Investigation of the Environmental Education Self-Efficacy of Science Teacher Candidates

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Abstract: In this research, the population consists of second, third and fourth grade teacher candidates studying at Trakya University Faculty of Education, Science Teaching Department in the 2022-2023 academic year. The sample for the research was obtained by using easily accessible sampling and scanning method and consisted of 81 science teacher candidates. In the study, quantitative data was obtained by using different variables to determine the self-efficacy of science teacher candidates in environmental education. The "Environmental Education Self-Efficacy Scale" developed by Özlü (2012) was used to collect the data. The data obtained from the use of the scales were analyzed with the SPSS 25 program. In light of the data obtained as a result of the research, it was determined that science teacher candidates were familiar with environmental problems and their environmental education self-efficacy was slightly above the medium level. When the candidates' environmental education self-efficacy status was considered in terms of demographic characteristics, no statistical difference was observed. Despite this, as the grade levels progress, there is an increase in self-efficacy.

Key Words: Environment, Science Teacher Candidate, Self-efficacy in Environmental Education

Fen Bilgisi Öğretmen Adaylarının Çevre Eğitimi Özyeterliklerinin İncelenmesi

Özet: Bu araştırmada evren 2022-2023 eğitim-öğretim yılında Trakya Üniversitesi Eğitim Fakültesi Fen Bilgisi Öğretmenliği Anabilim Dalında öğrenim gören ikinci, üçüncü ve dördüncü sınıflardaki öğretmen adaylarından oluşturmaktadır. Araştırma için örneklem kolay ulaşılabilir örnekleme ile tarama yönteminden faydalanılarak elde edilmiş ve 81 fen bilgisi öğretmen adayı oluşturmuştur. Araştırmada nicel veriler fen bilgisi öğretmen adaylarının çevre eğitimi konusunda öz-yeterliklerinin saptanmasında farklı değişkenler kullanılarak elde edilmiştir. Verilerin toplanmasında Özlü (2012)'nün geliştirdiği "Çevre Eğitimi Öz-yeterlik Ölçeği" nden yararlanılmıştır. Ölçeklerin kullanılmasından elde edilmiş olan veriler SPSS 25 programı ile analiz edilmiştir. Araştırmanın sonucunda saptanan verilere ışığında fen bilgisi öğretmen adayları için çevresel problemlere tanıdık oldukları ve çevre eğitimi öz-yeterliklerinin ise orta düzeyin biraz üzerinde olduğu belirlenmiştir. Adayların çevre eğitimi öz-yeterlik durumları demografik özellikler açısından ele alındığında istatistiksel yönden farklılık görülmemiştir. Buna rağmen sınıf seviyeleri ilerledikçe öz-yeterliklerinde bir artış ile karşılaşılmaktadır.

Anahtar Kelimeler: Çevre, Fen Bilimleri Öğretmen Adayı, Çevre Eğitiminde Öz-Yeterlik

1. INTRODUCTION

Although environmental education is an education that covers all segments of society, environmental education of the young generation is the most important target group. Because, although the young generation is not responsible for today's environmental problems, it is the segment that will be most affected by these environmental problems and therefore needs to be given the most knowledge, awareness and sensitivity on this issue (Erol & Gezer, 2006). Training teachers who have high environmental awareness, sufficient ecological knowledge, and the knowledge and experience to carry out theoretical and applied environmental studies successfully is of great importance in terms of the development of environmental education and achieving its intended goals (Kahyaoğlu et al., 2008; Sever & Yalçınkaya, 2012). Although legal regulations have been made and it is included in various curricula in schools, problems continue to occur in raising individuals who are sensitive to the environment (Uluşan, 2020; Aslan et al., 2008).

Environmental education does not only aim to help individuals change behavior on some issues. In the same direction, the training aims to provide individuals with the awareness to combat the problems they encounter and the behaviors that will contribute to the solution of the problems. Good environmental education always lies in protecting and protecting the environment against the destruction of the environment (Şimşekli, 2004; Yücel & Morgil, 1998). With environmental education, information about ecology is conveyed to individuals and individuals develop positive attitudes towards the environment, thus ensuring that the developed attitudes are transformed into behaviors. Environmental education course creates changes in the affective, psychomotor and cognitive aspects of prospective teachers (Erten, 2003).

What is expected from people is not only the way they perceive the environment and environmental problems, but also to produce solutions by participating in the problems. It is an education problem that citizens have sufficient environmental

awareness and ensure its permanence from generation to generation. The most important goal of environmental education is to raise conscious and sensitive people to protect the environment so that a clean and healthy environment can be handed down to future generations (Doğan, 2019).

