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ORIGINAL ARTICLE

Investigation of the Relationship between the Ecological Identity of Teacher Candidates and Environmental Risk Perceptions

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ABSTRACT

In this research, it was aimed to determine the relationship between the ecological identities of primary school teacher candidates and their environmental risk perceptions. The research was conducted with teacher candidates from a Turkish university located in the Central Black Sea Region in the fall semester of the 2021–2022 academic year. The research used the "Ecological Identity Scale" and the "Scale of Environmental Risk Perception." Both descriptive and inferential statistical analyses were used in the data obtained in the study. According to the research findings, the ecological identities of primary school teacher candidates and the sub-dimensions of identity and centrality were at the medium level; the differentiation sub-dimension was found to be at a high level. Similarly, it has been determined that there was a moderately positive and statistically significant relationship between the ecological identities of the primary school teacher candidates and their environmental risk perceptions. It has been determined that there was no statistically significant difference in the ecological identities of the primary school teacher candidates according to gender, grade level, or environmental education course. It was found that there was no statistically significant difference in the environmental risk perceptions of the primary school teacher candidates according to gender, grade level, or environmental education course. In line with the results obtained as a result of the research, educational activities can be carried out to improve the ecological identities and environmental risk perceptions of primary school teacher candidates. This research is important in terms of determining the relationship between ecological identity and environmental risk perception of prospective primary school teachers, who will be effective in the formation of ecological identity and environmental risk perception that individuals can gain at a young age. In line with this importance and the results of the research, suggestions that will increase the levels of ecological identity and environmental risk perception of prospective primary school teachers are given.

KEY WORDS: Class teacher candidates; ecological identity; environmental education; environmental risk perception

INTRODUCTION

Mankind has begun to rapidly degrade the environment by taking control and changing other living species by transforming natural areas into residential areas with transition to agriculture and settled life (Özdemir, 2016). There are some current environmental problems such as climate change, deforestation, acid rain, extinction of species, melting of glaciers, pesticide pollution, and genetically modified foods, which will show their effect in the future (Dobson, 2016; Kahyaoğlu, 2012). These environmental problems affecting today may have a greater impact in the future.

Human activities that degrade the environment hide behind concepts that impress and deceive people, such as high quality of life and comfort of life (Kılıç, 2008). In studies on the relationship of people with the environment, the effects of values, attitudes, and beliefs on the environment have been investigated and it has emphasized that social and psychological dynamics are very important in the solution of environmental problems (Walton and Jones, 2018). In this context, the relationship between the environment and identity (ego) has enabled the concept of ecological identity to enter the literature (Gezer and İlhan, 2018).

The construction of ecological identity is related to one's own experiences; it is an individual process (Williams and Chawla, 2016). Ecological identity affects people's beliefs about the environment and activities of daily living (Almeida, 2015). Ecological identity is driven by a sense of wonder. Curiosity and exploration in early childhood support ecological identity development (Pelo, 2014). Ecological identity encourages individuals to protect the environment (Clayton and Opotow 2003). Ecological identity includes people's environmental knowledge, sensitivity, and actions. Students' ecological identities can be developed just like their cultural and social identities (Pelo, 2009). Therefore, the environment- and ecology-based education that individuals receive are reflected in the ecological identity of individuals. This reflection affects the present and future social life according to the ecological identity levels of the people.

In addition to people's relationships with the environment (Wilson, 1996); ecological identity is related to values, attitudes, behaviours, and beliefs towards the environment (Clayton, 2003). It shows that people's concerns about environmental risks in their relations with the environment have increased in recent years (Slimak and Dietz, 2006). The determination of risk perceptions that threaten people's ecological identity and the environment gains importance in terms of solving environmental problems and environmental education (Kahyaoğlu, 2012).

Environmental risk perception increases the perceived severity because attention increases the fear and distinctiveness (Mrkva et al., 2021). The place attachment is important in environmental risk perception. Individuals who are attached to the environment show preventive coping behaviors against the high environmental risk perception. Therefore, there is a strong relationship between environmental risk perception and preventive coping behaviors (De Dominicis et al., 2015). Higher environmental risk perception is a result of the security feelings about a place (Quinn et al., 2019).

Individuals should be aware of environmental risks and have the awareness and sensitivity to protect the environment and it is a social duty for them to make efforts to protect the environment (Bodur and Taşocak, 2013). For this reason, an environmental education course, which includes environmental risk factors, is necessary for the awareness and solution of today's and the future's environmental problems, for our teachers, who are responsible for raising future generations, to bring environmental awareness and sensitivity to their students (Nkoana, 2020). In this context, it is thought that determining the relationship between ecological identities and environmental risk perceptions of pre-service primary school teachers will have an impact on the prevention and solution of present and future environmental problems.

When the literature on ecological identity is examined, it is seen that there are very few scientific studies in Turkey (Gezer and İlhan, 2018; Uzel 2019), while there are some international studies (Argus, 2018; Brusaferro, 2020; Buehler, 2019; Gray and Colucci Gray, 2018; Humpreys and Blenkinsop, 2018; Khatoon, 2019; Moghadam et al., 2020; Williams and Chawla, 2016). When the literature on environmental identity is examined, there are studies in Turkey in which environmental identities of pre-service teachers were examined according to different variables (Öztarakcı, 2019; Saraç, 2018; Tanık Önal et al., 2020; Uçar, 2015; Yetik, 2019). The difference of this study from other studies is that ecological identity and environmental risk perception are addressed together.

When the literature on environmental risk perception in Turkey was examined, it was determined that there were studies conducted with secondary school students (Palancı and Sarıkaya, 2019), high school students (Altunoğlu and Atav, 2009; Tümer and Sümen, 2020), university students (Sam et al., 2010), health sciences faculty (Değerli, 2018), health school and nursing department students (Mercan and Işık Mercan, 2020; Sayan and Kaya, 2016; Tarı Selçuk et al., 2016); pre-service teachers (Bican, 2014; Demir, 2020; Kahyaoğlu, 2012; Kaya et al., 2012; Yeşilyurt, 2018); primary school and science teachers (Yaşaroğlu and Otlu, 2022). During the literature review, no research was found in which ecological identity and environmental risk perception were considered together.

It is thought that examining the previous environmental problems and current environmental problems, and their causes in terms of their ecological identities and environmental risk perceptions of pre-service classroom teachers, will be important in terms of protecting natural life and natural habitats and preventing global environmental problems in the coming years. In this context, it is important to examine the ecological identities and environmental risk perceptions of pre-service primary school teachers in the study, as it will fill the gap in the literature and guide future environmental education research. In this context, examining the ecological identities and environmental risk perceptions of prospective primary school teachers in this study will be important as it will fill the gap in the literature and guide today's environmental education research.

In line with this importance and reason, the aim of the research was to examine the relationship between the ecological identities of pre-service primary school teachers and their environmental risk perceptions. In addition, it also aimed to examine the ecological identities and environmental risk perceptions of pre-service primary school teachers according to the variables of gender, grade level, and whether or not they have taken environmental education courses. For this purpose, answers to the following questions were sought:

1. What is, if any, the statistically significant relationship between the ecological identities of pre-service primary school teacher and their environmental risk perceptions?
2. What is a statistically significant difference between the ecological identities of the pre-service primary school teachers, gender, grade level, whether they take environmental education courses or not?
3. What is a statistically significant difference in the environmental risk perceptions of pre-service primary school teachers according to gender, grade level, whether they take environmental education courses or not?

