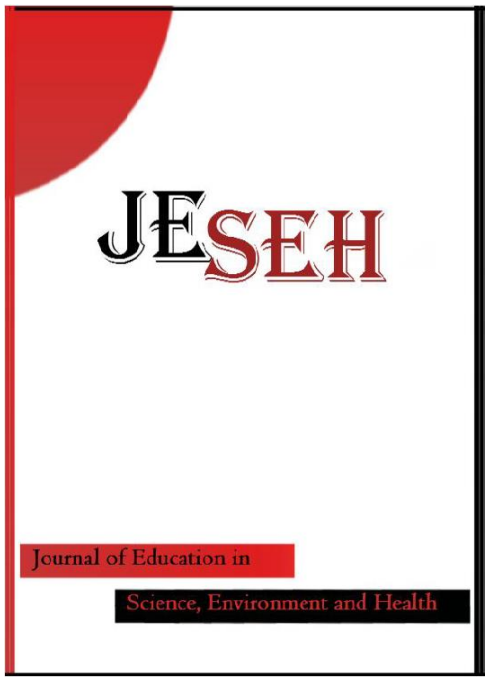

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Abstract

This non-experimental quantitative study aimed to determine if high school students' critical thinking (CT) dispositions and environmental attitudes differ by gender, father, and mother's educational background and their CT dispositions are significant predictors of environmental attitudes. UF/EMI Critical Thinking Disposition Instrument and Environmental Attitude Scale were used to collect data in this study carried out with 139 high school students. It was found out that students' CT dispositions did not differ by gender, father, and mother's educational background. Also, while students' environmental attitudes differed by gender in favor of females, they did not differ by mother and father's educational background. Besides, engagement, maturity, and innovativeness were significant predictors of the students' environmental attitudes. A positive relationship was found between students' CT dispositions and environmental attitude scores and engagement, maturity, and innovativeness together explained 31% of the total variance on their environmental attitudes.

Introduction

With the increasing population, the world is facing many critical environmental problems such as deforestation, scarcity of water, climate change, etc. (Steg et al., 2014a). One of the main reasons for these problems is human interaction with the environment (Cardinale et al., 2012; Vlek & Steg, 2007), and changing people's attitudes and behaviors towards the natural environment can be seen as an important solution for these problems (Keniger et al., 2013; Steg et al., 2014b). Students are expected not only to be able to protect the environment but also solve the environmental problems (Fua et al., 2018) and positive environmental attitudes are important for this. Schultz et al. (2004) defines the environmental attitude as beliefs that have an impact on individuals' behavioral intentions regarding the activities related to environment. According to Gifford and Sussman (2012), environmental attitude has three components which are cognitive (thoughts and knowledge about the environment), affective (feelings about the environment), and behavioral (environment-friendly behavioral intentions and actions).

It is a well-established belief that attitudes and real world behaviors are connected to each other (Fishbein & Ajzen, 1975; Ajzen 1991). When individuals have positive attitudes, they can show positive behaviors in the real world. Some previous studies showed a strong relationship between environmental attitudes and environmental-friendly behaviors (Poortinga et al., 2004; Iverson & Rundmo, 2001). Therefore, studying environmental attitudes is important because they may determine behaviors (Gifford & Sussman, 2012). The existing studies highlight that many factors such as gender, educational background, age, and income (Lee et al. 2015; Blocker & Eckberg, 1989; Dlamini et al., 2021; Mohai, 1992; Zhang, 1994; Marquart-Pyatt, 2008; Kemmelmeie et al., 2002; Franzen & Vogl, 2013a) significantly impact individuals' environmental attitudes. Based on these previous studies, the literature indicates that females, more educated, younger, and economically better situated individuals have more positive environmental attitudes. Literature also suggests that individuals' political beliefs and value orientations are significant predictors of environmental attitudes (Poortinga et al., 2004; Steg et al. 2014b). While biospheric values positively affect environmental attitudes, individuals with egoistic values have less concern about environmental issues (De Groot & Steg, 2008; Steg et al., 2011). Also, levels of trust (Meyer & Liebe, 2010), engaging in nature-related outdoor activities (Hausbeck et al., 1992), and levels of tolerance and understanding (Milfont & Gouveia, 2006) are closely related to environmental attitudes. Besides, the previous studies has also identified a set of variables that can be related to environmental attitudes such as environmental quality, urbanization, and population density of the countries (Franzen, 2003; Franzen & Meyer, 2010; Franzen & Vogl, 2013b). Based on the previous literature, people who live in wealthier countries display higher levels of environmental attitude (Franzen, 2003; Diekmann & Franzen, 1999; Dunlap & York, 2008).