Environmental problems have now become dangerous all over the world. From a global perspective, only environmentally literate people who internalize the environment and protect it in the behavioral process can prevent such rapid destruction of the environment (Çelikbaş, 2016; Karakaya, 2016). Environmental literacy gained educationally has a different importance for educators (Candan & Erten, 2015; Gülay & Öznacar, 2010). If it is aimed for future generations to have this characteristic, it should first be imparted to the teacher candidates who will educate these people (Bilim, 2012; Esa, 2010; Green et al., 2016).

In order to get the expected results from environmental education, teachers and teacher candidates who directly provide the relevant education must have good environmental/ecology knowledge. In addition, he/she must love the environment, be sensitive to environmental problems and have a high belief that he/she can fulfill his/her responsibilities (Erkol & Erbasan, 2018). At this point of belief, the self-efficacy factor comes into play. The judgment regarding the educational competencies possessed and the power and capacity of these competencies to impart certain targeted behaviors on learners is defined as teacher self-efficacy belief (Bandura, 1997; Söğüt, 2022). Therefore, it can be said that if a teacher or teacher candidate has no judgment about how to react to a problem or problems they encounter, it is a controversial issue for them to be able to provide these desired qualities to their students. At this point, considering how important the education given at an early age is for effective environmental education to take place, it is expected that the environmental education self-efficacy of science teachers who are role models for their students at this age is high (Söğüt, 2022).

Tschannen Moran and Woolfolk Hoy (2001) expressed self-efficacy belief and teacher self-efficacy as follows. Self-efficacy belief is a person's personal expectations regarding his/her level of success when faced with a new situation. Teacher self-efficacy is the judgment about whether a teacher can produce the expected results in the student, such as commitment to teaching and willingness to learn, as a result of the knowledge, skills and attitudes he/she has.

Self-efficacy perception is the conclusions drawn directly from people's inner world, where they see themselves, what they can and cannot do, and from their experiences. Therefore, it is actually directly related to the direction people give or will give themselves in life. Since the perception of self-efficacy is related to the way people perceive themselves, sometimes people may misjudge themselves and perceive themselves as better than they are, but this generally yields positive results. Likewise, people's perception of themselves as inadequate may cause them to perform poorly and fail in a job that they can achieve (Bandura, 1997; Köse, 2007).

Individuals who are not equipped to perform a performance, but have a high belief in self-efficacy, make an effort until they achieve that task. Perception of self-efficacy positively affects one's success (Özlü, 2012). According to Bandura, the perception of self-efficacy varies among fields and individuals, as well as between societies (Özenoğlu Kiremit, 2006). For example, if a teacher has high self-efficacy in environmental education and believes that he can explain environmental education topics very well, this does not mean that the same teacher believes that he can explain the subject of genetics very well (Bandura, 1997; Bandura et al., 2001; Moseley et al., 2002).

Teachers being more willing, patient and compassionate therefore increases students' performance in the course. In other words, the success of the teacher brings with it the success of the student. Successful students' self-efficacy beliefs also increase accordingly (Özlü et al., 2013). People with low self-efficacy perceptions do not undertake tasks where they think they will fail, but accept failure (Aydın, 2008; Bandura, 1997; Cengiz et al., 2018; Miyoshi, 2012; Saini, 2012; Schwarzer & Hallum, 2008). In studies conducted on this subject, it has been observed that teachers explain the subjects they have mastered in more detail and at length, but keep the subjects they do not know shorter and cover them superficially (Aydın, 2008; Özenoğlu Kiremit, 2006; Özlü, 2012). It seems that the perception of self-efficacy is extremely important in terms of teacher success and therefore student success (Gardner, 2009; Saracaloğlu & Yenice, 2009).

Considering the effects of the concept of self-efficacy on the individual, it can be realized how important the self-efficacy of individuals in environmental education is for both themselves and the society they live in. Through environmental education, it is aimed for all people to become more aware and informed about the environment (Güler,

2009) and to change some of their behaviors. Within the scope of these goals, by creating a good sense of self-efficacy in individuals regarding the environment, the way will be paved for raising generations that are more sensitive to the environment (Okumuş & Öztürk, 2019).

It is expected that teachers who prioritize the environment and environmental protection in every aspect of their lives, include environmental protection behaviors and make this a way of life, will be more committed to environmental education and will make more efforts to make their students love and protect nature. On the other hand, it is thought that teachers who do not take the environment and environmental protection among the priorities of their lives will see environmental education only as a requirement of their profession and will not have the desire and effort to struggle with the difficulties they will encounter while providing this education. The first profile described above includes teachers with high self-efficacy beliefs towards environmental education; the second profile refers to teachers with low scores. Considering that the people in question are science teachers or teacher candidates, it is thought that their responsible environmental behavior has an impact on their self-efficacy perceptions for the environmental education course they will teach (Söğüt, 2022).