METHODS

Research Design

In this study, which aimed to examine the relationship between the pre-school primary school teachers' ecological identities and their environmental risk perceptions, the correlational survey model, which is one of the quantitative research methods, was used. Correlational research examines the relationship between two or more variables. In the correlational research, which is examined without interfering variables, if there is a change detected, it is tried to determine how this change occurs (Karasar, 2011).

Study Group

The study group consists of 198 pre-service teachers (158 females and 40 males) selected by convenience sampling method, studying in the primary school teaching department of the education faculty of a state university located in the Central Black Sea Region of Turkey in the fall semester of the 2021–2022 academic year. Ethics committee and legal permissions were obtained from the relevant institutions and committees before the data were collected. The necessary informed consent was obtained before any data collection was carried out. A convenience sample is used for situations where the researcher has advantages such as time, accessibility, convenience, and low cost while collecting data (Yıldırım and Şimşek, 2018). In this study, convenience sample was used in the study since the researcher received help from the university and department students she/he studied while reaching the sample. Demographic characteristics of the study group are given in Table 1.

When Table 1 is examined, 198 pre-service teachers, 158 (79.8%) female and 40 (20.2%) male, participated in the research. 43 (21.7%) were in the 1st grade, 49 (24.7%) in the 2nd grade, 50 (25.3%) in the 3rd grade, and 56 (28.3%) in the 4th grade. 145 (73.2%) stated that they had taken an environmental education course, while 53 (26.8%) indicated that they had not.

Data Collection

In this section, there are explanations about "Ecological Identity Scale" and "Environmental Risk Perception Scale."

Ecological identity scale

To determine the ecological identities of pre-service primary school teachers, the "Ecological Identity Scale", was used. It is a 5-point Likert type consisting of 18 items developed by Walton and Jones (2018) and adapted into Turkish by Gezer and İlhan (2018). There are three sub-dimensions in the scale: "Identity", "Differentiation", and "Centrality". The Identity sub-dimension in the scale consists of 7 items, the Differentiation sub-dimension consists of 5 items, the Centrality sub-dimension consists of 6 items. Thirteen of the scale items are positive and five are negative items. Negative items are the items in the Differentiation sub-dimension. Negative items were scored in reverse. Answer options from items 1 to 12 use the 5-point Likert Scale with 5 points "Extremely True for Me," 4 points "Correct for Me," 3 points "Partially True for Me," 2 points "Not True for Me," and 1 point "My Not Right For." Answer options from items 13 to 15 were 5 points "Extremely High," 4 points "High," 3 points "Moderate," 2 points "Low," and 1 point "Extremely Low." The 16th to 18th items, were 5 points "Pretty much," 4 points "Very," 3 points "Moderate," 2 points "Little," and 1 point "Pretty little." The sub-dimensions for the Ecological Identity Scale and the reliability values of the whole scale are given in Table 2.

When Table 2 is examined, it was seen that the Cronbach's Alpha Reliability Coefficient of the scale was 0.80 for the whole scale; they were, respectively, 0.80, 0.79, and 0.82 for the sub-dimensions of identity, differentiation, and centrality (Büyüköztürk, 2016). In line with these data, it was concluded that the scale could be used for this study.

Environmental risk perception scale

The "Environmental Risk Perception" scale developed by Slimak and Dietz (2006) was used. The scale has 24 items and is a 5-point Likert scale. It was adapted into Turkish by Altunoğlu and Atav (2009) with some changes. It consists of 23 items. The scale adapted to Turkish was adapted as a 7-point Likert-type scale. The scale has four sub-dimensions: ecological risks, chemical waste risk, resource depletion risk, and global environmental Risks. The global environmental risk sub-dimension in the scale consists of 4 items, the chemical waste risk sub-dimension consists of 7 items, ecological risks sub-dimension consists of 7 items, and the resource depletion risk sub-dimension consists of 5 items. The answer options of the scale were based on 7 points "Very important," 6 points "Very important," 5 points "Important," 4 points "Moderately important," 3 points "Little important," 2 points "Very little important," and 1 point "Unimportant". The sub-dimensions

Table 1: Demographic characteristics of the study group

Variables	n	%
Gender		
Woman	158	79.8
Male	40	20.2
Grade level		
1st class	43	21.7
2nd class	49	24.7
3rd class	50	25.3
4th grade	56	28.3
Status of receiving an environmental education course		
Yes	145	73.2
No	53	26.8
Total	198	100

Table 2: Reliability values of sub-dimensions of ecological identity scale

Scale sub-dimension	Confidence value
Identity	0.80
Differentiation	0.79
Centrality	0.82
The whole scale	0.80

Table 3: Reliability values of the sub-dimensions of the environmental risk perception scale

Scale sub-dimension	Confidence value
Global environmental risk	0.90
Chemical waste risk	0.91
Ecological risks	0.91
Resource depletion risk	0.79
The whole scale	0.95

for the Environmental Risk Perception Scale and the reliability values of the whole scale are given in Table 3.

When Table 3 is examined, the Cronbach's Alpha Reliability Coefficient of the scale was 0.95 for the whole scale; Global Environmental Risk, Chemical Waste Risk, Ecological Risks, and Resource Depletion Risk sub-dimensions were 0.90, 0.91, 0.91, and 0.79, respectively. A calculated reliability coefficient of 0.70 and higher was generally considered sufficient for the reliability of test scores (Büyüköztürk, 2016). In line with these data, it was concluded that the scale could be used for this study.

Data Collection Process

For data collection in the study, considering the pandemic process and distance education, pre-school primary school teachers were approached in October–November 2021 with the questionnaire form (Microsoft forms) created in the online environment. Pre-service primary school teachers were offered the online questionnaire and as part of the questionnaire, their informed consent was recorded. The forms, which were filled in completely and without errors by the pre-service classroom teachers, were included in the study dataset. In all processes of this study, precautions have been taken to ensure that it is carried out in accordance with ethical rules and all the rules have been complied with.

Data Analysis

The data obtained in the study were recorded in the computer environment and statistical analyses were made. The demographic characteristics of the pre-service primary school teachers participating in the study were determined by calculating the frequency and percentage values (Table 1). Both descriptive and inferential statistical analyses of the data obtained from the scales were made. Values such as frequency, standard deviation, and mean were used in descriptive analysis.

For inferential statistics, it was first examined whether the data showed a normal distribution. The skewness-kurtosis normality distribution test was used to determine whether the data were suitable for the normal distribution according to the variables. Whether the data are normally distributed or not is given in Table 4.

When Table 4 is examined, the skewness of the Ecological Identity Scale is −0.31, the kurtosis 1.21; for the Environmental Risk Perception Scale, the skewness is −0.48 and the kurtosis is −0.30. According to Tabachnick and Fidell (2013), skewness and kurtosis values need to be between −1.5 and +1.5 for a normal distribution. In this context, it was determined that the data showed a normal distribution as a result of the analyses. Therefore, parametric tests were used in the analysis. In the analyses, independent sample t-test was used for variables with two independent groups, and one-way analyses of variance (ANOVA) for variables with three or more independent groups. The results were evaluated at the 95% confidence interval and the significance level of $\rho < 0.05$.

The correlation coefficient was examined to determine the relationship between the ecological identities of the pre-school primary school teachers and their environmental risk perceptions. It was stated that the correlation coefficient between 0.70 and 1.00 was high; between 0.70 and 0.30 was moderate; between 0.30 and 0.00 was a low level of correlation. Positive relationships were indicated by a "plus" symbol, while negative relationships were indicated by a "minus" sign.

