

DOI: 10.7596/taksad.v7i5.1770

Citation: Doğan, Y. (2018). Investigation of Preservice Teachers' Knowledge Related to Basic Concepts of Environmental Phenomenon. Journal of History Culture and Art Research, 7(5), 47-66. doi:<http://dx.doi.org/10.7596/taksad.v7i5.1770>

Investigation of Preservice Teachers' Knowledge Related to Basic Concepts of Environmental Phenomenon*

Yakup Doğan¹

Abstract

The purpose of this study is to reveal knowledge of preservice preschool teachers about the basic concepts of environmental phenomenon. Phenomenology, one of the qualitative research method, was used in the study. The study group included 62 preservice teachers (54 female and 8 male) who were studying preschool education at one of the state universities located in the Southeastern Anatolia Region in Turkey. An open-ended questionnaire was prepared and used by the researcher to collect data. Content analysis technique was used to analyze the data obtained from study. According to the results of the study, a small number of the preservice teachers were determined to have sufficient knowledge about the basic concepts related to the environmental phenomenon. Similarly, a minority of the preservice teachers were found to have acceptable knowledge. However, the majority of preservice teachers were found to have inadequate/incorrect knowledge about basic environmental concepts. It can be said that this situation which may be based on the fact that the preservice teachers had not taken courses related to the environment, had not participated in the activities related to the environment and had not become members to nongovernmental organization related to the environment. Based on the results of this study, it can be recommended that the curricula could be enriched in relation to the environment and ecology, hands-on environmental activities could be implemented and participation of nongovernmental organizations' activities may be encouraged.

Keywords: Environmental education, Environmental concepts, Preservice preschool teachers, Education.

* A part of this study was presented as oral presentation at the 27th International Conference on Educational Sciences, April 18-22, 2018, Antalya, Turkey.

¹ Asst. Prof. Dr., Kilis 7 Aralık University, Muallim Rifat Faculty of Education, Department of Elementary Education, Kilis, Turkey. E-mail: yakupdogan06@gmail.com

Introduction

Environment can be defined as all the circumstances and conditions in which all living and non-living things coexist, influence each other directly or indirectly, and survive within a sustainable balanced climate. However, this balance has deteriorated in the last two hundred years largely due to the influence of human activities and has caused problems in global scale.

Environmental problems are at the forefront of the biggest global problems of the century we live in. The greatest feature of environmental problems is that they are at global scale. (Aydin & Kaya, 2011; Haris, 2004; Tsekos & Matthopoulos, 2009; Yücel & Morgil, 1998). Erten (2004) describes environmental problems as all the factors that cause the negativity in the behavior and lifestyle of living things. The underlying reason for the rapidly growing environmental problems that lead to the deterioration of the human-nature balance is undoubtedly the rapidly developing industry. This phenomenon caused the natural environment to change rapidly in the 20th century. The ecological balance that has spontaneously functioned for centuries is not able to maintain this function anymore. The magnitude of environmental problems has reached such dimensions that nature cannot be neglected in its own structure. Despite this, people continue to pollute the natural environment consciously or unconsciously.

From day to day, human beings continue to damage and remove the environmental components that make up their living space (Turgut, 2009). Studies reveal that the main causes of environmental pollution are human activities. In this case, people can be regarded as the main cause of degradation of ecological balance (Yücel & Morgil, 1998). As the current environmental problems are more and more on the agenda of the global public opinion, the attitude and awareness of the human beings towards the environment - the main factor of the problems- have become more questionable (Oğuz, Çakıcı, & Kavas, 2011). Some concepts such as environment, environmental problems, environmental education, environmental awareness, environmental consciousness, environmentally-friendly behaviors have become highly disputable issues especially since the second half of the 20th century with the environmental problems reaching the dimensions which threaten the vitality and especially the existence of human beings. With the understanding of the importance of developing environmental awareness in solving and reducing environmental problems, environmental education based on effectiveness and sustainability (Hovardas & Korfiatis, 2011; Özdemir, 2007; Potter, 2010; Short, 2010) has been deemed necessary and gained more importance.

Environmental education is defined as 'the act of developing environmental awareness in individuals, having them to acquire environmentally conscious, positive and lasting behavioral changes and taking part in the preservation of natural, historical, cultural and socio-aesthetic values, participating actively to solve problems' (Turkish Undersecretary of Environment, 1990). Özoğlu (1993) describes environmental education as 'a permanent education process in which individuals and the public can develop environmental awareness and acquire the necessary knowledge, values, skills, and experiences in order to be able to take action with resolution and perseverance in solving current or future environmental problems as an individual or community'.