It is of great importance for teachers to have full self-efficacy beliefs, both for the development of students and for teachers to fulfill their duties successfully and devotedly. Teachers with high self-efficacy beliefs are more willing, patient, and compassionate and make good use of their time. This also increases students' performance in the course. In other words, the success of the teacher brings with it the success of the student. Successful students' self-efficacy beliefs will increase accordingly (Aydın, 2008; Özlü, 2012).

Determining teachers' self-efficacy for environmental education is an important step for environmental education. It is important that the self-efficacy scales used to accurately determine the self-efficacy of teachers have high validity and reliability and measure the desired feature in the most accurate way (Özlü et al., 2013). Many studies have been conducted in the national and international literature on the subject of environmental self-efficacy (Apaydın Timur, 2020; Aydın, 2008; Çetkin, 2019; Çıngıl Barış, 2020; Gökmen et al., 2019; Kahyaoğlu, 2011; Karademir, 2016; Konakçı, 2019; Krishna & Thenmozhi, 2021; Mullens, 2016; Okumuş & Öztürk, 2019; Richardson et al., 2014; Rosdiana et al., 2020; Söğüt, 2022; Uzel

et al., 2019). Teachers, who come after the family in raising individuals, must be role models who have a positive attitude towards the environment. In this study, it was aimed to determine the environmental self-efficacy of prospective teachers, who we expect to instill positive behavior in our children, and to determine their perspectives on environmental problems.

2. MATERIALS AND METHODS

This study was undertaken to reveal the environmental education self-efficacy of teacher candidates studying at Trakya University Faculty of Education, Department of Mathematics and Science, Science Teaching Department. Study permission was obtained from Trakya University Social and Human Sciences Research Ethics Committee with the letter numbered E-29563864-050.04.04-245850 on 20.04.2022. In addition, necessary permissions were obtained for the environmental education self-efficacy scale used in the study.

Sub-problems of the research;

● What is the environmental education self-efficacy level of science teacher candidates?

● Do science teacher candidates' environmental education self-efficacy vary according to demographic factors? Was determined as.

2.1. Demographic Characteristics of the Working Group

The sample group in this study consists of N = 81 teacher candidates studying in the second, third and fourth grades in the Science Teaching Department of Trakya University Faculty of Education in the 2022-2023 academic year. No sampling method was used for the sample, and due to the small number of teacher candidates, it was aimed to sample the entire study group to collect data.

The demographic characteristics of the teacher candidates participating in the research according to gender are given in Table 1.

Table 1: Distribution of Demographic Characteristics of Science Teacher Candidates According to Gender Variable.

Gender	N	%
Female	62	76,5
Male	19	23,5
Total	81	100,0

According to the demographic data obtained from Table 1, it is seen that of the 81 teacher candidates in the study 76.5% are female and 23.5% are male.

The demographic characteristics of the teacher candidates participating in the research according to the class variable in which they are studying are given in Table 2.

Table 2: Distribution of Demographic Characteristics of Science Teacher Candidates According to Grade Level Variable

Grade Level	N	%
Second Grade	29	35,8
Third Grade	27	33,2
Fourth Grade	25	30,0
Total	81	100,0

According to the demographic data in Table 2, it is seen that 35.8% of the teacher candidates are second grade, 33.2% are third grade and 30.0% are fourth grade. Although there is not much difference in the number of individuals between classes, it seems that the number of individuals in the second class is higher than the other classes.

The distribution of teacher candidates participating in the research according to the place of residence variable is given in Table 3.

Table 3: Distribution Results of Demographic Characteristics of Science Teacher Candidates According to Place of Residence.

Place of Residence	N	(%)
Province	43	53,1
District	30	37,0
Village	8	9,9
Total	81	100,0

When Table 3 is examined, 53.1% of the teacher candidates live in the city center, 37.0% in the district and 9.9% in the village. More than half of them live in the city center and a very small part lives in the villages.

The demographic characteristics of the teacher candidates participating in the study according to their mother's education level are given in Table 4.

Table 4: Distribution of Demographic Characteristics of Science Teacher Candidates According to Their Mother Education Levels.