FINDINGS

In this section, the data obtained as a result of the study conducted to evaluate the relationship between ecological identities and environmental risk perceptions of pre-service primary school teachers and the findings obtained from the analysis of these data are included.

General Distribution of Pre-service Primary Teachers' Ecological Identities

The average scores that the pre-service teachers received from the environmental identity scale and its sub-dimensions are given in Table 5.

When Table 5 is examined, it was determined that the highest score of the pre-service primary school teachers regarding the ecological identity scale was 90.0, the lowest score was 40.0; the scale average was 69.33, and the standard deviation was 7.82; for the identity sub-dimension, the highest score was 35.0, the lowest score was 17.0, the scale mean was 27.85, and the standard deviation was 3.58; for the differentiation sub-dimension, the highest score was 25.0, the lowest score was 9.0, the scale mean was 19.95, and the standard deviation was 4.01; for the centrality sub-dimension, the highest score was 30.0, the lowest score was 6.0, the scale mean was 21.52, and the standard deviation was 3.95. The minimum and maximum scores were considered in the interpretation of the arithmetic means of the scale and its sub-dimensions. For the ecological identity scale, it was evaluated that 40.0–56.6 points were low, 56.7–73.2 points moderate, 73.3–90.0 points high; for the identity sub-dimension, 17.0–23.0 points were low, 23.1–29.0 points moderate, 29.1–35.0 points high; for the differentiation sub-dimension, 9.0–14.3 points were low, 14.4–19.6 points were medium, 19.7–25.0 points are high; for the centrality sub-dimension, 6.0–14.0 points were low,

Table 4: Normal distribution of data

Scale	Skewness	Kurtosis
Ecological identity scale	−0.31	1.21
Environmental risk perception scale	−0.48	−0.30

Table 5: Descriptive statistics of pre-service primary teacher' ecological identities

Ecological identity	n	Minimum	Maximum	$\bar{X}$	S
General ecological identity	198	40.0	90.0	69,33	7.82
Identity	198	17.0	35.0	27,85	3.58
Differentiation	198	9.0	25.0	19,95	4.01
Centrality	198	6.0	30.0	21,52	3.95

14.1–22.0 points were medium, and 22.1–30.0 points were high. In line with the findings obtained from the pre-service teachers' ecological identity scale it was found that the pre-service teachers' ecological identities were moderate in the sub-dimensions of identity and centrality while it was high level in the sub-dimension of differentiation.

General Distribution of Pre-service Primary Teachers' Environmental Risk Perceptions

Total scores that pre-service primary teachers obtained from the environmental risk perception scale and its sub-dimensions are given in Table 6.

When Table 6 is examined, it was determined that the highest score of the pre-service primary school teachers regarding the environmental risk perception scale was 161.0, the lowest score was 77.0, the scale average was 137.45, and the standard deviation was 18.03; for the global environmental risk sub-dimension, the highest score was 28.0, the lowest score was 4.0, the mean scale score was 24.07, and the standard deviation was 3.90; for the chemical waste risk sub-dimension, the highest score was 49.0, the lowest score was 25.0, the mean scale score was 43.19, and the standard deviation was 5.67; for the ecological risks sub-dimension, the highest score was 49.0, the lowest score was 7.0, the mean scale score was 42.37, and the standard deviation was 6.11; for the resource depletion risk sub-dimension, the highest score was 35.0, the lowest score was 11.0, the mean scale score was 27.81, and the standard deviation was 5.07.

The minimum and maximum scores were considered in the interpretation of the arithmetic means of the scale and its sub-dimensions. It was evaluated that for the environmental risk perception scale, 77.0–105.0 points were low, 105.1–133.0 medium, 133.1–161.0 points high; for the global environmental risk sub-dimension, 4.0–12.0 points were low, 12.1–20.0 points medium, 20.1–28.0 points high; for the chemical waste risk sub-dimension, 25.0–33.0 points were low, 33.1–41.0 points medium, 41.1–49.0 points high; for the ecological risks sub-dimension, 7.0–21.0 points were low, 21.1–35.0 points moderate, 35.1–49.0 points high; for resource depletion risk sub-dimension, 11.0–19.0 points was evaluated as low, 19.1–27.0 points as medium, 27.1–35.0 points as high level. In line with the findings obtained from the pre-service primary school teachers' environmental risk perception scale, it was determined that there was a high level of relationship between pre-service teachers' environmental risk perception, global environmental risk, chemical waste risk, and ecological risks sub-dimensions while it was moderate in the sub-dimension of the resource depletion risk.

The Relationship between the Pre-service Primary School Teachers' Ecological Identities, Environmental Risk Perceptions, and Sub-dimensions

The relationship between the ecological identities of the pre-service primary school teachers and their environmental risk perceptions and sub-dimensions was calculated with the Pearson Product Moments Correlation Coefficient. Information on the calculated correlation coefficient is given in Table 7.

When Table 7 is examined, it was seen that there was a moderately positive and statistically significant relationship between the pre-service primary school teachers' ecological identities and their environmental risk perceptions. It was found that there was a moderately positive and statistically significant relationship between pre-service primary school teachers' ecological identities and the sub-dimensions of global environmental risk ($r = 0.53$, $\rho < 0.05$), identity ($r = 0.39$, $\rho < 0.05$), differentiation ($r = 0.32$, $\rho < 0.05$) centrality ($r = 0.35$, $\rho < 0.05$) 0.05). It was determined that there was a moderately positive correlation between ecological identities and the sub-dimensions of chemical waste risk ($r = 0.48$, $\rho < 0.05$), identity ($r = 0.36$, $\rho < 0.05$), differentiation ($r = 0.38$, $\rho < 0.05$) sub-dimensions of pre-service classroom teachers while there was a low level positive statistically significant relationship in the centrality sub-dimension ($r = 0.23$, $\rho < 0.05$). It was detected that there was a moderately positive relationship between pre-service primary school teachers' ecological identities and the sub-dimensions of the ecological risks ($r = 0.32$, $\rho < 0.05$) and differentiation ($r = 0.31$, $\rho < 0.05$), while there was a statistically significant low-level positive relationship in the identity sub-dimension ($r = 0.22$, $\rho < 0.05$). it was identified that there was a moderate positive correlation between pre-service primary school teachers' ecological identities and the sub-dimensions of the resource depletion ($r = 0.35$, $\rho < 0.05$), identity ($r = 0.27$, $\rho < 0.05$), differentiation ($r = 0.21$, $\rho < 0.05$), centrality (r). $= 0.24$, $\rho < 0.05$), while there was a statistically significant low-level positive correlation between the sub-dimensions.

Examination of Pre-service Teachers' Ecological Identities According to Various Variables

It was investigated whether there was a statistically significant difference in the ecological identities of the pre-service primary school teachers in terms of whether or not they received environmental education, gender, and grade level.

Table 6: Descriptive statistics on primary school teachers' environmental risk perceptions

Environmental risk perception	n	Minimum	Maximum	$\bar{X}$	S
General environmental risk perception	198	77.0	161.0	137.45	18.03
Global environmental risk	198	4.0	28.0	24.07	3.90
Chemical waste risk	198	25.0	49.0	43.19	5.67
Ecological risks	198	7.0	49.0	42.37	6.11
Resource depletion risk	198	11.0	35.0	27.81	5.07

Independent sample t-test was used to analyze pre-service primary school teachers' ecological identities according to gender. Statistical analysis of the pre-service primary school teachers' ecological identities according to gender is given in Table 8.

