoğlu & Kanadlı, 2019). However, the relationship between critical thinking dispositions and analytical thinking skills is still scarce. Therefore, the present study intends to explore high school students' critical thinking dispositions and analytical thinking skills. To this end, it seeks answers to the following research questions:

RQ 1) What is the level of high school students' critical thinking dispositions and analytical thinking skills?

RQ 2) Do high school students' levels of critical thinking dispositions and analytical thinking skills differ by a) gender, b) school type, c) mother's levels of education, d) father's level of education, and e) number of read books per year.

RQ 3) Is high school students' analytical thinking skills a significant predictor of their critical thinking dispositions?

2. Method

2.1. Research Design

Based on a quantitative research approach, this study employed a correlational survey model. Correlational studies are used when the aim is to reveal the relationship between two or more variables or to make predictions based on this relationship (Creswell 2015; Fraenkel et al., 2012).

2.2. Sample

High schools in the provincial center of a city in the western part of Turkey comprise the study population. Multistage cluster sampling was used to identify the sample for this study (Christensen et al., 2015; Cresswell, 2015). Thus, school types were identified, followed by the schools that represented each type. This study uses formula proposed by Krejcie and Morgan (1970), in which the minimum required sample size is 384 for a population of 100,000 or above. Overall, 441 high school students participated in the study, and the statistical analysis involved 433 students, whose descriptive statistics are presented in Table 1.

Table 1

Descriptive statistics of the participants

| <i>Variables</i> | | <i>Frequency</i> | <i>Percentage</i> |
|-------------------------------|--|------------------|-------------------|
| Gender | Female | 236 | 54.5 |
| | Male | 197 | 45.5 |
| School Type | Anatolian High School | 113 | 26.1 |
| | Science High School | 136 | 31.4 |
| | Vocational and Technical Anatolian High School | 184 | 42.5 |
| Mother's Level of Education | Middle School or below | 240 | 55.4 |
| | High School | 108 | 24.9 |
| | Associate degree or above | 85 | 19.6 |
| Father's Level of Education | Middle School or below | 207 | 47.8 |
| | High School | 118 | 27.3 |
| | Associate degree or above | 108 | 24.9 |
| Number of books read per year | 6 or fewer | 220 | 50.8 |
| | 7-12 | 114 | 26.3 |
| | 13 or more | 99 | 22.9 |

As can be seen in Table 1, more than half of the high school students were females (54.5%), while almost half attended vocational and technical Anatolian high schools (42.5%). The majority of them read fewer than six books per year (50.8%). A total of 55.4% of the mothers and 47.8% of the fathers of the participants completed education at the middle school or below level.

2.3. Data Collection Tools

Data were collected using the critical thinking disposition, and the analytical thinking scales. The critical thinking disposition scale, called the UF/EMI critical thinking disposition scale, was developed by Florida University researchers and adapted into Turkish culture by Ertaş Kılıç and Şen (2014). The 5-point Likert scale consists of 26 items and was administered to 342 ninth-grade and tenth-grade students. In order to examine the three-factor structure of the scale, a confirmatory factor analysis (CFA) was conducted, and one item was removed. The final scale had 25 items and three factors, consistent with the original structure. The Cronbach Alpha internal reliability coefficient, which indicates the reliability of the scale, was found to be 0.91 for the overall scale, 0.88 for the participation sub-dimension, 0.70 for cognitive maturity, and 0.73 for innovation. The explained variance of the scale is 35.56%. Goodness of fit indexes calculated by confirmatory factor analysis (CFA) are as follows: $\chi^2/df = 2.99$, RMSEA=.008, CFI=.94, NFI=.91, GFI=.84, SRMR=.06

The analytical thinking skills scale for high-school students, which aims to determine high school students' analytical thinking levels, was developed by Ocak and Park (2020). This 24-item 5-point Likert scale with four sub-dimensions was developed based on data from 324 high school students. The factors were named as follows: internalization of data, attention to detail, analysis of data, and strategic approach. Their cronbach alfa coefficients were found to be 0.86, 0.84, 0.77, and 0.74, respectively and the overall reliability coefficient of the scale was 0.908. The variance

explained by the scale is 54.45%. CFA revealed the following goodness of index values: $\chi^2/df = 2.29$, RMSEA=0.06., CFI=0.96, NFI=0.93, GFI=.86, SRMR=.05.