Mother Education Level	N	(%)
Illiterate	5	6,2
Literate	3	3,7
Primary education (grades 1-5)	31	38,3
Secondary education (6th-8th grade)	15	18,5
High school	18	22,2
University	9	11,1
Total	81	100,0

According to the data obtained from Table 4, 38.3% of the prospective teachers' maternal education levels are primary school graduates, 22.2% are high school graduates and 11.1% are university graduates. Additionally, 3.7% are only literate.

The demographic characteristics of the teacher candidates participating in the study according to their father's education level are given in Table 5.

Table 5: Distribution of Demographic Characteristics of Science Teacher Candidates According to Their Father's Education Level.

Father's Education Level	N	(%)
Literate	1	1,2
Primary education (grades 1-5)	19	23,5
Secondary education (6th-8th grade)	16	19,8
High school	26	32,1
University	19	23,5
Total	81	100,0

According to the data obtained from Table 5, 32.1% of the teacher candidates' father education levels are high school graduates, 23.5% are secondary school and university graduates, and only 1.2% are literate.

The demographic characteristics of the teacher candidates participating in the research according to their mother's occupational status are given in Table 6.

Table 6: Demographic Characteristics of Science Teacher Candidates According to Mother's Occupation.

Mother Occupation	N	(%)
Housewife	53	65,4
Officer	8	9,9
Self-Employment	20	24,7
Total	81	100,0

According to the data in Table 6, when the mother occupation status of teacher candidates is examined, 65.4% are housewives, 24.7% are self-employed and 9.9% are civil servants. A large proportion are made up of housewife mothers.

The demographic characteristics of the teacher candidates participating in the research according to their father's occupation status are given in Table 7.

Table 7: Demographic Characteristics of Science Teacher Candidates According to Father's Occupation.

Father Occupation	N	(%)
Officer	11	13,6
Retired	19	23,5
Self-employment	45	55,6
Farmer	6	7,4
Total	81	100,0

According to the demographic data obtained from Table 7, when the father's occupation status of the teacher candidates is examined, 55.6% are self-employed, 23.5% are retired, 13.6% are civil servants and 7.4% are farmers. More than half of teacher candidates are self-employed fathers.

2.2. Data Collection Tools

In this study, the scale method, which is a quantitative descriptive analysis method, was used. The most important reason for using the scale design is to reveal environmental attitudes for the general population through studies conducted on the sample selected in the population. In this study, a scale was used to determine the demographic information of prospective science teachers and then their self-efficacy towards the environment.

The "Environmental Education Self-Efficacy Scale" used in the study was developed by Özlü (2012) [161]. Exploratory factor analysis of the scale developed by Özlü (2012) found the Kaiser-Meyer-Olkin (KMO) value to be 0.94. The results of the Bartlett Sphericity test were examined to determine whether the data showed normal distribution. A test result of 0.000 (p<0.01) indicates that the distribution is normal. By using the Varimax rotation method for factor analysis, it was determined that the scale had a 2-factor structure and 67.04% of the total variance was explained within the scope of the 2-factor structure of the scale. The factors that explained 67.04% of the total variance were determined as 'Field Knowledge' and 'Teaching Strategies'. According to the t-test results performed to determine the internal consistency coefficient of the scale, it was seen that the t-test values obtained varied between 5.873 and 11.207 and all items were significant at the .000 level. To calculate the reliability of the environmental education self-efficacy scale, which consists of 24 items, Cronbach's α coefficient was calculated and its internal consistency was tested. Cronbach's α coefficient calculated for the overall scale was found to be 0.97. The calculated values for the sub-dimensions of the scale were found to be 0.93 for the 1st factor, the field knowledge dimension, and 0.96 for the 2nd factor, the teaching strategies

dimension. For each item in the scale, prospective teachers were asked to give themselves a score between 0 and 100. The scores that can be obtained from the field knowledge sub-dimension of the scale are between 0-1000; the scores that can be obtained from the teaching strategy sub-dimension vary between 0-1400. The points that can be obtained for all of them are between 0-2400. The variance explanation rates and eigenvalues of the 2-factor structure of the scale are given in Table 8.

Table 8: Total Variance Explanation Rates and Eigenvalues of Factors.

Factors	Eigenvalue	Explained Variance (%)	Total Variance (%)
1	16,864	62,46	62,46
2	1,236	4,58	67,04

The two sub-dimensions that explained 67.04% of the total variance were determined as Content Knowledge and Teaching Strategies. The distribution of the items in the sub-dimensions is shown in Table 9.