The focus of environmental education programs has usually been to ensure positive attitudes towards the environment through increased knowledge of the environment (Pooley & O'Connor, 2000). However, it is not possible to say that the basic ecological information given in the context of environmental education has always developed environmental sensitivity and related behaviors in individuals (Kuhlemeier, vanDen Bergh & Lagerweij, 1999; Pooley & O'Connor, 2000; Schmidt, 2007). The concept of environmental

education is not only about knowledge; but also about values, attitudes, ethics and actions (Davis, 1998).

In the framework of formal education in Turkey, even though there is no curriculum specific to environmental education, basic information about the environment is provided within the primary and secondary education as well as high school programs under different courses. With regards to higher education, there is no specific environmental education policy that is nationally adopted or implemented. It is, therefore, not possible to talk about a standardized education infrastructure or its implementation at the national level in higher education. However, higher education institutions are responsible for educating individuals with the necessary knowledge, skills and values to contribute to the improvement of the quality of life of the global community (Corcoran, 2004).

The main aim to be obtained from environmental awareness is gaining environmental information as well as positive attitudes and behaviors toward the environment. Creating positive attitudes and values towards the environment is possible through environmental education. Environmental education provides information about ecology on the one hand, and improves the attitudes toward the environment on the other hand and transforms these attitudes into behavior (Kaya, Akilli, & Sezek, 2009). Education is of great importance in the development of environmentally sensitive behavior. The most important period in human life for transforming knowledge into behavior is preschool years. Through the education given during such years, the knowledge and attitudes that have been transformed into behavior are permanent. It is, therefore, very important that environmental education start from the first years of life. The earlier the environmental education starts, the more permanent behavioral change it may create. It is because the information and attitudes formed in preschool and school ages constitute the basis of future behaviors (Bertiz, Doğan & Erten, 2017; De Haan, 1991; Erten, 2004; Gruenewald, 2003; Kruse & Card, 2004). Values, judgments and attitudes, especially formed in childhood and younger ages, are of great importance in the development of empathy in relationships with nature and in the formation of love for nature at an early age. While Knapp (1994) emphasizes the importance of the environment and knowledge in the formation of students' environmental experiences, Palmer (1998) notes that students' environmental knowledge is composed of environmental perceptions and environmental concepts. It is of great importance to present individuals with the necessary information about the environment and have them acquire relevant positive attitudes in order to create behavioral changes. Attitudes, behaviors, and knowledge have important roles for students in learning about the environment in and out of class. It should not be forgotten that individuals with negative attitudes toward the environment will be insensitive to environmental problems and will even continue to create problems to the environment (Uzun & Sağlam, 2006). From this point of view, preschool years are an opportunity that parents and educators should not miss to form the basis in order to raise self-confident individuals who are able to show positive attitudes, think creatively, develop original ideas, advocate their own ideas, produce solutions against the problems, be sensitive to the environment they live in, and fulfill their responsibilities. The educational environment and educational programs to be provided to the child during this period are important for the future generations to grow up on solid basis.

Environmental education is a continuous process that needs to be lifelong in both formal and non-formal education. For this reason, educators have great responsibilities in educating the individuals who will actively participate in solving the problems and in informing all the layers of the society about environmental problems. At this stage, there is an emerging necessity to train qualified teachers that are capable of providing such education (Altın, 2001). According to Yücel and Morgil (1998), the development of environmental awareness in people is closely related to knowing what kind of preliminary information they have about them. In environmental education studies in the world and our country, people's interest, thoughts and behaviors toward the environment have been examined more closely. The

awareness-raising studies in this field should be based on training since it begins with preschool education, is shaped by secondary education and takes its final form at university.