2.4. Data Analysis

Descriptive analysis, regression analysis, and MANOVA were employed to answer the research questions. Independent variables for MANOVA were gender, school type, mother's education level, father's education level, and the number of books read per year while dependent variables were critical thinking dispositions and analytical thinking skills scores. Prior to implementing MANOVA, Palant (2016) suggests removing outliers from the dataset, checking the data for multicollinearity and normal distribution, ensuring that the singularity problem is eliminated, and that the variance matrix and covariance matrix are homogeneous. All data were analyzed accordingly, as a result of which no data was lost from the dataset. To identify the univariate outlier values, z scores were checked to make sure they were within the +3 and -3 range. The values that did not fall within this range were excluded from the dataset. Thus, it can be concluded that the data did not contain univariate outliers (Stevens, 2001). The data with univariate outlier characteristics that emerged from the boxplot were also eliminated. Mahalanobis distances were calculated to determine whether the variables showed a multivariate normal distribution and whether all the dependent variables could be used in MANOVA analysis. The values with Mahalanobis distances higher than 13.82, which is the value set for a minimum of two variables (Pallant, 2016), were removed from the dataset. Ultimately, Mahalanobis distance values were within the range of .0016 and 10.799. When the Mahalanobis distances were examined, it was observed that there were no outliers. To assess univariate normality, the Kolmogorov-Smirnov normality test, skewness and kurtosis coefficients, and the histogram graph with normal distribution were analyzed. One criterion of normality assumption was taken as skewness and kurtosis coefficients within the -1 and +1 range (Morgan et al., 2004). As a result, the univariate normality assumption was met. The scatterplot of all the binary relations of the dependent variables revealed an oval shape, which indicates that there was no threat to linearity (Tabachnick & Fidell, 2013). Multicollinearity was checked through correlation analysis; correlation coefficients below .8 were found, which manifested that correlation was not high. Box's M Test was performed to test the homogeneity assumption of covariance matrices. If the p (sig) values are greater than 0.001 in this test, it means this assumption is not neglected (Pallant, 2016). As the test results showed that p (sig.) value was $p > 0.001$ for all variables, it can be concluded that the homogeneity assumption of variance-covariance matrices were also met. Whether the relationship between variables is linear or not for simple regression analysis was examined on the scatterplot, and it was observed to be linear. The analysis results were interpreted concerning percentage, frequency, mean, and standard deviation values, with a 0.5 significance level. The Cohen's d statistics, calculated based on the extent to which the significant difference is influenced by the difference between the means, are reported. Eta squared values were interpreted as follows: .01=minor effect, .06=moderate effect, .14=large effect (Cohen, 1988).

3. Findings

3.1. Critical Thinking Dispositions and Analytical Thinking Skills of the Students

In Table 2, the descriptive statistics regarding the disposition and skills of critical thinking of high school students were presented.

Table 2

Critical thinking disposition and analytical thinking skills scores of the students

| Scales | N | Number of Items | Mean | SD | Min | Max |
|-------------------------------|-----|-----------------|-------|-------|-------|--------|
| Analytical thinking | 433 | 24 | 88.99 | 14.68 | 47.00 | 120.00 |
| Critical thinking disposition | 433 | 25 | 99.04 | 13.57 | 56.00 | 125.00 |

As can be observed in Table 2, the analytical thinking and critical disposition mean scores of high school students were found to be 88.99 and 99.04, respectively. These mean scores suggest that high school students have a high level of analytical thinking skills and critical thinking dispositions.

3.2. Critical Thinking Dispositions and Analytical Thinking Skills of the Students in terms of Some Variables

This section investigated whether gender, school type, mother's education level, father's education level, and the number of books read per year affected high school students' critical thinking dispositions and analytical thinking skills.