When Table 8 is examined, it was seen that there was no statistically significant difference in the pre-service primary school teachers' ecological identities according to gender ($t = 1.85$, $\rho > 0.05$). When the sub-dimensions of the ecological identity scale were examined, it was determined that there was no statistically significant difference according to gender in the dimensions of identity ($t = 0.15$, $\rho > 0.05$) and differentiation ($t = 1.28$, $\rho > 0.05$). However, there is a statistically significant difference between female pre-service teachers ($\bar{X} = 3.63$) and male pre-service teachers ($\bar{X} = 3.38$) in favor of female pre-service teachers in the sub-dimension of centrality ($t = 2.21$, $\rho < 0.05$). ANOVA was conducted to understand whether there was a statistically significant difference in the primary school teachers' ecological identity scale and its sub-dimensions according to grade level. Statistical (ANOVA) analysis of primary school teachers' the ecological identities according to grade level is given in Table 9.

When Table 9 is examined, there was no significant difference between the pre-service primary school teachers' ecological identities according to the grade level ($F [3–194] = 1.883$, $\rho > 0.05$). When the sub-dimensions of the Ecological Identity Scale are examined, identity ($F [3–194] = 2.515$, $\rho > 0.05$), differentiation ($F [3–194] = 0.141$, $\rho > 0.05$) and centrality [$F (3–194) = 1.470$, $\rho > 0.05$], there was no statistically significant difference according to grade level.

Independent sample t-test was used to analyze the pre-service primary school teachers' ecological identities according to whether they received environmental education courses or not. The statistical analysis of analyze the pre-service primary school teachers' ecological identities according to whether or not they received an environmental education course is given in Table 10.

When Table 10 is examined, there was no statistically significant difference between pre-service primary school teachers' ecological identities according to whether or not they received environmental education ($t = -0.76$, $\rho > 0.05$). When the sub-dimensions of the ecological identity scale were examined, it was determined that there was no statistically significant difference according to gender in the sub-dimensions of identity ($t = -1.24$, $\rho > 0.05$), differentiation ($t = 0.94$, $\rho > 0.05$), and centrality ($t = -1.34$, $\rho > 0.05$).

Examination of Pre-service Teachers' Environmental Risk Perceptions According to Various Variables

It was investigated whether there is a statistically significant difference in the environmental risk perceptions of pre-service primary school teachers according to gender, grade level, and whether they received environmental education courses or not.

Independent sample t-test was used to analyze the pre-service primary school teachers' environmental risk perceptions according to gender. Statistical analysis of pre-service primary school teachers' environmental risk perceptions according to gender is given in Table 11.

When Table 11 is examined, there was no statistically significant difference in pre-service primary school teachers' environmental risk perceptions according to gender. When the sub-dimensions of the environmental risk perception scale are examined, it was determined that there was no significant difference in dimension of global environmental risk ($t = 1.86$, $\rho > 0.05$), chemical waste risk ($t = -0.15$, $\rho > 0.05$), ecological risks ($t = 0.23$, $\rho > 0.05$), and resource depletion risk ($t = 1.73$, $\rho > 0.05$), according to gender. However, when the averages in the whole scale and in the sub-dimensions of

Table 7: The results of the correlation analysis between the pre-service primary teachers' ecological identities, and their environmental risk perceptions and sub -dimensions

Scale and sub-dimensions	r/p/N	Identity	Differentiation	Centrality	Ecological identity scale
Global environmental risk	r	0.39*	0.32*	0.35*	0.53*
	p	0.00**	0.00**	0.00**	0.00**
	N	198	198	198	198
Chemical waste risk	r	0.36*	0.38*	0.23*	0.48*
	p	0.00**	0.00**	0.00**	0.00**
	N	198	198	198	198
Ecological risks	r	0.22*	0.31*	0.12	0.32*
	p	0.00**	0.00**	0.07	0.00**
	N	198	198	198	198
Resource depletion risk	r	0.27*	0.21*	0.24*	0.35*
	p	0.00**	0.00**	0.00**	0.00**
	N	198	198	198	198
Environmental risk perception scale	r	0.35*	0.35*	0.26*	0.47*
	p	0.00**	0.00**	0.00**	0.00**
	N	198	198	198	198

*$\rho<0.01$, **$\rho<0.05$

global environmental risk, ecological risks, and resource depletion risk are examined, it is seen that the scale averages of female pre-service teachers were higher than male pre-service teachers. When the averages in the chemical waste risk sub-dimension were examined, it was determined that the scale averages of male pre-service teachers are higher than female pre-service teachers.

A ANOVA was conducted to understand whether there was a statistically significant difference in the Environmental Risk Perception Scale and its sub-dimensions of the pre-service primary school teachers according to the grade level. Statistical (ANOVA) analysis of the pre-service primary school teachers ' environmental risk perceptions by grade level is given in Table 12.

When Table 12 was examined, there was no significant difference in the environmental risk perceptions of the pre-service primary school teachers according to the grade level in the whole scale [F(3–194) = 0.407, ρ > 0.05]. When the sub-dimensions of the Environmental Risk Perception Scale are examined, global environmental risk (F [3–194] = 1.000, ρ > 0.05), chemical waste risk (F [3–194] = 0.099, ρ > 0.05), ecological risks (F [3–194] = 0.516, ρ > 0.05), and risk of depletion of resources (F [3–194] = 0.256, ρ > 0.05) dimensions were not statistically significant according to grade level. Independent sample t-test was used to analyze the environmental risk perceptions of pre-service primary school teachers according to whether they took environmental education courses or not. The statistical analysis of the pre-service primary school teachers' environmental risk perceptions according to whether they took environmental education courses or not is given in Table 13.

When Table 13 was examined, there was no statistically significant difference in the pre-service primary school teachers' environmental risk perceptions according to whether they received environmental education courses or not (t = 0.04,

Table 8: Statistical analysis of pre-service primary teachers' ecological identities according to gender

Size	Group	N	$\bar{X}$	S	sd	t	ρ
Identity	Female	158	3.98	0.51	196	0.15	0.877
	Male	40	3.96	0.50			
Differentiation	Female	158	4.02	0.79	196	1.28	0.199
	Male	40	3.84	0.80			
Centrality	Female	158	3.63	0.62	196	2.21	0.028*
	Male	40	3.38	0.76			
The whole scale	Female	158	3.88	0.41	196	1.85	0.066
	Male	40	3.73	0.51			

*ρ<0.05

Table 9: Statistical analysis of pre-service primary teachers' ecological identities according to grade level (ANOVA)

Dimension	Source of variance	Sum of squares (SS)	Sd	Mean squares (MS)	F	ρ
Identity	Between groups	1.933	3	0.644	2.515	0.060
	Within groups	49.715	194	0.256		
	Total	51.648	197			
Differentiation	Between groups	0.275	3	0.092	0.141	0.936
	Within groups	126.708	194	0.653		
	Total	126.984	197			
Centrality	Between groups	1.901	3	0.634	1.470	0.224
	Within groups	83.637	194	0.431		
	Total	85.538	197			
The whole scale	Between groups	1.055	3	0.352	1.883	0.134
	Within groups	36.211	194	0.187		
	Total	37.265	197			