Teachers are the most important factor in achieving the objectives of environmental education. Teachers, therefore, should be educated to be knowledgeable about the environment and to be able to effectively teach environmental education (Ünal & Dimişki, 1998). It is widely accepted that the success of environmental education in the schools is the result of the teachers (Simmons, 1993), and thus perceptions of the preservice teachers should be developed to improve the quality of environmental education. The rationale behind this assumption is that there is a relationship between the teaching of the teacher and the learning of the student (Lang, 1999). In order to be able to achieve effective teaching, it is necessary for the preservice teachers to have a clear concept about the subject they will teach. For this reason, Barnes (1989) emphasized the importance of evaluating the preservice teachers' conception of the subjects they will teach. Teachers produce their own perceptions of the subject they are teaching while working in order to make it understandable to the student. Students also form their own concepts out of what is taught to them. This process results in new concepts for both the teacher and the student. Thus, the conceptual understanding that the teacher possesses influence the learning of the students.

Likewise, environmental educators indicate that it is very important to assess the environmental perceptions of preservice teachers (Ballantyne & Bain, 1995). The reason why this should be done is the fact that in studies conducted on the concepts about the subjects to be taught by preservice teachers, it has been observed that preservice teachers start their training with their own ideas about teaching and learning and they have knowledge and beliefs about the nature and manner of teaching their own subjects, and these preconceptions are influenced by previous experience and change during teachers' training (Corney, 2000). If future teachers are misinformed or do not have a clear understanding of concepts, it is likely that these preconceptions will continue in their classes (Hooper, 1988).

Environmental education is a learning process that enhances people's knowledge and develops the skills necessary to solve the environmental awareness, attitude, and problems of individuals. In this respect, it is ensured that the individuals possess ethical behavior by developing positive attitudes and consciousness towards the environment. DiEnno and Hilton (2005) state that there is a close relationship between environmental knowledge and positive attitudes towards the environment. Teachers are the most important factor in developing positive attitudes toward the environment and environmental knowledge in students. So that a teacher who has environmental awareness and positive environmental attitudes will be able to give children positive attitudes about the environment (Malone & Tranter, 2003). In this case, it is necessary for the teacher training programs to be structured on the assumption that preservice teachers should have environmental awareness and be able to develop positive attitudes toward the environment since protecting the environmental is not a duty just to be fulfilled by environmental educators; and likewise, rendering environmental education is not a duty to be fulfilled by environmentalists or environmental educators. Teachers and preservice teachers are responsible for protecting the environment and creating positive environmental consciousness in students (Erten, 2006).

In order to provide a suitable environmental education, firstly, educators who can give this education should be trained. Therefore, the training of teachers who will train generations to decide on the environment in the future constitutes one of the most important stages of lifelong environmental education, which is suggested to be given to all layers of society. Teachers who have received environmental education are deemed as the priority of priorities (Bilir, 2015). It is stated that the success of environmental education in the schools depends on teachers (Simmons, 1993), and the perceptions of preservice teachers need to be assessed so that the quality of environmental education can be increased (Ballantyne & Bain, 1995). From this perspective, the aim of this study is to reveal the extent of knowledge of preservice teachers about the common basic concepts of the environmental phenomenon.

Method

Research Design

In this study, phenomenological research design- one of the qualitative research designs- was used in order to reveal the extent of knowledge of preservice teachers about some common basic concepts related to environmental phenomenon. Phenomenological research design is used to describe situations which we are aware of but about which we do not have in-depth and detailed knowledge. In qualitative research, the cases and events that have been investigated are handled and interpreted in their own context (Cropley, 2002; Yıldırım & Şimşek, 2016). According to phenomenologists, it is generally assumed that there are some common points about how people perceive and interpret similar events. Phenomenological studies, therefore, aim at explaining these common points (Fraenkel, Wallen & Hyun, 2012). Phenomenology is likely to form a suitable basis for studies that aim to investigate the phenomena which are not completely unfamiliar but cannot be clearly grasped in meaning (Yıldırım & Şimşek, 2016). In this context, preservice teachers' extent of knowledge about the common basic concepts related to the environmental phenomenon was considered as a phenomenon, which is why the phenomenology design was used in the research.

Study Group

The study group consists of 62 preservice teachers (54 females, 8 males) who are seniors study at Preschool Education at a state university in the Southeastern of Turkey. Convenience sampling method was used to determine the study group. In this method, the researcher chose a nearby and convenient sample group and worked with existing the individuals (Fraenkel, Wallen & Hyun, 2012; Yıldırım & Şimşek, 2016). In phenomenological studies, it is aimed to obtain more information about the phenomenon rather than meeting a greater number of individuals. Therefore, it focuses not on the number of individuals in the study group but on the quality of the information obtained from individuals (Baş & Akturan, 2008; Sanders, 1982). Accordingly, the study conducted according to the phenomenological research design focused on the quality of the data obtained from the group selected through convenient sampling method rather than reaching a large number of individuals.