3.2.1. Gender

The MANOVA results of the high school students' scores for critical thinking disposition and analytical thinking skills by gender were presented in Table 3.

Table 3

The MANOVA results on the critical thinking disposition and analytical thinking skills by gender

| Independent Variable | Wilks' Lambda | F | Hypothesis df | Error df | p | η^2 |
|----------------------|---------------|-------|---------------|----------|------|----------|
| Gender | .971 | 6.492 | 2.000 | 430.000 | .002 | .029 |

The MANOVA results in Table 3 indicate a statistically significant difference between female and male students, $F(2,430)=6.492$; $p = .002$; Wilks' Lambda=.971; Partial Eta Squared=.02. Table 4 presents the results obtained for each dependent variable and the tests for between-subjects effects.

Table 4

Tests of between-subjects effects and group means by gender

| Dependent Variable | Gender | N | Mean | SD | df | Mean Square | F | p | η^2 |
|---------------------|--------|-----|---------|-------|----|-------------|--------|------|----------|
| Critical thinking | Female | 236 | 100.237 | 12.80 | 1 | 747.377 | 4.086 | .044 | .009 |
| | Male | 197 | 97.599 | 15.02 | | | | | |
| Analytical thinking | Female | 236 | 91.203 | 13.98 | 1 | 2550.126 | 12.145 | .001 | .027 |
| | Male | 197 | 86.330 | 15.07 | | | | | |

As can be observed in Table 4, where the scores obtained for each dependent variable are presented separately, the only statistically significant difference was found to be in the analytical skills scores of female and male students based on the Bonferroni-corrected alpha level of .025 ($F(1, 431)=12.145$; $p=.001$; Partial Eta Squared=.027). Female students were found to have a higher level of analytical thinking skills than male students. However, the effect size is small.

3.2.2. School type

The MANOVA results of the high school students' scores for critical thinking disposition and analytical thinking skills by school type were presented in Table 5.

Table 5

The MANOVA results on the critical thinking disposition and analytical thinking skills by school type

| Independent Variable | Wilks' Lambda | F | Hypothesis df | Error df | p | η^2 |
|----------------------|---------------|-------|---------------|----------|------|----------|
| School type | .969 | 3.367 | 4.000 | 858.000 | .010 | .015 |

The MANOVA results in Table 5 reveal a statistically significant difference among high school students by school type, $F(4, 858)=3.367$; $p = .005$; Wilks' Lambda=.969; Partial Eta Squared=.015. Table 6 presents the results obtained for each dependent variable and the tests of between-subjects effects.

Table 6
Tests of between-subjects effects and group means by school type

| Dependent Variable | School Type | N | Mean | SD | df | Mean Square | F | p | η^2 |
|---------------------|--------------------------------------|-----|--------|-------|----|-------------|-------|------|----------|
| Critical thinking | Science High School | 136 | 102.17 | 10.99 | 2 | 1075.259 | 5.971 | .003 | .027 |
| | Vocation and Tech. Anat. High School | 184 | 96.95 | 15.15 | | | | | |
| | Anatolian High School | 113 | 98.66 | 13.08 | | | | | |
| Analytical thinking | Science High School | 136 | 91.62 | 13.59 | 2 | 971.430 | 4.585 | .011 | .021 |
| | Vocation and Tech. Anat. High School | 184 | 86.70 | 15.39 | | | | | |
| | Anatolian High School | 113 | 89.55 | 14.28 | | | | | |

According to the analyses presented in Table 6, a statistically significant difference was revealed based on the Bonferroni-corrected alpha level of .025, between the scores indicating students' critical thinking dispositions ($F(2, 430)=5.971$; $p=.003$; Partial Eta Squared=.02) and analytical thinking skills ($F(2, 430)=4.585$; $p=.01$; Partial Eta Squared=.02) by school type. A scheffe post hoc test was conducted to identify which groups accounted for the significant difference. The results of this test revealed that there was a significant difference between science high school students and those from a vocational and technical Anatolian high school. That is, it can be stated that science high school students have higher levels of critical thinking dispositions and analytical critical thinking skills when compared to those of vocational and technical Anatolian high school students.