In this study, it was expected that critical thinking (CT) is another important variable that can affect individuals' environmental attitudes. Individuals with high CT skills or dispositions do not use these skills only during the learning process. They also use them at any moment of their daily life. Thanks to CT, individuals can realize the condition of their environment better and develop their curious attitude towards environmental problems. They also understand the environmental problems and investigate the obtained data to find the best way to solve this problem. Therefore, this makes CT a necessary step to preserve environmental sustainability (Puspitasari et al., 2016; Amin et al., 2020). Indeed, previous literature emphasizes attitudes towards renewable energy sources are influenced by CT dispositions of individuals (Lee, 2016; Opitz, 2016; Sakschewski et al., 2014; Güven & Çakır, 2019). Also, some previous studies indicate that CT teaching improves not only students' CT skills or dispositions but also their environmental attitudes (Hofreiter et al., 2007, Orhan, 2021; Muhsilin et al., 2019; Mengi Us, 2019). Therefore, previous literature shows a positive relationship between CT and environmental attitudes. Although there are studies investigating the relationship between the attitudes towards renewable energy sources and CT dispositions (Lee, 2016; Opitz, 2016; Sakschewski et al., 2014; Güven & Çakır, 2019), very few studies were encountered aiming to investigate the relationship between students' general environmental attitudes and CT dispositions in the literature. Therefore, the aim of this study was to investigate if high school students' CT dispositions are a significant predictor of their environmental attitudes. To this end, the following questions were sought:

1. Do high school students' CT dispositions and environmental attitudes significantly differ by their gender, father, and mother's educational background?
2. Are high school students' scores on UF/EMI Critical Thinking Disposition Instrument (CTDI) subscales significant predictors of their environmental attitudes?

Method

In this non-experimental quantitative study, a cross-sectional survey design was employed. High school students' environmental attitude was determined as the dependent variable and their scores on engagement, maturity, and innovativeness sub-dimensions were determined as predictor variables.

Study Group

The study group consisted of 139 students (76 female, 63 male) studying in different high schools in northern Turkey in the academic year of 2020-2021. The age of the students ranged between 13 and 16 (M=14.46, Mdn=14, Mo=14, SD=0.52). While Stevens (1996) suggests 15 participants for each predictor variable, Pallant (2001) recommends 40 participants for each predictor variable in multiple regression analysis. In this current study with 3 predictor variables which are engagement, maturity and innovativeness, it can be said that the sample size of 139 is enough. I also computed a-priori power analysis for conducting a linear multiple regression analysis before the study. The minimal sample size of students needed for this analysis (alpha=0.05; power=0.95; 3 predictors) to detect a medium effect size (f^2=0.15) based on the previous literature would be 119, based on Faul et al.'s (2007) G*Power 3 software program. Therefore, the acquired sample size of 139 in this study was very good.

Data Collection Tools

UF/EMI Critical Thinking Disposition Instrument (CTDI)

CTDI was used to determine students' CT dispositions in this study. CTDI was developed by Irani et al. (2007) and is composed of three sub-dimensions which are engagement (11 items), maturity (7 items), and innovativeness (7 items). After the Turkish adaptation study which was conducted with 342 ninth- and tenth-grade students by Kılıç and Şen (2014), one item was omitted from the instrument, and the remaining items were found to be consistent with the construct in the original instrument. Cronbach's alphas of instrument's sub-dimensions ranged from 0.70 to 0.88. For the total scale, Cronbach's alpha was found to be 0.89. Cronbach's alpha values calculated for this study were 0.87 for the engagement sub-dimension, 0.64 for the maturity sub-dimension, and 0.67 for the innovativeness sub-dimension. Furthermore, the reliability estimate for the total scale was calculated as 0.86.