*ρ<0.05

Table 10: Statistical analysis of the pre-service primary school teachers' ecological identities according to whether or not they take environmental education course

Dimension	Group	n	$\bar{X}$	S	SD	t	ρ
Identity	Yes	145	3,95	0.52	196	−1.24	0.21
	No	53	4,05	0.47			
Differentiation	Yes	145	4,02	0.76	196	0.94	0.34
	No	53	3,90	0.90			
Centrality	Yes	145	3,54	0.64	196	−1.34	0.17
	No	53	3,69	0.67			
The whole scale	Yes	145	3,83	0.42	196	−0.76	0.44
	No	53	3,89	0.46			

*ρ<0.05

Table 11: Statistical analysis of pre-service primary teaches' environmental risk perceptions according to gender

Dimension	Group	N	$\bar{X}$	S	Sd	t	ρ
Global environmental risk	Woman	158	6.08	0.85	196	1.86	0.064
	Male	40	5.76	1.33			
Chemical waste risk	Woman	158	6.16	0.81	196	−0.15	0.874
	Male	40	6.18	0.80			
Ecological risks	Woman	158	6.06	0.89	196	0.23	0.814
	Male	40	6.02	0.78			
Resource depletion risk	Woman	158	5.62	1.00	196	1.73	0.084
	Male	40	5.31	1.02			
The whole scale	Woman	158	6.00	0.78	196	0.91	0.361
	Male	40	5.87	0.78			

*ρ<0.05

Table 12: Statistical analysis of pre-service primary school teachers environmental risk perceptions according to grade level (ANOVA)

Dimension	Source of variance	Sum of squares (SS)	Sd	Mean squares (MS)	F	ρ
Global environmental risk	Between groups	2.854	3	0.951	1.000	0.394
	Within groups	184.584	194	0.951		
	Total	187.438	197			
Chemical waste risk	Between groups	0.199	3	0.066	0.099	0.960
	Within groups	129.298	194	0.666		
	Total	129.496	197			
Ecological risks	Between groups	1.190	3	0.397	0.516	0.671
	Within groups	148.985	194	0.768		
	Total	150.175	197			
Resource depletion risk	Between groups	0.799	3	0.266	0.256	0.857
	Within groups	201.845	194	1.040		
	Total	202.643	197			
The whole scale	Between groups	0.757	3	0.252	0.407	0.748
	Within groups	120.428	194	0.621		
	Total	121.186	197			

*ρ<0.05

Table 13: Statistical analysis of pre-service primary teachers' environmental risk perceptions according to whether or not they have taken environmental education courses

Dimension	Group	N	$\bar{X}$	S	Sd	t	ρ
Global environmental risk	Yes	145	5.99	1.01	196	−0.46	0.645
	No	53	6.07	0.86			
Chemical waste risk	Yes	145	6.16	0.82	196	−0.15	0.876
	No	53	6.18	0.77			
Ecological risks	Yes	145	6.07	0.90	196	0.52	0.599
	No	53	6.00	0.76			
Risk of depletion of resources	Yes	145	5.56	1.00	196	0.06	0.947
	No	53	5.55	1.03			
The whole scale	Yes	145	5.97	0.79	196	0.04	0.962
	No	53	5.97	0.74			

*ρ<0.05

ρ > 0.05). When the sub-dimensions of the environmental risk perception scale were examined, it was determined that there was no significant difference in global environmental risk (t = −0.46, ρ > 0.05), chemical waste risk (t = −0.15, ρ > 0.05), ecological risks (t = 0.52, ρ > 0.05), and resource depletion risk in terms of (t = 0.06, ρ > 0.05) whether or not they received an environmental education course.

CONCLUSION AND DISCUSSION

Environmental education and environmental problems are not a regional issue, but an issue that concerns the whole world. Environmental problems are common problems of all humanity. For this reason, teachers have great responsibilities in environmental education. Teachers should be conscious and responsible about the environment, and they should be well-equipped and develop positive attitudes toward the environment. If such teachers are trained, the generations they raise may have the same awareness and sensitivity about the environment. At this point, it is essential to attach the importance to teacher training program. In this context, it is important to determine the environmental identity and literacy of pre-service teachers who will be the teachers of the future because they will provide their students with knowledge, awareness, consciousness, and positive behavior about environmental education. The environmental education given

at a young age is an important factor in children's perceptions, attitudes, and sensitivities toward the environment. Hence, primary school teachers have great responsibilities regarding environmental education. Pre-service primary school teachers' awareness, perceptions, and attitudes toward the environment also affect the teaching process and students. For a quality and effective environmental education, it will be possible to improve the perceptions, attitudes, and identities of the pre-service teachers before the duty. Higher education institutions that train teachers play a key role in environmental education to determine and develop the primary school teachers' environmental identities and environmental risk perceptions (Gökmen, 2008). Therefore, pre-service primary school teachers' ecological identities and environmental risk perceptions were examined for the aim of the research.

It has been determined that the scores that pre-service primary teachers obtained from the ecological identity scale and its sub-dimensions and their ecological identity levels are at a moderate level. According to this result, it can be thought that necessary educational measures should be taken to increase the pre-service teachers' ecological identity levels to a high level. In the study conducted by Yaşaroğlu and Otlu (2022), it was found that the pre-service teachers' environmental identities were at a moderate level.

It was determined that the pre-service primary school teachers 'environmental risk perception levels were at high levels thanks to high scores they got from the environmental risk perception scale and its sub-dimensions. According to this result, it can be said that pre-service teachers have developed their perceptions of environmental risk in both higher education and lower education levels and that these trainings have an effect. Bican (2014), Demir (2020), and Kahyaoğlu (2012) also determined in their research that pre-service teachers have a high level of environmental risk perception.

It has been determined that there was a positive and significant relationship between the pre-service primary school teachers' ecological identities and their environmental risk perceptions. It can be interpreted that ecological identity had a significant impact on environmental risk perception. Kızılay and Tanık Önal (2019) determined a positive relationship between pre-service science teachers' environmental identities and environmental problems behaviors, other studies have found similar results such as Işık Mercan (2022) "the adults" ecological identities and ecological footprint awareness'; Tanık Önal et al. (2020) and Yetik (2019) "pre-service science teachers" ecological identities and environmentally friendly behaviors; Yaşaroğlu and Otlu (2022) "the primary school and science teachers" environmental identity and environmental risk perceptions'; Yue et al. (2021) "Environmental identity and attitudes towards animals"; Freed (2018) "university students" environmental identities and pro-environmental behaviors (recycling)'; and Hinds and Sparks (2008) "environmental identities with the desire to interact with nature". As a result, in this study, it was determined that there is a positive and significant relationship between the ecological identities of the pre-service primary school teachers and their environmental risk perceptions.

It was determined that there is no statistically significant difference in the pre-service teachers' ecological identities according to the gender variable. However, it was determined that the female pre-service teachers' average scores were higher than the male pre-service teachers' average scores. As a result, in this study, it was found that gender had no effect on the primary school teachers' ecological identities. The studies by Öztarakçı (2019), Uzel (2019), Yaşaroğlu and Otlu (2022) show similarities with this result. On the other hand, in the studies conducted by Yue et al. (2021) and Kızılay and Tanık Önal (2019), it was determined that women have a higher ecological identity than men. Stets and Biga (2003) stated that there is no direct relationship between gender and ecological identity, but there may be a relationship between ecological identity and variables such as race and ethnicity.