The demographic data for preservice preschool teachers in the study group are given in Table 1 in terms of frequency and percentages.

Table 1. Demographic data of preservice teachers

Category	Codes	f	%
Gender	Female	54	%87.1
	Male	8	%12.9
High School	General High School	14	%22.6
	Anatolian High School	17	%27.4
	Anatolian Teacher High School	3	%4.8
	Girls Vocational High School	28	%45.2
Mother's Education Level	Primary School	38	%61.3
	Secondary School	6	%9.7
	High School	8	%12.9
	Associate Degree	0	%0.0
	Bachelor's Degree	10	%16.1
Father's Education Level	Primary School	25	%40.4
	Secondary School	7	%11.3

	High School	18	%29.0
	Associate Degree	1	%1.6
	Bachelor's Degree	11	%17.7
Mother's Profession	Housewife	53	%85.5
	Worker	-	-
	Civil Servant	7	%11.3
	Farmer	2	%3.2
	Self-employed	-	-
Father's Profession	Unemployed	16	%25.8
	Worker	9	%14.5
	Civil Servant	13	%20.9
	Farmer	4	%6.5
	Self-employed	20	%32.3
Location of the Family	Village	4	%6.5
	Town	2	%3.2
	District	13	%20.9
	Province	43	%69.4

When the demographic characteristics given in Table 1 are examined, it is seen that the vast majority of the preservice preschool teachers are female (87.1%), almost half of them graduated from girls vocational high schools (45.2%) and the others graduated from Anatolian high schools and general high schools. Mothers of the preservice teachers are mostly primary school graduates (61.3%) while their fathers are mostly primary school (40.4%) and high school graduates (29.0%). As to profession, it is seen that the majority of the mothers are housewives (85.5%) and the fathers are mostly self-employed (32.3%), unemployed (25.8%) and civil servants (20.9%). According to the location of the family, most of the preservice teachers are resident in the provinces (69.4%), and in the districts (20.9%).

Table 2 illustrates data with frequency and percentages about whether preservice teachers have taken courses related to environment, participated in any activity related to the environment (inside or outside university, etc.) as well as about their membership status in an environmental non-governmental organization (club, society, groups, activities, organizations, associations, foundations, etc.).

Table 2. Preservice teachers' participation in courses and activities, and their membership status in environmental non-governmental organizations

Category	Codes	f	%
Having Taken Courses About the Environment	Yes	20	%32.2
	No	42	%67.8
Having Participated in Activities About the Environment	Yes	29	%46.7
	No	33	%53.3
Having a Membership in Environmental Non-Governmental Organizations	Yes	7	%11.2
	No	55	%88.8

According to Table 2, it is seen that most of the preservice teachers (67.8%) did not take a course related to the environment during their education and more than half (53.3%) did not participate in environment related activities. It is observed that the vast majority (88.8%) of the preservice teachers are not affiliated with any civil society organizations related to the environment. When the education programs in Turkey (primary, secondary, higher education) are examined, it is seen that environment and ecology-related theoretical and practical courses are not included in elementary and secondary education, whereas in higher education, they are included in the curriculum only in some departments of education faculties as

theoretical courses (Science Education and Elementary Education). However, environmental and ecological-related subjects and acquisition in primary and secondary level curricula are included in some school subjects (Science, Social Studies) at a limited level.

Data Collection Tool

An open-ended questionnaire has been prepared in order to reveal the extent of knowledge of preservice preschool teachers about some common basic concepts related to the environment. During the preparation of the questionnaire, the relevant literature was reviewed, opinions of the preservice teachers were taken and relevant expert opinions were taken from two lecturers who were field experts working in the field of environment. In the first part of the form, there is some demographic questions about the participant, and in the second part there are open-ended questions to ask the preservice teachers to explain the basic concepts of environmental phenomena. The prepared draft form was given to a lecturer working in the field of languages for language validation, to field experts working in the field of environmental coverage for validity and to five preservice teachers who were not included in the working group for preliminary application to determine whether the questions were clear and understandable (Patton, 2002; Yıldırım & Şimşek, 2016). Following these applications, the questionnaire was given its final form. The questionnaire in its final form includes some questions that determine the demographic information of preservice teachers and eleven questions about the basic concepts about the environment. The final questionnaires were distributed to the preservice teachers and the teachers were asked to fill them in written form. After the application was over, the questionnaires were collected and sorted out, and the participants were given the code names PT1, PT2,, PT61, PT62 (PT: Preservice Teacher). Then the data in the form were computerized, after which two researchers were given the data to analyze the content independently from each other.