Since self-efficacy indicates people's belief in themselves, a Likert-type scaling of agree or disagree would not be accurate, so a 0-100 scale was used to calculate the items written in accordance with the specified sub-dimensions. Having a wide area allows the person to express himself/herself more easily and therefore obtain healthier results. For this reason, the teacher candidates who participated in the application were asked to indicate how competent they felt by giving a value between 0 and 100 to the 24 items in the scale, after filling in the personal information section of the scale. In addition, since the concept of self-efficacy is related to people's belief in themselves and their ability to do a job, it is not correct that the items used to indicate the concept of self-efficacy are of negative origin. For this reason, there are no negative statements among the written items (Table 9).

2.3. Analysis of Data

SPSS (Statistical Package for Social Sciences) 25.0 package program was used in the analysis of the quantitative data obtained in the research. In the analysis, descriptive statistical methods such as mean and percentage distributions, unrelated samples t-test and single-factor analysis of variance (ANOVA) and non-parametric statistical methods were used to test the relationship between environmental education self-efficacy and variables.

Table 9: Items and Sub-Dimensions in the Environmental Education Self-Efficacy Scale.

Item number	Item	Sub Dimension
S1	I know the concepts related to the environment.	FIELD KNOWLEDGE
S3	I can easily plan projects and events related to environmental issues.	
S4	I can plan alternative activities for my students who have difficulty understanding environmental concepts.	
S5	I have knowledge about the impact of environmental issues on a point/regional and global scale.	
S7	I know the relationship of environmental concepts with other disciplines.	
S10	I know the causes of environmental problems.	
S11	I can explain environmental issues by relating them to daily life.	
S13	I know what needs to be done to prevent and control environmental degradation.	
S16	I can answer students' questions about the environment.	
S19	I know the effects of environmental issues on daily / social life.	
S2	I can apply different teaching strategies in learning environmental topics.	TEACHING STRATEGIES
S6	I can effectively guide students' projects on environmental issues.	
S8	I know the steps necessary to teach environmental issues effectively.	
S9	I can reach students who are not interested in environmental issues.	
S12	I know the measurement and evaluation methods that can be used to evaluate environmental education.	
S14	I can explain environmental issues by relating them to other disciplines.	
S15	I can create a learning environment where students can express themselves comfortably.	
S17	I can take students' individual differences into consideration when preparing activities on environmental issues.	
S18	I can apply different activities while explaining environmental issues.	
S20	I know the teaching methods and techniques I can use for effective environmental education.	
S21	I can apply field studies, travel observation and data collection methods in explaining environmental issues.	
S22	With the environmental education I provide, I can create the environmental awareness that every individual should have.	
S23	I can use my time most efficiently when explaining environmental issues.	
S24	Before teaching environmental issues, I make preparations for the lesson.	

3. RESULTS AND DISCUSSION

In this section, first the effect of teacher candidates' self-efficacy perceptions in environmental education on their academic average was examined. Then, the statistical findings of the candidates' self-efficacy perceptions from different demographic perspectives are given.

ANOVA Test was applied for the general evaluation of the findings obtained as a result of the application of the environmental education self-efficacy scale (Field Knowledge, Teaching Strategy and Self-Efficacy) to teacher candidates, and the results are presented in Table 10 below.

Tablo 10: Fen Bilgisi Öğretmen Adaylarının Çevre Eğitimi Öz-yeterlik Sonuçları.

	N	Minimum	Maximum	Average	SS
Field knowledge	81	100,00	990,00	739,16	164,16
Teaching strategy	81	140,00	1358,00	1023.37	232,00
Self-efficacy	81	240,00	2348,00	1762,53	388,88

*p<0.05

When Table 10 is examined, it can be seen that the field proficiency, teaching strategy and self-efficacy results of the teacher candidates are generally above average.

Mann-Whitney U Test was applied to see whether science teacher candidates' environmental education self-efficacy perceptions differ according to the gender variable, and the results are presented in Table 11 below.

Table 11: Environmental Education Self-Efficacy Results of Science Teacher Candidates According to Gender Variable.

	Gender	N	Rank Average	Rang Sum	U	p
Field knowledge	Female	62	39,66	2459,00	506,00	,35
	Male	19	45,37	862,00		
	Total	81				
Teaching strategy	Female	62	38,86	2409,00	456,50	,14
	Male	19	47,97	862,00		
	Total	81				
Self-efficacy	Female	62	39,15	2427,50	474,50	,20
	Male	19	47,03	893,50		
	Total	81				

*p<0.05

According to Table 11, when the scores obtained by science teacher candidates according to gender variable are examined, it is seen that there is no significant difference in their self-efficacy perceptions. Kruskal-Wallis Test was applied for the self-efficacy values of prospective science teachers' environmental education self-efficacy perceptions according to the grade level variable and the results are presented in Table 12.