Environmental Attitude Scale (EAS)

EAS developed by Uzun et al. (2019) was used to determine students' environmental attitudes. The reliability and validity studies were conducted with 1687 students. The scale is composed of three subscales which are the environmental behavior subscale (13 items), the environmental opinion subscale (11 items), and the environmental emotion subscale (16 items). Cronbach's alphas of the subscales ranged from 0.82 to 0.94. For the total scale, Cronbach's alpha was found to be 0.94. Cronbach's alpha values calculated for this study were 0.85 for the behavior subscale, 0.75 for the opinion subscale, and 0.87 for the emotion subscale. Furthermore, the reliability estimate for the total scale was calculated as 0.90.

Data Collection

After getting ethical committee approval from Zonguldak Bülent Ecevit University (No. 44858 dated 03.06.2021), the data for the current study were gathered in the spring term of 2020-2021 academic year. Privacy and confidentiality issues were shared with all students and they were informed about their right to withdrawal anytime they want. The instruments took approximately 20-25 minutes to complete.

Data Analysis

The collected data were analyzed in SPSS 20 statistical software. No missing data were observed as a result of a review for each variable, and normality was tested with Skewness and Kurtosis values. Z transformation was used to determine outliers per variable and Z-scores with values greater than 3.29 were accepted as potential outliers (Tabachnick & Fidell, 2012). Z-scores indicated no influential outliers should be excluded. Also, multivariate outliers were checked by using Mahalanobis Distance (Mahalanobis D^2) and no influential outliers were found to be excluded from the dataset. Pearson correlation coefficients, CI, VIF, and tolerance values between the predictor variables were investigated to make sure there is no high correlation among them. For the assumptions of MANOVA, multivariate normality was tested with the Henze-Zirkler test, and it was seen multivariate normality was presented in the data. Also, Box's M test results indicated that covariance between the groups was equal (Box's M test=200.080; p>0.01). Besides, Levene test results made for each variable to examine whether or not the variance between independent variable groups are equal showed that variance was equal between groups for engagement (F=1.439; p>0.05), maturity (F=0.737; p>0.05), innovativeness (F=1.230; p>0.05), behavior (F=1.287; p>0.05), opinion (F=1.346; p>0.05), and emotion (F=1.630; p>0.05). Independent samples t-test, MANOVA test, Pearson correlation, and multiple linear regression with enter method were used in this study.

Results

Descriptive statistics including means, standard deviations of all measured subscales of the EAS and CTDI instruments, and independent samples t-test results by gender are presented in Table 1 below.

Table 1. Descriptive statistics for the EAS and CTDI scales

	Total Sample (n=139)		Female (n=76)		Male (n=63)				
	$\overline{X}$	sd	$\overline{X}$	sd	$\overline{X}$	sd	$t_{(139)}$	p	Cohen's d
CTDI subscales									
Engagement	3.87	0.60	3.93	0.63	3.80	0.56	1.292	0.19	-
Maturity	3.82	0.51	3.84	0.50	3.81	0.53	0.317	0.75	-
Innovativeness	3.85	0.54	3.90	0.56	3.79	0.51	1.234	0.21	-
Total	3.85	0.48	3.89	0.50	3.80	0.45	1.113	0.26	-
EAS subscales									
Behavior	2.76	0.68	2.96	0.64	2.52	0.65	3.944	0.00	0.67
Opinion	4.57	0.38	4.64	0.28	4.49	0.47	2.119	0.03	0.36
Emotion	4.08	0.55	4.17	0.51	3.97	0.57	2.147	0.03	0.36
Total	3.80	0.42	3.92	0.38	3.66	0.42	3.781	0.00	0.64