Data Analysis

In the analysis of the qualitative data obtained in the study, the content analysis technique, mostly used in qualitative studies, was used. The main aim in content analysis is to reach the concepts and relationships that can explain the obtained data. In content analysis, certain texts are summarized with certain rules-based coding into smaller content categories of some words. In this framework, the truths that may be hidden in the data are revealed and the similar concepts and themes are put together and interpreted in such a way that the reader can understand (Büyüköztürk et al., 2012; Yıldırım & Şimşek, 2016).

Preservice preschool teachers were asked about basic concepts related to environment and ecology such as environment, ecology, ecosystem, flora, fauna, habitat, species, population, community, biodiversity and food pyramid in order to reveal in depth the extent of knowledge of preservice teachers about these concepts. The collected data were coded separately in order to bring together similar concepts and themes stated as answers by the preservice teachers. Participants' responses to the basic concepts related to the environment were divided into three different categories according to the related literature as follows: *adequate*, *acceptable* and *inadequate/incorrect*, and codes were prepared for the answers given. The frequencies and percentages of the codes were taken and the opinions of the preservice teachers about the concepts related to the environment were analyzed. Finally, the reliability of the research was reviewed and estimated as $79/79+7=0.92$, using Miles and Huberman's (1994) formula [Reliability=Consensus/(Consensus+Dissidence)] in order to determine whether the codes collected under eleven themes represented the relevant themes in terms of reliability by taking into account the consensus and the dissidence among researchers. The fact that researchers have a percentage of compatibility close to or above 90% means that reliability is ensured (Miles & Huberman, 1994).

Findings

Preservice preschool teachers were asked about basic concepts related to environment and ecology such as environment, ecology, ecosystem, flora, fauna, habitat, species, population, community, biodiversity and food pyramid in order to reveal in depth the extent of knowledge of preservice teachers about these concepts. Participants' responses to the basic concepts related to the environment were subjected to content analysis and the results were presented in tables. Each concept (theme) was evaluated according to three sub-categories (*adequate, acceptable and inadequate/incorrect*) and the codes indicated for the answers given. Below the tables are the directly quoted sample expressions of the preservice teachers after the results were interpreted.

Preservice teachers were first asked to define the concept of '*environment*', and the results obtained through the content analysis of their answers were shown in Table 3.

Table 3. Codes about the concept of environment

Theme	Categories	Codes	f	%
Environment	Adequate	Natural environment in which living beings interact	4	%5.8
	Acceptable	The environment in which all living beings live	11	%15.9
		Living surroundings	34	%49.3
	Inadequate/ Incorrect	Everything around us	4	%5.8
		Environment where requirements are met	3	%4.3
		Living and non-living things	2	%2.9
		Systems	2	%2.9
		Ecological cycle	1	%1.5
	I don't know/blank	8	%11.6	

Environment, with its most general definition, is defined as the 'physical, biological, social, economic and cultural environment in which people and other creatures maintain relationships throughout their lives, and interact mutually' (Turkish Ministry of Environment and Urbanization, 2015). In the light of this definition, according to the findings in Table 3, only four of the codes (5.8%) were seen adequate within the scientific definition of the concept of environment, whereas 11 codes (15.9%) were considered acceptable and 54 codes (78.3%) were considered inadequate/incorrect. Some of the answers given by the preservice teachers to the concept of environment are as follows:

PT62: '*The surroundings where people live together and interact with other living beings.*' (adequate)

PT42: '*The common living area where all living creatures reside.*' (acceptable)

PT24: '*The area in which we live.*' (inadequate/incorrect)

The participants were asked to define the concept of '*ecology*', and the results of the responses were shown in Table 4 after conducting the content analysis.