Table 12: Environmental Education Self-Efficacy Results of Science Teacher Candidates According to Grade Level Variable.

	Grade Level	N	Rank Average	U	p
Field knowledge	Second grade	29	36,84	1,45	,48
	Third grade	27	42,72		
	Fourth grade	25	43,96		
	Total	81			
Teaching strategy	Second grade	29	33,17	5,04	,08
	Third grade	27	44,78		
	Fourth grade	25	46,00		
	Total	81			
Self-efficacy	Second grade	29	34,71	3,28	,19
	Third grade	27	43,80		
	Fourth grade	25	45,28		
	Total	81			

*p<0.05

According to Table 12, it was observed that there was no significant difference in terms of the environmental education self-efficacy perception variable among the grade levels of science teacher candidates.

Kruskal-Wallis Test was applied for the self-efficacy values of science teacher candidates' environmental education self-efficacy perceptions according to the area of residence and the results are presented in Table 13.

Table 13: Environmental Education Self-Efficacy Results of Science Teacher Candidates According to Field of Residence Variable.

	Area of Residence	N	Rank Average	U	p
Field knowledge	Province	43	42,16	,42	,81
	District	30	40,55		
	Village	8	36,44		
	Total	81			

Teaching strategy	Province	43	42,35	,33	,85
	District	30	39,17		
	Village	8	40,63		
	Total	81			
Self-efficacy	Province	43	42,36	,35	,84
	District	30	39,85		
	Village	8	38,00		
	Total	81			

*p<0.05

According to Table 13, it was seen that there was no significant difference in terms of self-efficacy perception in the science teacher candidates' scores according to their field of residence.

Kruskal-Wallis Test was applied for the self-efficacy values of prospective science teachers' environmental education self-efficacy perceptions according to the mother's education level variable, and the results are presented in Table 14 below.

Table 14. Environmental Education Self-Efficacy Results of Science Teacher Candidates According to the Variable of Mother's Education Level.

	Mother Education Level	N	Rank Average	U	p
Field knowledge	Illiterate	5	37,10	4,85	,43
	Literate	3	40,76		
	Primary education	31	45,57		
	Secondary education	15	41,86		
	High school	18	28,78		
	University	9	58,67		
	Total	81			
Teaching strategy	Illiterate	5	41,50	6,86	,23
	Literate	3	42,15		
	Primary education	31	46,63		
	Secondary education	15	39,42		
	High school	18	24,83		
	University	9	58,17		
	Total	81			
Self-efficacy	Illiterate	5	39,70	6,41	,27
	Literate	3	41,44		
	Primary education	31	46,67		
	Secondary education	15	40,42		
	High school	18	25,89		
	University	9	59,17		
	Total	81			

*p<0.05

When Table 14 is examined, it is revealed that the environmental education self-efficacy perceptions of science teacher candidates do not show a significant difference according to their mother's educational status.

Kruskal-Wallis Test was applied for the self-efficacy values of science teacher candidates' environmental education self-efficacy perceptions to their father's education levels and the results are presented in Table 15 below.

Table 15. Environmental Education Self-Efficacy Results of Science Teacher Candidates According to the Variable of Father's Education Level.

	Father's Education Level	N	Rank Average	U	p
Field knowledge	Literate	1		4,74	,19
	Primary education	19	49,05		
	Secondary education	16	37,66		

		N	Rank Average		
	High school	26	42,92		
	University	19	33,53		
	Total	81			
Teaching strategy	Literate	1		3,56	,31
	Primary education	19	48,82		
	Secondary education	16	39,16		
	High school	26	41,15		
	University	19	34,85		
	Total	81			
Self-efficacy	Literate	1		4,33	,23
	Primary education	19	49,37		
	Secondary education	16	38,53		
	High school	26	41,71		
	University	19	34,10		
	Total	81			

*p<0.05

According to Table 15, it is seen that the environmental education self-efficacy perceptions of science teacher candidates do not show a significant difference according to their father's educational status. Since the number of literate individuals in terms of father's education was 1, statistical analysis could not be performed.

Kruskal-Wallis Test was applied to science teacher candidates in terms of their environmental education self-efficacy perceptions and their mother's occupation status, and the results are presented in Table 16 below.

Table 16. Environmental Education Self-Efficacy Results of Science Teacher Candidates According to the Variable of Mother's Occupational Status.