It was determined that the pre-service primary school teachers' ecological identities did not differ according to the grade level. As a result of this study, it was found that class level had no effect on the pre-service primary school teachers' ecological identities. According to this result, Kızılay and Tanık Önal (2019) found in their study that the grade level did not have an effect on the pre-service science teachers' environmental identities. However, in the study conducted by Uzel (2019), it was stated that the 4th grade pre-service teacher's ecological identities differed in favour of them.

It was determined that there was no statistically significant difference in the primary school teachers' ecological identities according to whether or not they received environmental education courses. According to this result, it was determined that whether or not taking environmental education courses had an effect on the pre-service primary school teachers' ecological identities. However, Humpreys and Blenkinsop (2018) stated that the nature and environmental experiences gained at an early age and environmental education supported the ecological identity development of children. When the literature was examined, Türkeli (2022), Özyürek et al. (2019), it was seen that environmental education course has no effect on the pre-service teacher's attitudes towards the environment. However, Işık (2021) and Tuncer (2021) emphasized that it was important to take an environmental education course for the environmental awareness and pre-service teachers' attitudes toward the environment, and Atik and Doğan (2019) also expressed the same thing for the university students' environmentally friendly behavior. Goodwin (2016) stated that the contents of general science and biology courses should be changed in this direction to increase the level of ecological identity based on life experience. Thus, the study conducted by Duan and Fortner (2010) also supports this result.

It was determined that there was no statistically significant difference in the pre-service primary school teachers' environmental risk perceptions according to the grade level variable. According to this result, it was determined that

there was no effect of grade level on the environmental risk perceptions of the pre-school primary school teachers. These findings are similar to the results conducted by Sam et al. (2010). Despite these studies, in the study conducted by Prasad et al. (2022), it was determined that older children were less afraid of nature than other children, so it can be said that the environmental risk perception differs depending on the grade level and age.

It was determined that there was no statistically significant difference in the pre-service primary school teachers' environmental risk perceptions according to the status of receiving environmental education courses. According to this result, it was determined that there was no effect of whether or not they take environmental education courses on the pre-service primary school teachers' environmental risk perceptions. It parallels the results of the study by Sam et al. (2010). On the other hand, in his study, Değerli (2018) found that university students, who stated that there should be environmental courses in universities, had a high level of environmental risk perception. In his study, Erdoğan (2011) stated that the nature and science school project given to the students had a positive effect on the environmental behavior of the students. Marcus (2012) stated in his study that students in the eco-school program were more willing to participate in projects on environmental problems.

As a result of the study, it was determined that there was a positive and significant relationship between the pre-service primary school teacher's ecological identities and their environmental risk perceptions. It was determined that there was no statistically significant difference in the pre-service primary school teachers' ecological identities and environmental risk perceptions according to the variables of gender, grade level, and whether or not to receive environmental education courses. In addition, it was found that the scores that pre-service primary teachers obtained from the ecological identity scale and its sub-dimensions and their ecological identity levels were at medium level while environmental risk perception levels were at a high level with the scores, they got from the environmental risk perception scale and its sub-dimensions.

Recommendations

The following recommendations are made based on this study:

- The study was conducted in one university. It would be beneficial if it was extended to pre-service teachers studying in different departments of various universities.
- Analyses were made using only quantitative data in the study. For more detailed research, further research could be done by using both quantitative and qualitative data to reveal more in-depth results.
- By including different variables in the scales used in the study, more detailed results of the pre-service primary school teachers could be reached in future studies.
- It is suggested that it may contribute to develop the ecological identity levels and environmental risk perceptions of pre-service teachers by including ecological identity and environmental risk perception in the content of the "Environmental Education" course.
- To improve pre-service teachers' ecological identities and environmental risk perception, in-class and extra-curricular activities can be planned and implemented at different grade levels.
- Activities that will increase the level of ecological identity and environmental risk perception can be prepared for male pre-service teachers whose ecological identity level and environmental risk perception are low compared to average scores.

Ethical Statement

This research was found ethically appropriate by the Tokat Gaziosmanpaşa University Social and Human Sciences Research Ethics Committee with decision dated 08.06.2021, decision numbered 01–26, and session number 12.07.

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REFERENCES

Almeida, A.C. (2015). *A Cabeça do Brasileiro* [*The Brazilian's Head*]. Brazil: Editora Record [Record Publishing].

Altunoğlu, B.D., & Atav, E. (2009). Ortaöğretim öğrencilerinin çevre risk algısı [Secondary school students' environmental risk perception]. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi* [*Hacettepe University Journal of Education*], 36, 1-11.

Argus, S. (2018). *Girl Scout Voices: Describing Ecological Identity*. (Unpublished Master's Thesis) United States: Prescott College ProQuest Dissertations Publishing.

Atik, A.D., & Doğan, Y. (2019). Üniversite öğrencilerinin çevre dostu davranışları [University students eco-friendly behaviors]. *Muallim Rıfat Eğitim Fakültesi Dergisi* [*Journal of Muallim R fat Faculty of Education*], 1(1), 1-21.

Bican, S. (2014). *Fen Bilgisi Öğretmen Adaylarının Çevre Risk Algılarının Belirlenmesi*. (Yayimlanmamiş Yüksek Lisans Tezi) [*Determination of Environmental Risk Perceptions of Science Teacher Candidates*]. (Unpublished Master's Thesis) Ankara: Gazi Üniversitesi Eğitim Bilimleri Enstitüsü [Gazi University Institute of Education Sciences].

Bodur, G., & Taşocak, G. (2013). Nursing students' views about environmental sensitivity in Turkey. *Journal of Human Sciences*, 10(1), 820-831.

Brusaferro, V.R. (2020). *Shaping "Little" Ecological Worldviews: A Case Study of Ecological Identity Indicators at Forest Preschool*. (Doctoral Thesis) United States: Prescott College ProQuest Dissertations Publishing.

Buehler, J.M. (2019). *Engaging Youth in Experiential Environmental Education: An Exploration of the Effects on Ecological Identity Development*. (Master's Thesis) Prescott United States: College ProQuest Dissertations Publishing.

Büyüköztürk, Ş. (2016). Sosyal Bilimler için Veri Analizi El Kitabı [*Manual of Data Analysis for Social Sciences*]. United States: Pegem Akademi Yayıncılık [Pegem Academy Press].

Clayton, S., & Opotow, S. (2003). *Identity and the Natural Environment: The Psychological Significance of Nature*. United States: MIT Press.

Clayton, S.D. (2003). Environmental identity: A conceptual and operational definition. In: Clayton, S.D., & Opotow, S. (Eds.), *Identity and the Environment: The Psychological Significance of Nature*. United States: MIT Press, pp. 45-65.

De Dominicis, S., Fornara, F., Cancellieri, U.G., Twigger-Ross, C., & Bonaiuto, M. (2015). We are at risk, and so what? Place attachment,

environmental risk perceptions and preventive coping behaviours. *Journal of Environmental Psychology*, 43, 66-78.

Değerli, M.A. (2018). *Üniversite Öğrencilerinin Çevresel Risk Algısı ve Çevresel Tutumlarının Belirlenmesi.* (Yayımlanmamış Yüksek Lisans Tezi). [*Determination of Environmental Risk Perception and Environmental Attitudes of University Students*]. (Unpublished Master's Thesis). İstanbul: İstanbul Medipol Üniversitesi [İstanbul Medipol University].