As it can be seen in the descriptive statistics in Table 1, high school students had a positive and strong inclination towards engagement ($\overline{X}$=3.87), maturity ($\overline{X}$=3.82), and innovativeness ($\overline{X}$=3.85) subscales. Students also had strong CT dispositions ($\overline{X}$=3.85). Besides, while students had highly positive attitudes towards opinion ($\overline{X}$=4.57) and emotion ($\overline{X}$=4.08) subscales, they had moderately positive attitudes towards behavior subscale ($\overline{X}$=2.76). Also, it was found out that students' engagement subscale (t_{139}=1.292, p>0.05), maturity subscale (t_{139}=0.317, p>0.05), innovativeness subscale (t_{139}=1.234, p>0.05), and total CT disposition (t_{139}=1.113, p>0.05) scores did not differ by gender although females revealed higher scores for each subscale and total scores. However, the difference was found to be significant for behavior subscale (t_{139}=3.944, p<0.05), opinion subscale (t_{139}=2.119, p<0.05), emotion subscale (t_{139}=2.147, p<0.05), and total environmental attitude (t_{139}=3.781, p<0.05) scores. Female students had higher scores than male students for each EAS subscale and total scale. While gender variable had a small effect on students' opinion (d=0.36) and emotion (d=0.36) subscales scores, it had a medium effect on students' behavior subscale (d=0.67) and total EAS scores (d=0.64) based on Cohen's (1988) classification.

Table 2. MANOVA test results of students' CTDI and EAS subscales according to the educational background of father and mother

Effect		Value	F	Hypothesis df	Error df	p	η^2
Intercept	Wilks' Lambda (λ)	0,010	1884.925	6.00	114.00	0.00	0.990
Mother's EB	Wilks' Lambda (λ)	0,775	1.258	24.00	398.90	0.18	0.064
Father's EB	Wilks' Lambda (λ)	0.767	1.316	24.00	398.90	0.14	0.062
Mother's EB* Father's EB	Wilks' Lambda (λ)	0.614	0.891	66.00	615.45	0.71	0.078

Note: Mother's EG means mother's educational background; Father's EG means father's educational background

As it can be seen in Table 2, according to results of MANOVA test which is made to determine whether students' CTDI and EAS subscales scores differ according to their mother and father's educational background, it was found out that CTDI and EAS subscales scores did not differ according to students' mother's educational background variable (λ=0.775; $F_{(139)}$=1.258; p>0.05), father's educational background variable (λ=0.767; $F_{(139)}$=1.316; p>0.05), and mother's educational background*father's educational background variable (λ=0.614; $F_{(139)}$=0.891; p>0.05).

Table 3. MANOVA test results of students' CTDI and EAS subscales according to the educational background of father and mother

Source	Dependent variable	Sum. of squares	df	Mean square	F	p	η^2
Mother's EB	Engagement	2.677	4	0.669	1.949	0.10	0.061
	Maturity	0.616	4	0.154	0.583	0.67	0.019
	Innovativeness	2.301	4	0.575	2.200	0.07	0.061
	Behavior	5.008	4	1.252	3.189	0.01	0.097
	Opinion	0.211	4	0.053	0.360	0.83	0.012
	Emotion	0.356	4	0.089	0.350	0.84	0.012
Father's EB	Engagement	0.374	4	0.093	0.272	0.89	0.009
	Maturity	0.969	4	0.242	0.918	0.45	0.030
	Innovativeness	1.189	4	0.297	1.137	0.34	0.037
	Behavior	0.095	4	0.024	0.061	0.99	0.002
	Opinion	0.694	4	0.174	1.183	0.32	0.038
	Emotion	2.980	4	0.745	2.927	0.02	0.090
Mother's EB* Father's EB	Engagement	2.710	11	0.501	0.718	0.72	0.062
	Maturity	0.883	11	0.054	0.304	0.98	0.027
	Innovativeness	2.212	11	0.345	0.769	0.67	0.066
	Behavior	5.511	11	0.246	1.276	0.24	0.106
	Opinion	0.591	11	0.080	0.366	0.96	0.033
	Emotion	3.800	11	0.201	1.357	0.20	0.111

Note: Mother's EG means mother's educational background; Father's EG means father's educational background

Table 3 shows that students' engagement scores ($F_{(139)}$=2.710; p>0.05), maturity scores ($F_{(139)}$=0.883; p>0.05), innovativeness scores ($F_{(139)}$=2.212; p>0.05), behavior scores ($F_{(139)}$=5.511; p>0.05), opinion scores ($F_{(139)}$=0.591; p>0.05), and emotion scores ($F_{(139)}$=3.800; p>0.05) did not significantly differ according to students' mother's educational background*father's educational background variable. Therefore, it can be said that students' mother's and father's educational background together were not a significant variable that affects high school student's CTDI and EAS subscales scores.