	Mother's Occupation Status	N	Rank Average	U	p
Field knowledge	Self-Employment	20	43,15	,25	,88
	Officer	8	41,56		
	Housewife	53	40,10		
	Total	81			
Teaching strategy	Self-Employment	20	41,83	,13	,94
	Officer	8	38,38		
	Housewife	53	41,08		
	Total	81			
Self-efficacy	Self-Employment	20	43,03	,22	,90
	Officer	8	39,25		
	Housewife	53	40,50		
	Total	81			

*p<0.05

According to Table 16, it was seen that the environmental education self-efficacy perceptions of science teacher candidates did not show a statistically significant difference in terms of the mother's occupational status variable.

Kruskal-Wallis Test was applied to determine the effect of father's occupational status on prospective science teachers' environmental education self-efficacy perceptions and the results are presented in Table 17 below.

Table 17: Environmental Education Self-Efficacy Results of Science Teacher Candidates According to the Variable of Father's Occupation Status.

	Father's Occupation Status	N	Rank Average	U	p
	Farmer	6	43,83	2,82	,42
	Self-employment	45	43,69		

Field knowledge	Retired	19	39,66		
	Officer	11	30,77		
	Total	81			
Teaching strategy	Farmer	6	44,42	2,97	,39
	Self-employment	45	43,14		
	Retired	19	41,29		
	Officer	11	29,86		
	Total	81			
Self-efficacy	Farmer	6	43,83	3,03	,39
	Self-employment	45	43,41		
	Retired	19	40,84		
	Officer	11	29,86		
	Total	81			

*p<0.05

According to Table 17, it is seen that the environmental education self-efficacy perceptions of science teacher candidates do not show a significant difference according to the father's occupational status variable.

4. CONCLUSION

In this study, the environmental education self-efficacy of science teacher candidates was examined in terms of academic average and various demographic variables. Various environmental problems experienced today have become borderless and have reached global dimensions, resulting in the need to take urgent measures in this regard. There must be a correlation between all measures to be taken to prevent environmental problems and the institutions that will take the measures. Efforts to prevent environmental problems before they occur can only be achieved through environmental education (Ek et al., 2009; Sever & Yalçınkaya, 2012).

Theoretical courses for environmental education in educational institutions are insufficient and supporting practices are needed. Schools and teachers have a great influence on shaping individuals' environmental attitudes and behaviors. Various practices should be included to save students from rote memorization, gain scientific thinking skills, and raise them as productive, investigative and questioning individuals. It is thought that active participation is necessary to increase environmental knowledge to the desired level and ensure the permanence of environmental behavior (Büyükkaynak, 2018).

Pre-service teachers becoming models for the environment for future generations is directly proportional to providing quality education on the environment. Currently, the environmental education course in higher education faculties of education is limited to only 2 theoretical course

hours and has no practice, and therefore this course hour is not considered sufficient to gain environmental self-efficacy. Students cannot be active enough due to lack of sufficient class hours. However, since their childhood, they have been receiving environmental education in various courses in their families and schools, although, in line with statistical data, it cannot be said that their self-efficacy is at a very good level.

In the study, the environmental education self-efficacy achievement score results of the teacher candidates were generally found to be above the average (Table 10). However, no statistically significant difference was found between demographic variables and self-efficacy score results. Çimen, Yılmaz & Çimen (2011); Gökmen, Ekici & Öztürk (2012), as a result of their studies with biology teacher candidates using different measurement tools, found that the teacher candidates were at an average level in terms of environmental education self-efficacy perceptions. Karakoçan Dev & Kurtdede Fidan (2020) worked with 184 classroom teachers working in official schools affiliated with the Ministry of Education in the central districts of Afyonkarahisar province. As a result of the research, they determined that, unlike this study, the self-efficacy of classroom teachers was high. Likewise, Yılmaz and Çimen (2008) concluded that the average self-efficacy level scores of students studying in the Department of Biology Education were high.

Similar to this study, Uzel, Adıgüzel, Yılmaz & Gül (2019) found that there was no statistically significant difference in self-efficacy perceptions among teacher candidates according to the findings obtained from the research data (Table 11). Aydın (2008) also stated that there was no difference between classroom teachers and classroom teacher candidates in terms of their environmental self-efficacy perceptions in terms of gender. Kahyaoğlu

(2009) found that the self-efficacy of science and classroom teacher candidates in teaching environmental problems did not differ significantly in terms of the gender variable. In the same study; It has been determined that primary school and science teacher candidates can answer questions about environmental problems in science and technology classes and will not have any problems in doing science experiments related to environmental problems. In general, they stated that they could teach environmental problems well and that they considered themselves competent in creating and controlling activities. Similarly, Harurluoğlu & Kaya (2009) report that prospective biology teachers have high self-efficacy beliefs regarding biology teaching. They also found that there was no significant difference in gender. These results support the research findings regarding gender. In his master's thesis study, Çavuşoğlu (2019) found that teacher candidates' environmental education self-efficacy, academic competence perception and responsibility perception sub-dimensions differ significantly according to gender, and the difference is in favor of male students.