Demir, A.S. (2020). *Fen Bilimleri ve Sınıf Eğitimi Öğretmen Adaylarının Çevre Risk Algılarıyla Çevre Tutumlarının Belirlenmesi*. (Yayımlanmamış Yüksek Lisans Tezi). [*Determination of Environmental Risk Perceptions and Environmental Attitudes of Science and Classroom Education Teacher Candidates*]. (Unpublished Master's Thesis) Samsun: Ondokuz Mayıs Üniversitesi [Ondokuz Mayıs University].

Dobson, A. (2016). *Ekolojizm*. (Trans: Cengiz Yücel), İstanbul: Yeni İnsan Press.

Duan, H., & Fortner, R. (2010). A cross-cultural study on environmental risk perception and educational strategies: Implications for environmental education in China. *International Electronic Journal of Environmental Education*, 1(1), 1-19.

Erdoğan, M. (2011). Ekoloji temelli yaz doğa eğitimi programının ilköğretim öğrencilerinin çevreye yönelik bilgi, duyuşsal eğilimler ve sorumlu davranışlarına etkisi [The effects of ecology-based summer nature education program on primary school students' environmental knowledge, environmental affect and responsible environmental behavior]. *Kuram ve Uygulamada Eğitim Bilimleri* [*Educational Sciences: Theory and Practice*], 11(4), 2223-2237.

Freed, A. (2018). The relationship between university students' environmental ıdentity, decision-making process, and behavior. *Environmental Education Research*, 24(3), 474-475.

Gezer, M., & İlhan, M. (2018). Ekolojik kimlik ölçeğinin Türkçe uyarlaması: Geçerlik ve güvenirlik çalışması [The Turkish adaptation of the ecological identity scale: Validity and reliability study]. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi* [*Gazi University Journal of Gazi Education*], 38(3), 1121-1142.

Gökmen, A. (2008). *Bilgisayar Destekli Çevre Eğitiminin Öğretmen Adaylarının Madde Döngüleri Konusundaki Başarılarına Etkisi.* (Yayımlanmamış Yüksek Lisans Tezi) [*The Effect of Computer Aided Environmental Education on Pre-service Teachers' Achievement in Matter Cycles*]. (Unpublished Master's Thesis) Ankara: Gazi Üniversitesi Eğitim Bilimleri Enstitüsü [Gazi University Institute of Education Sciences].

Goodwin, T. (2016). Educating for ecological literacy. *The American Biology Teacher*, 78(4), 287-291.

Gray, D.S., & Colucci Gray, L. (2018). Laying down a path in walking: Student teachers' emerging ecological identities. *Environmental Education Research,* 25(3), 341-364.

Hinds, J., & Sparks, P. (2008) Engaging with the natural environment: The role of affective connection and identity. *Journal of Environmental Psychology*, 28, 109-120.

Humpreys, C., & Blenkinsop, S. (2018). Ecological identity, empathy, and experiential learning: A young child's explorations of a nearby river. *Australian Journal of Environmental Education,* 34(2), 143-158.

Işık Mercan, S. (2022). Ekolojik kimlik ve ekolojik ayak izi: Çevre sorunlarında bir ikilem mi? [Ecological identity and ecological footprint: A dilemma in environmental issues?] *International Journal of Geography and Geography Education (IGGE)*, 47, 148-161.

Işık, R. (2021). *Üniversite Öğrencilerinin Sahip Olduğu Çevre Bilinci ile Çevresel Etik Davranışları Arasındaki Ilişkinin Incelenmesi*. (Yayımlanmamış Yüksek Lisans Tezi) [*Examining the Relationship between Environmental Awareness of University Students and their Environmental Ethical Behavior*]. (Unpublished Master's Thesis) Çanakkale: Çanakkale Onsekiz Mart Üniversitesi Lisansüstü Eğitim Enstitüsü [Çanakkale Onsekiz Mart University Graduate School of Education].

Kahyaoğlu, M. (2012). The relationship between teacher candidates' environmental risk perceptions and problem solving skills. *Journal of Education and Future*, 2, 93-104.

Karasar, N. (2011). *Bilimsel Araştırma Yöntemi* [*Scientific Research Method*]. United Kingdom: Nobel Yayın Dağıtım [Nobel Press].

Kaya, M.F, Kahyaoğlu, M., & Birel, G.F. (2012). An evaluation of elementary teacher candidates' environmental approaches, environmental risk perceptions and environmental behaviours. *Procedia-Social and Behavioral Sciences*, 55, 655-660.

Khatoon, N. (2019). *Understanding the Grade V Students' Ecological Identity in Karachi and Helping them in Enhancing their Ecological Consciousness.* (Unpublished Doctoral Thesis). Karachi, Pakistan: Aga Khan University.

Kılıç, S. (2008). *Çevre Etiği Ortaya Çıkışı, Gelişimi ve Sonuçları* [*The Emergence, Development and Consequences of Environmental Ethics*]. United Kingdom: Orion Kitabevi [Orion Press].

Kızılay, E., & Önal, N.T. (2019). From the environmental identity to the behavior: The status of pre-service science teachers. *International Journal of Evaluation and Research in Education* (*IJERE*), 8(2), 271-279.

Marcus, A. (2012). Implementation of environmental education case study: Activating the "Green School" program among elementary school students in Israel. *Geographia Technica*, 16(2), 52-58.

Mercan, Y., & Işık Mercan, S. (2020). The relationship between 'environmental attitudes and behaviors', and 'environmental sensitivity and perceived environmental risks'. *Humanistic Perspective*, 2(3), 231-251.

Moghadam, J.N., Ziabari, R.S., & Reza, A.M. (2020). A critical discourse analysis of ecological identities in the Iranian society: A constructivist grounded study. *Iranian Journal of Sociolinguistics*, 3(4), 79-92.

Mrkva, K., Cole, J.C., & Van Boven, L. (2021). Attention increases environmental risk perception. *Journal of Experimental Psychology General*, 150(1), 83-102.

Nkoana, E.M. (2020). Exploring the effects of an environmental education course on the awareness and perceptions of climate change risks among seventh and eighth grade learners in South Africa. *International Research in Geographical and Environmental Education*, 29(1), 7-22.

Özdemir, O. (2016). Ekolojik Okuryazarlık ve Çevre Eğitimi [Ecological Literacy and Environmental Education]. United States: Pegem Akademi Yayıncılık [Pegem Academy Press].

Öztarakcı, D. (2019). *Öğretmen Adaylarının Çevre Dostu Davranışları ve Çevre Kimlikleri.* (Yayımlanmamış Yüksek Lisans Tezi) [*Environmental Friendly Behaviors and Environmental Identities of Teacher Candidates*]. (Unpublished Master's Thesis) Balıkesir: Balıkesir Üniversitesi Fen Bilimleri Enstitüsü [Balikesir University Institute of Science and Technology].

Özyürek, C., Demirci, F., Güler, H., Sarıgöl, J., Tepe, B., & Çetinkaya, M. (2019). Öğretmen adaylarının çevre okuryazarlık bileşenlerinin farklı değişkenlere göre incelenmesi [Examination of teacher candidates' environmental literacy components according to different variables]. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi* [*Journal of Mehmet Akif Ersoy University Faculty of Education*], 50, 227-253.