Table 4. Inter-correlations among the subscales of CTDI and EAS

	Maturity	Innovativeness	Total CTDI	Behavior	Opinion	Emotion	Total EAS
Engagement	0.561**	0.757**	0.900**	0.490**	0.208*	0.398**	0.501**
Maturity	-	0.587**	0.810**	0.447**	0.072	0.432**	0.451**
Innovativeness	-	-	0.899**	0.502**	0.181*	0.416**	0.507**
Total CTDI	-	-	-	0.552**	0.180*	0.476**	0.559**
Behavior	-	-	-	-	0.297**	0.563**	0.874**
Opinion	-	-	-	-	-	0.245**	0.573**
Emotion	-	-	-	-	-	-	0.813**

Note: **correlation is significant at p< 0.01; *correlation is significant at p< 0.05

As can be seen in Table 4, most of the subscales of CTDI and EAS were found to be moderately to highly correlated to each other. However, there was not a significant correlation between maturity and opinion subscales scores (r=0.072; p>0.05). Also, high school students' total CTDI scores were moderately correlated to their total EAS scores (r=0.559).

Table 5. Multiple linear regression results between environmental attitude and engagement, maturity, and innovativeness scores

	B	Std. Error	β	t	p
Constant	1.932	0.248	-	7.804	0.00
Engagement	0.154	0.078	0.221	1.976	0.05
Maturity	0.159	0.074	0.195	2.161	0.03
Innovativeness	0.174	0.089	0.225	1.964	0.04

R=0.559, R^2=0.313, $F_{(3, 138)}$= 20.466, p<0.01

As can be seen in Table 5, the established regression model was significant ($F_{(3,138)}$=20.466, p<0.01). As a result of the multiple linear regression analysis, it was seen that engagement (β=0.221, $t_{(138)}$=1.976, p<0.05), maturity (β=0.195, $t_{(138)}$=2.161, p<0.05) and innovativeness (β=0.225, $t_{(138)}$=1.964, p<0.05) scores were significant predictors of high school students' environmental attitudes (R=0.559, R^2=0.313, p<0.01). Engagement, maturity, and innovativeness together explained 31% of the total variance on their environmental attitudes. Besides, innovativeness (β=0.225) was the significant predictor with the largest effect on students' environmental attitudes. It was followed by engagement (β=0.221) and maturity (β=0.195). The regression equation related to the model can be seen below:

Environmental attitude= 1.932 + 0.154*engagement + 0.159*maturity + 0.174*innovativeness.

Conclusion and Discussion

In this current study, it was aimed to determine if high school students' CT dispositions and environmental attitudes significantly differ by their gender, father, and mother's educational background and their scores on CTDI subscales are significant predictors of environmental attitudes. It was found out that students had a positive and strong inclination towards all three CT disposition subscales. Also, gender, father, and mother's educational background did not significantly affect high school students' CT dispositions. In some studies in the literature, it was found that CT dispositions did not significantly differ by gender (Liu et al., 2019; Khandaghi et al., 2011; Mahmoud & Mohamed, 2017; Polat, 2017; Özdemir, 2005; Walsh & Hardy, 1999; Facione et al., 1995), and mother and father's educational background (Polat, 2017; Özdemir, 2005; Şahin, 2018; Aybek & Ekinci, 2010). In a meta-analysis study by Çolak et al. (2019), it was found out that the effect of gender, mother and father's educational background variables on CT dispositions was very small. However, there are also some contradictory studies which concluded that CT dispositions significantly differed by gender (Ricket & Rudd, 2004; Kökdemir, 2003; Ferah, 2000; Tümkaya et al., 2009; Walsh, 1996; Rodriquez, 2000).