3.2.3. Mother's education level

The MANOVA results of the high school students' scores for critical thinking disposition and analytical thinking skills by mother's education level were presented in Table 7.

Table 7
The MANOVA results on the critical thinking disposition and analytical thinking skills by mother's educational level

| Independent Variable | Wilks' Lambda | F | Hypothesis df | Error df | p | η^2 |
|----------------------------|---------------|-------|---------------|----------|------|----------|
| Mother's educational level | .965 | 3.872 | 4.000 | 858.000 | .004 | .018 |

As presented in Table 7, the MANOVA showed a statistically significant difference among high school students by mother's educational level ($F(4, 858)=3.872$; $p = .004$; Wilks' Lambda=.965; Partial Eta Squared=.018). Table 8 presents the tests of within-subjects effects for the results obtained for each dependent variable.

Table 8
Tests of between-subjects effects and group means by mother's educational level

| Dependent Variable | Level of Education | N | Mean | SD | df | Mean Square | F | p | η^2 |
|---------------------|---------------------------|-----|--------|-------|----|-------------|-------|------|----------|
| Critical Thinking | Middle school or below | 240 | 97.07 | 14.08 | 2 | 1243.936 | 6.938 | .001 | .031 |
| | High school | 108 | 100.19 | 13.09 | | | | | |
| | Associate degree or above | 85 | 103.12 | 11.63 | | | | | |
| Analytical Thinking | Middle school or below | 240 | 87.07 | 15.02 | 2 | 1348.939 | 6.420 | .002 | .029 |
| | High school | 108 | 89.67 | 14.46 | | | | | |
| | Associate degree or above | 85 | 93.54 | 12.96 | | | | | |

Table 8 shows a statistically significant difference between students' critical thinking dispositions ($F(2, 430)=6.938$; $p=.001$; Partial Eta Squared=.03) and analytical thinking skills based on the level of education of their mothers ($F(2, 430)=6.420$; $p = .001$; Partial Eta Squared=.02) at a Bonferroni-corrected alpha level of .025. A scheffe post hoc test was performed to determine which

group accounted for the significant variance. The results revealed that students whose mothers had an education level of an associate degree or above had higher levels of critical thinking dispositions and analytical thinking skills than students whose mothers had an education level of middle school or below.

3.2.4. Father's education level

Based on the father's education level, which is another variable, MANOVA results are presented in Table 9 for critical thinking disposition and analytical thinking skills scores of high school students.

Table 9

The MANOVA results on the critical thinking disposition and analytical thinking skills by father's educational level

| Independent Variable | Wilks' Lambda | F | Hypothesis df | Error df | p | η^2 |
|----------------------------|---------------|-------|---------------|----------|------|----------|
| Father's educational level | .983 | 1.794 | 4.000 | 858.000 | .128 | .008 |

According to the MANOVA results presented in Table 9, there were no statistically significant differences between students' levels of critical thinking dispositions and analytical thinking based on their father's educational level ($F(4, 858)=1.794$; $p = .008$; Wilks' Lambda=.983; Partial Eta Squared=.008).

3.2.5. Number of read books per year

Finally, the MANOVA results of the high school students' scores for critical thinking disposition and analytical thinking skills by number of read books per year were presented in Table 10.

Table 10

The MANOVA results on the critical thinking disposition and analytical thinking skills by number of read books per year

| Independent Variable | Wilks' Lambda | F | Hypothesis df | Error df | p | η^2 |
|----------------------|---------------|--------|---------------|----------|------|----------|
| Number of books | .880 | 14.094 | 4.000 | 858.000 | .000 | .062 |

The MANOVA results, as presented in Table 10, revealed that there was a statistically significant difference among high school students' critical thinking disposition and analytical thinking scores by the number of books they read per year ($F(4, 858)=14.094$; $p = .000$; Wilks' Lambda=.880; Partial Eta Squared=.062). The results for each dependent variable and the within-subjects effects are presented in Table 11.