No significant difference was found in the study conducted according to the grade level variable (Table 12). In their study, Uzel, Adıgüzel, Yılmaz & Gül (2019) determined a significant difference in the scores received by teacher candidates from the environmental education self-efficacy scale according to the class level variable. It was found that this difference was significant in favor of 2nd, 3rd and 4th grade students compared to 1st grade students. Özdemir, Aydın & Vural (2009) found that there was a significant difference in the environmental education self-efficacy perception scale of classroom teacher candidates in the 3rd and 4th grades who took an environmental science course compared to the 1st and 2nd grades who did not take an environmental science course. Çavuşoğlu (2019) found that there was a significant difference when the environmental education self-efficacy of teacher candidates was examined according to the grade level variable. It has been determined that this differentiation is in favor of students studying in the 4th grade. Kahyaoğlu (2014) states that the difference between the environmental education self-efficacy perceptions of 150 primary school teacher candidates and their status of taking environmental education courses is significant. Cengiz, Gürdap, Karaca & Acun (2021) found the average score of 4th grade students to be higher than other grades. Önder (2015), in a study of 851 university students, concluded that the environmental knowledge, environmental attitudes

and environmentalist worldviews of departments receiving environmental education were more positive. As a result of these findings, it can be said that as the grade level increases, environmental education self-efficacy also increases. In this study, no statistically significant difference was found, but according to the data results, there is an increase in environmental self-efficacy perceptions in the following years, starting from the 2nd grade, in line with their maturation as they get older, even though they have not taken the environmental course.

No significant statistical difference was found in the environmental education self-efficacy of teacher candidates according to their place of residence (province, district, and village) (Table 13). However, according to the average score results, it decreases by province, district and village. The reason for this may be that people in the city center, who are far from nature, are more knowledgeable and competent in this regard, considering factors such as their fondness and willingness to be in nature and the higher education level of people living in the city center. Additionally, living in crowded environments may have increased their self-confidence. However, when the literature was examined, studies were found that found a significant difference between the environment we live in and environmental education self-efficacy (Akıllı & Yurtcan, 2009; Söğüt, 2022; Şama, 2003).

There was no significant difference between parental education level and environmental self-efficacy, and studies reaching the same conclusion were also found (Gökçe et al., 2007) (Tables 14 and 15). Çavuşoğlu (2019) found a statistically significant difference between the parental education levels and environmental education self-efficacy of the teacher candidates who participated in the study. It was found that this difference was in favor of teacher candidates whose mother's education level was high school or above. In the light of these findings, it was stated that as the education level of the teacher candidates' mothers increases, their environmental education self-efficacy also increases, and this means that the mother shares her knowledge about the environment with the teacher candidate. A statistically significant difference was found between teacher candidates' father education levels and environmental education self-efficacy. It has been found that this differentiation is between teacher candidates who are high school students and above and primary school teachers, in favor of teacher candidates who are high school students and above. Uzun & Sağlam (2005) and Şama (2003)

revealed results parallel to Çavuşoğlu's findings in their studies.

There was no significant difference between parents' occupational status and environmental self-efficacy (Tables 16 and 17). However, children of families where the mother is self-employed and the father is a farmer-self-employed were found to be more sensitive to the environment. Contrary to this study, Söğüt (2022) concluded that the responsibility perceptions of teacher candidates whose mother's profession is a housewife are higher than the responsibilities of teacher candidates whose mother's profession is civil servant/retired. Again, in the study of Söğüt (2022), as in this study, no difference was observed in environmental education self-efficacy perceptions and sub-dimensions of academic competence, instructional competence and orientation perceptions according to father's profession. While the children of farmers and workers have the highest sense of responsibility, the children of non-working fathers have the lowest sense of responsibility. The responsibility perceptions of students whose father's profession is farmer are higher than the responsibility perceptions of teacher candidates whose father's profession is tradesman, civil servant, unemployed and retired. At this point, a relationship with the environment they live in can be mentioned.

This research was conducted to evaluate the environmental education self-efficacy of university science teacher candidates who will play important roles in society in the future. In this context, the aim of the study is to ensure that the results obtained on self-efficacy will guide future studies on environmental education and perception of environmental problems as a research tool.

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