Therefore, it can be said that most of the studies, including this study, concluded that CT dispositions were not significantly predicted by gender and hence, gender was a variable that should not be considered in the explanation of CT dispositions. However, some other studies revealed that gender was a critical variable considering individuals' CT dispositions and hence, should be considered. Due to this inconsistency between the results of previous studies, it can be said that further research and analysis regarding the effect of gender on CT dispositions are necessary.

Also, this study revealed that while students had highly positive inclination towards opinion and emotion subscales, they had relatively low positive attitudes towards behavior subscale. In other words, although they had a strongly positive opinion and emotion towards the environment, they seemed to perform a few positive actions towards it. This result is confirmed by many previous studies (Mifsud, 2011; Rebolj & Devetak, 2013; Liu et al., 2015; Saka, 2016). The results of this study indicated that the students' environmental attitudes significantly differed by gender. Female students had higher scores than male students for each EAS subscale and total scale. There are some studies in the literature which indicated that environmental attitudes significantly differed by gender in favor of female participants (Yüksel & Yıldız, 2019; Gökçe et al., 2007; Tikka et al., 2000; Ekici, 2005; Duarte et al., 2017; Arnocky & Stroink, 2010; Pauw & Petegem, 2010; Coertjens et al., 2010). Also, in his meta-analysis study, Gökmen (2021) found out that gender had a small effect on environmental attitudes and females had significantly more positive environmental attitudes. Therefore, this result is consistent with the existing literature. This result may be attributable to the expectation that females are more interested and concerned about environmental problems than males (Spellmann et al., 2003; Mohai, 1992; Blocker & Eckberg, 1989). This expectation derives from the claim that while females are socialized to be family nurturers and caregivers, males are socialized to be family breadwinners and economic providers from their childhood (Mohai, 1992; Blocker & Eckberg, 1989). While this situation leads to develop a motherhood mentality for females, it develops a marketplace mentality for males (McStay & Dunlap, 1983). Therefore, the nurturing attitudes and the motherhood mentality of females which are the results of this socialization make them to have concerns about many social issues such as environmental pollution, scarcity of water, and poverty. However, because of their marketplace mentality, economic growth is the priority for males and that can cause environmental pollution (Blocker & Eckberg, 1989; McStay & Dunlap, 1983). Therefore, based on this argument (Blocker & Eckberg, 1989; Mohai, 1992; McStay & Dunlap, 1983), it is expected that females have more positive environmental attitudes than males and the results of this study justified this expectation. However, it can be said that this difference is based on gender roles and socialization (Zelezny et al., 2000). In this study, it was found out that students' mother and father's educational background did not significantly affect their environmental attitudes. This result is confirmed by earlier studies (Gökçe et al., 2007; Yavuz, 2019; Şahin, 2015; Şama, 2003; Sadık & Çakan, 2010; Gürbüz et al., 2007). Therefore, it can be said that the educational background of mother and father is not an important factor on environmental attitudes. Actually, it can be expected that not educational backgrounds but environmental attitudes of mother and father can significantly affect children's environmental attitudes (Ballantyne et al., 1998; Istead, 2009). In other words, when the mother and father have positive environmental attitudes, we can expect that the children will also have positive environmental attitudes.