Table 11

Tests of between-subjects effects and group means by number of read books per year

| Dependent Variable | Number of read books per year | N | Mean | SD | df | Mean Square | F | p | η^2 |
|---------------------|-------------------------------|-----|--------|-------|----|-------------|--------|------|----------|
| Critical thinking | 6 or fewer | 220 | 95.03 | 13.68 | 2 | 3627.889 | 21.567 | .000 | .091 |
| | 7-12 | 114 | 102.60 | 12.70 | | | | | |
| | 13 or more | 99 | 103.84 | 11.58 | | | | | |
| Analytical thinking | 6 or fewer | 220 | 84.15 | 14.19 | 2 | 5329.318 | 27.814 | .000 | .115 |
| | 7-12 | 114 | 93.13 | 12.58 | | | | | |
| | 13 or more | 99 | 94.97 | 14.43 | | | | | |

Table 11 shows that there is a statistically significant difference between students' critical thinking dispositions ($F(2, 430)=21.567$; $p = .000$; Partial Eta Squared=.091) and analytical thinking skills ($F(2, 430)=27,814$; $p = .000$; Partial Eta Squared=.115) based on the results for each dependent variable in terms of number of read books per year at a Bonferroni-corrected alpha level of .025. A scheffe post hoc test was performed to determine which group accounted for the significant variance. The results revealed that there was a significant difference between the critical thinking

disposition and analytical thinking scores of the students who read six or fewer books and those who read more than six books per year. That is, those who read six or fewer books per year had lower levels of critical thinking dispositions and analytical thinking skills when compared to those who read more than six books per year.

3.3. Regression Analysis

Table 12 depicts the results of a simple regression analysis of analytical thinking skills on critical thinking dispositions.

Table 12

Simple regression of analytical thinking skills as a predictor of critical thinking dispositions

| | <i>R</i> | <i>R</i> ² | <i>Adjusted R</i> ² | <i>Std. Error of the Estimate</i> | <i>F</i> | <i>p</i> |
|--------------------------------|----------|-----------------------|--------------------------------|-----------------------------------|----------|----------|
| Critical Thinking Dispositions | .757 | .574 | .573 | 9.59251 | 580.233 | .000 |

A close examination of Table 12 reveals that analytical thinking skills account for 57% of the variance in critical thinking dispositions [$R = .757$, $R^2 = .574$, $F(1, 431) = 580.233$ $p < .001$].

Table 13

Simple regression of analytical thinking skills on critical thinking dispositions

| <i>Model</i> | <i>Unstandardized Coefficients</i> | | <i>Standardized Coefficients</i> | | |
|--------------------------------|------------------------------------|-----------|----------------------------------|----------|----------|
| | <i>B</i> | <i>SE</i> | β | <i>t</i> | <i>p</i> |
| 1 (Constant) | 7.870 | 3.399 | | 2.315 | .021 |
| Critical Thinking Dispositions | .819 | .034 | .757 | 24.088 | .000 |

The analysis results presented in Table 13 suggests that one unit of variance in analytical thinking leads to an increase of .819 in critical thinking dispositions. In summary, the predicted result of this model is as follows: $y = 7.87 + 0.819x$

4. Discussion and Conclusion

The present study examined analytical thinking skills and critical thinking dispositions of high school students as well as the relationship between these higher order thinking skills in terms of various variables. The results of the study revealed that high school students had high levels of analytical thinking skills and critical thinking dispositions. In a study by Köksal and Çöğmen (2018), middle school students were found to have high levels of critical thinking skills across all critical thinking sub-dimensions. Hamurcu et al. (2005) conducted a study revealing that teacher candidates in the science education and class teacher departments were generally strong in critical thinking dispositions. The results obtained from the present study show that similar results are also achieved at different education levels. On the other hand, Güven and Kürüm (2008) reported that the overall critical thinking dispositions of teacher candidates in the Faculty of Education were generally low. However, the same teachers were found to have high levels of analytical disposition. In a study by Arum and Roksa (2011), where students' analytical, critical, and problem-solving skills were evaluated after a project, it was revealed that freshman students had low levels of higher-order skills. In Tümkaya's (2011) study, it was reported that students' overall critical thinking dispositions were low.