Palancı, E., & Sarıkaya, M. (2019). Ortaokul öğrencilerinin çevre risk algı puanları ile fen bilimleri dersi akademik başarıları arasındaki ilişkinin araştırılması [Investigation of the relationship between secondary school students' environmental risk perception scores and academic achievement in science courses]. *Anadolu Kültürel Araştırmalar Dergisi [Anatolian Journal of Cultural Studies*], 3(1), 15-25.

Pelo, A. (2009). A pedagogy for ecology. *Rethinking Schools*, 23(4), 30-35.

Pelo, A. (2014). A sense of wonder: Cultivating an ecological identity in young children-and in ourselves. *Canadian Children*, 39(2), 5-10.

Prasad, A., Lal, P., Wolde, B., Smith, M., Zhu, M., Samanthula, B.K., & Panorkou, N. (2022). Exploring the human-nature connection and the perceived risk of nature in children. *Applied Environmental Education and Communication*, 21(1), 87-101.

Quinn, T., Bousquet, F., & Guerbois, C. (2019). Changing places: The role of sense of place in perceptions of social, environmental and overdevelopment risks. *Global Environmental Change*, 57, 101930.

Sam, N., Gürsakal, S., & Sam R. (2010). Üniversite öğrencilerinin çevresel risk algısı ve çevresel tutumlarının belirlenmesi [Determination of environmental risk perception and environmental attitudes of university students]. *Akademik Bakış Dergisi* [*Academic Perspective Journal*], 20, 1-16.

Saraç, E. (2018). *Sınıf Öğretmeni Adaylarının Çevre Kimlikleri ve Çevreye Yönelik Materyalist Eğilimleri: Eylem Araştırması.* (Yayımlanmamış

Doktora Tezi) [*Environmental Identities and Materialistic Tendencies of Primary School Teacher Candidates: Action Research*]. (Unpublished Doctoral Thesis) Ankara: Gazi Üniversitesi Eğitim Bilimleri Enstitüsü [Gazi University Institute of Educational Sciences].

Sayan, B., & Kaya, H. (2016). Assessment of the environmental risk perceptions and environmental attitudes of nursing students. *Contemporary Nurse*, 52(6), 771-781.

Slimak, W.M., & Dietz, T. (2006). Personal values, beliefs, and ecological risk perception. *Risk Analysis*, 26(6), 1689-1705.

Stets, J.E., & Biga, C.F. (2003). Bringing identity theory into environmental sociology. *Sociological Theory*, 21(4), 398-423.

Tabachnick, B.G., & Fidell, I.S. (2013). *Using Multivariate Statistics, New International Edition*. Harlow: Pearson Education Limited.

Tanık Önal, N., Kılınç, A., & Saraçoğlu, S. (2020). Fen bilgisi öğretmen adaylarının çevre kimliklerinin ve çevre dostu davranışlarının incelenmesi [Examination of environmental identities and environmentally friendly behaviors of pre-service science teachers]. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi* [*Journal of Uludag University Faculty of Education*], 33(3), 749-777.

Tarı Selçuk, K., Mercan Y., & Çevik C. (2016). Hemşirelik bölümü öğrencilerinde çevresel risk algısı ve ilişkili etmenler [Environmental risk perception and related factors in nursing students]. *Uluslararası Hakemli Hemşirelik Araştırmaları Dergisi* [*International Refereed Journal of Nursing Research*], 7, 116-135.

Tümer, A., & Sümen, A. (2020). Ergenlerde çevresel risk algısının belirlenmesi [Determination of environmental risk perception in adolescents]. *Gümüşhane Üniversitesi Sağlık Bilimleri Dergisi* [*Gumushane University Journal of Health Sciences*], 9(2), 142-150.

Tuncer, A. (2021). *Öğretmen Adaylarının Çevresel Tutumunu Belirlemek Amacıyla Geliştirilen Çevre'ye Yönelik Tutum Ölçeği: Ordu Üniversitesi Örneği*. (Yayımlanmamış Yüksek Lisans Tezi) [*Attitude Scale towards Environment Developed to Determine the Environmental Attitudes of Teacher Candidates: Ordu University Example*]. (Unpublished Master's Thesis) Ordu: Ordu Üniversitesi Fen Bilimleri Enstitüsü [Ordu University Institute of Science and Technology].

Türkeli, Ö. (2022). *Öğretmen Adaylarının Çevre Okuryazarlığı Kavramına İlişkin Tutum ve Davranışlarının Incelenmesi*. (Yayımlanmamış Yüksek Lisans Tezi) [*Examination of Teacher Candidates' Attitudes and Behaviors towards the Concept of Environmental Literacy*]. (Unpublished Master's Thesis) Alanya: Alanya Alaaddin Keykubat Üniversitesi Lisansüstü Eğitim Enstitüsü [Alanya Alaaddin Keykubat University Graduate Education Institute].

Uçar, M.B. (2015). *Fen Bilgisi Öğretmen Adaylarının Çevre Dostu Davranışlarının Modellenmesi.* (Yayımlanmamış Yüksek Lisans Tezi) [*Modeling Environmentally Friendly Behaviors of Science Teacher Candidates*]. (Unpublished Master's Thesis) Elazığ: Fırat Üniversitesi Eğitim Bilimleri Enstitüsü [Fırat University Institute of Educational Sciences].

Uzel, N. (2019). Analysis of preservice teachers' ecological identity according to some variables. In: Gül, A., and Uzel, N. (Eds.), *Current Research in Environmental Education*. United States: SRA Academic Publishing, pp. 39-52.

Walton, T.N., & Jones, R.E. (2018). Ecological identity: The development and assessment of a measurement scale. *Environment and Behavior*, 50(6), 657-689.

Williams, C.C., & Chawla, L. (2016). Environmental identity formation in nonformal environmental education programs. *Environmental Education Research*, 22(7), 978-1001.

Wilson, R.A. (1996). *Starting early: Environmental education during the early childhood years.* Clearinghouse for Science, Mathematics and Environmental Education, 23(2), 23-25.

Yaşaroğlu, C., & Otlu, H. (2022). A research on the environmental identities and environmental risk perceptions of classroom and science teachers according to different variables. *International Journal of Psychology and Educational Studies*, 9(2), 450-461.

Yeşilyurt, F. (2018). *Öğretmen Adaylarının Çevre Risk Algılarının Belirlenmesi.* (Yayımlanmamış Yüksek Lisans Tezi) [*Determining the Environmental Risk Perceptions of Teacher Candidates*]. (Unpublished Master's Thesis) Amasya: Amasya Üniversitesi Fen Bilimleri Enstitüsü [Amasya University Institute of Science and Technology].

Yetik, N. (2019). *3. Sınıf Fen Bilgisi Öğretmen Adaylarının Çevre Kimliklerinin ve Çevre Dostu Davranışlarının Belirlenmesi.* (Yayımlanmamış Yüksek Lisans Tezi) [*Determination of Environmental Identities and Environmentally Friendly Behaviors of 3rd Grade Science Teacher Candidates*]. (Unpublished Master's Thesis) Aksaray: Aksaray Üniversitesi Fen Bilimleri Enstitüsü [Aksaray University Institute of Science and Technology].

Yıldırım, A., & Şimşek, H. (2018). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri* [*Qualitative Research Methods in the Social Sciences*]. Turkey: Seçkin Yayıncılık [Seçkin Press].

Yue, D., Wang, S., Liang, X., Tong, Z., & Sun, Y. (2021). Comparative analysis of environmental identity and animal attitude between male and female. *IOP Conference Series: Earth and Environmental Science*, 647, 012162.