According to another result obtained from the study, it was found that engagement, maturity, and innovativeness were significant predictors of the students' environmental attitudes. There was a positive relationship between engagement, maturity, innovativeness, and students' environmental attitude scores and it was determined that engagement, maturity, and innovativeness together explained 31% of the total variance on their environmental attitudes. This result may be attributable to the fact that individuals with high CT dispositions are eager to learn new things, curious about what is going on around them, resourceful, flexible, actively engaged in their surroundings, self-confident, being aware of own predispositions and biases, and able to modify their ideas in line with situational requirements (Facione et al., 1995). Also, they see the incidents as multidimensional rather than one-dimensional (Girot, 2000) and they have greater skills at making mature judgments (Facione et al., 1995). Therefore, it can be said that when the individuals have higher CT dispositions, they also have more positive environmental attitudes. Saka (2016) found out that CT dispositions significantly predicted environmental ethics approaches in her study which aimed to investigate the effects of CT dispositions on environmental ethics approaches. Also, Güven and Çakır (2019) found a significant relationship between the students' attitudes towards renewable energy sources and CT dispositions. There are also other studies which concluded that CT can affect individuals' thoughts, decisions, and attitudes towards renewable energy sources (Lee, 2016; Opitz, 2016; Sakschewski et al., 2014). Therefore, it can be said that this finding is confirmed by many previous studies. Also, previous experimental research (Hofreiter et al., 2007; Mengi Us, 2019; Muhsilin et al., 2019) indicated that CT teaching improves not only students' CT skills and dispositions but also their environmental attitudes which revealed that higher CT dispositions result in higher environmental attitudes.

Besides, this study revealed that innovativeness (β=0.225) was the significant predictor with the largest effect on students' environmental attitudes. It was followed by engagement (β=0.221) and maturity (β=0.195). According to Irani et al. (2007), innovativeness is about measuring the disposition of being eager to look for new knowledge. Individuals with a positive inclination towards innovativeness subscale are intellectually curious about new challenges and want to know more about what is going on around them. They, who are also described as "hungry learners", actively seek to know more about their life, and their world through research, reading, and questioning. Therefore, individuals with high dispositions towards innovativeness are highly interested in their environment, life, and the world. They enjoy being occupied with new challenges and obstacles such as environmental problems. Therefore, the result which indicated innovativeness was the significant predictor with the largest effect can be explained by this. Also, individuals with high dispositions towards engagement subscale value the reasoning process, are self-confident, and eager to find situations which she/he can use reasoning skills, and solve problems (Irani et al., 2007). Besides, According to Irani et al. (2007), individuals with a positive inclination towards maturity subscale are open-minded and need enough evidence and data before making a decision. They are also aware that most of the problems can have more than one possible solution and they know that their decisions can be influenced by their own prejudices, tendencies, experiences or other people. Therefore, individuals with high dispositions towards engagement and maturity subscales are expected to have highly positive environmental attitudes because they make true decisions regarding daily problems such as environmental issues by using their reasoning skills. So, this can be shown as a possible explanation for the result which indicated engagement and maturity were the significant predictors of environmental attitudes.

In short, this study concluded that high school students had a positive and strong inclination towards all three CT disposition subscales and gender, father and mother's educational background did not significantly affect their CT dispositions. Another result of this study was that although high school students had strongly positive opinions and emotions towards the environment, they seemed to perform a few environmentally positive actions. This result is important because having a positive opinion and emotion towards the environment is not enough to solve today's challenging environmental problems. In addition to having positive opinions and emotions, individuals should also show positive actions towards the environment. Therefore, students should be encouraged to take action to preserve the environment. This study revealed that while the students' environmental attitudes significantly differed by gender in favor of female students, they did not differ by students' mother and father's educational background. Another important result of this study was that engagement, maturity, and innovativeness were significant predictors of the high school students' environmental attitudes and they together explained 31% of the total variance on their attitudes towards the environment. This result emphasized the importance of CT which is one of the 21st-century skills to improve the students' environmental attitudes. Therefore, CT should be implemented during the effort of increasing environmental attitudes and improving students' CT dispositions should be one of the most important aims of today's educational systems because it will also have a positive impact on students' environmental attitudes.

Limitations and Recommendations

Although this study is important to shed light on the relationship between high school students' CT dispositions and environmental attitudes, it has several limitations. First, it has a limitation in terms of its target sample. This study was carried out with high school students and it can be a good idea to repeat this study with other samples from different educational levels. Second, it has a limitation in terms of data collection tools. The research data were only collected with quantitative tools in this study. Therefore, future studies with qualitative or mixed methods may help provide a further understanding of the relationship between CT dispositions and environmental attitudes.

Scientific Ethics Declaration

The author(s) declare that the scientific ethical and legal responsibility of this article published in JESEH journal belongs to the author(s).

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