Study results also revealed no significant difference between the critical thinking disposition scores of females and males. Ocağ and Kutlu Kalender (2017), who conducted a study with middle school students, found that female students had higher levels of critical thinking skills as compared to male students. However, Ekinci and Aybek (2010) did not find a significant difference between female and male students in their study on university students' critical thinking dispositions. Similarly, in studies by Kürüm (2002), Tokyürek (2001), and Akar (2007), gender was found to have no impact on critical thinking. These results are consistent with those of the present study. However, in the studies by Demirkaya and Çakar (2012) and Bayındır (2015), it was

revealed that critical thinking levels did not differ by gender. The variation in the results obtained from the studies could be attributed to the differences in the scales used and the sample groups participating in the studies.

Science high schools in Turkey demonstrate higher levels of critical thinking disposition than vocational and technical Anatolian high schools since these schools accept students who demonstrate the highest achievement in central examinations. Seferoğlu and Akbıyık (2006), who conducted a study with students from grade 9, found a positive relationship between students' academic achievements and critical thinking dispositions. Science high school students are known to have the highest levels of academic success in Turkey. On the other hand, vocational and technical Anatolian high schools accept students with lower academic levels, and as a natural consequence, the academic achievement levels of the students in these schools are low. It could explain why science high school students have a higher critical thinking disposition. However, Akkuş Çakır and Senemoğlu (2016) could not find a significant relationship between university students' analytical thinking skills and their academic achievements. This indicates that the results obtained may be different for different education levels.

The students whose mother's level of education was an associate degree or above had higher levels of critical thinking dispositions and analytical thinking skills when compared to those whose mother's level of education was middle school or below. In a study by Ekinçi and Aybek (2010), it was revealed that university students' critical thinking dispositions did not differ by their mother and father's level of education. Similarly, in a study on teacher candidates by Gülveren (2007), no significant relationship was found between students' critical thinking skills and their mother and father's level of education. In addition, no significant difference was found between high school students' analytical thinking skills and critical thinking dispositions and their father's level of education. In Turkey, mothers are primarily considered to be responsible for the children and their education (Tutkun & Şahin, 2016). This could explain why the father's level of education is not a determinant in students' analytical thinking skills and their critical thinking dispositions.

High school students who read six or fewer books per year were found to have lower critical thinking dispositions and analytical thinking skills when compared to those reading between 7 and 12 books and those reading 13 or more books. In the studies conducted with university students, it can be observed that there is a positive and statistically significant relationship between teacher candidates' critical thinking skills and their attitudes towards reading books, their interest in reading books, and their library frequenting habits (Çelik et al., 2015; Gökkuş & Delican, 2016; Koçak et al., 2015). This seems to support the findings of the present study.

In examining analytical thinking skills as a predictor of critical thinking dispositions, it is concluded that analytical thinking skills explain 57% of critical thinking variance. This suggests that high school students' analytical thinking skills have an impact on their critical thinking dispositions. Amer (2005) points out that thinking analytically is a component of thinking critically. The higher order thinking skills is a process as a whole. This process generally results in problem solving. However, other type of higher order thinking skills, such as analytical thinking, critical thinking, and creative thinking need to be utilized within the process. Hence, one can claim that thinking skills impact each other. Everybody today recognizes the importance of information, and it has become increasingly critical that this information is analyzed and processed in a timely manner. Considering the benefits of technology and modern urban life, it does not seem likely that individuals and students can keep up with the rapid changes through traditional education. Students' achievement in both professional and social life is influenced by higher order critical and analytical thinking. It is recommended that similar studies on higher order thinking skills be replicated, as well as work on teaching these skills to students.

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