Table 4. Codes about the concept of ecology

Theme	Categories	Codes	f	%
Ecology	Adequate	The branch of science that studies the interactions of living beings with each other and with their environment	1	%1.6
	Acceptable	The branch of science that studies the interactions of	3	%4.8

		people with each other and with the environment	
Inadequate/ Incorrect	Environmental science	28	%45.2
	Natural systems	5	%8.1
	Living science	4	%6.6
	Natural area in which living beings live	3	%4.8
	Environmental system	3	%4.8
	Interactions within life	1	%1.6
	Balance	1	%1.6
	I don't know/blank	13	%20.9

Ecology is a branch of science that studies 'the relationships and interactions of living beings with each other and with non-living things around them' (Odum & Barrett, 2008, p.517). According to the findings in Table 4, it is seen that almost all of the codes obtained (93.6%) were inadequate/incorrect when the definitions given by the preservice preschool teachers about the concept of ecology were evaluated. This situation shows that preservice teachers' extent of knowledge about ecology, which is a popular concept, is very weak. Only one participant's definition was sufficient for ecology, and three (4.8%) of them were acceptable. About half of the preservice teachers (45.2%) misidentified the concept of ecology as 'environmental science'. Some of the answers given by preservice teachers to the concept of ecology are as follows:

PT36: *'The branch of science that studies the interactions of living beings with each other and with their environment'* (adequate)

PT41: *'The branch of science that studies the environment.'* (acceptable)

PT57: *'Environmental Science.'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of 'ecosystem' and the results obtained through the content analysis of their responses are shown in Table 5.

Table 5. Codes about the concept of ecosystem

Theme	Categories	Codes	f	%	
Ecosystem	Adequate	The system in which living and non-living things interact	3	%4.8	
	Acceptable	-	0	%0.0	
	Inadequate/ Incorrect		System of environment/nature	14	%22.6
			Habitat of living beings	7	%11.4
			Natural cycle	6	%9.7
			Living and non-living things	3	%4.8
			Relationships among living beings	2	%3.2
			Living conditions	2	%3.2
			Climate/weather conditions	2	%3.2
			Balance	2	%3.2
			Sub-branch of ecology	1	%1.6
			I don't know/blank	20	%32.3

Odum and Barrett (2008) describe the concept of ecosystem as 'ecological systems that are created and sustained by the interrelationships between the living things in a given area and the lifeless media surrounding them' (p. 517). When the findings in Table 5 are examined, it is seen that only three codes (4.8%) were obtained as adequate in the answers of the preservice teachers about the ecosystem concept

while almost all of the other codes (95.2%) were inadequate/incorrect. Some of the answers given by preservice teachers to the concept of ecosystem are as follows:

PT30: *'The system in which living and non-living things interact.'* (adequate)

PT56: *'The natural life cycle composed of living beings.'* (inadequate/incorrect)

Preservice teachers were asked to define the concept of *'flora'* and the results of the content analysis of their responses are shown in Table 6.

Table 6. Codes about the concept of flora

Theme	Categories	Codes	f	%
Flora	Adequate	All of the plants that grow in a particular region	6	%9.7
	Acceptable	The system composed of plant communities	13	%21.0
		The concepts related to flowers	5	%8.1
	Inadequate/ Incorrect	Living area	2	%3.2
		A concept related to plants	1	%1.6
		A sea organism	1	%1.6
		The classification of plants and animals	1	%1.6
		A family of living beings	1	%1.6
	I don't know/blank	32	%51.6	

Flora is defined as 'all of the natural plants that have adapted to a certain region and survived in this region e (Yıldız, Sipahioğlu & Yılmaz, 2009, p.26). According to the findings given in Table 6, very few teachers (9.7%) defined the concept of flora as adequately according to its definition in the literature. The definitions given by 21.0% of the preservice teachers were acceptable, but the majority (69.3%) of the definitions about flora was inadequate/incorrect. An important finding is that approximately half of the preservice teachers (51.6%) do not know the concept of flora at all. Some of the responses to the concept of flora are:

PT32: *'Flora, is a general name of plant types that grow in a particular region.'* (adequate)

PT9: *'The system composed of plant communities.'* (acceptable)

PT33: *'A region in which a living being lives.'* (inadequate/incorrect)

Preservice teachers were asked to define the concept of *'fauna'* and the results obtained through the content analysis of their responses are shown in Table 7.

Table 7. Codes about the concept of fauna

Theme	Categories	Codes	f	%
Fauna	Adequate	All of the animals that live in a particular region	16	%25.8
	Acceptable	The system composed of animals	2	%3.2
	Inadequate/ Incorrect	A unit within a flora	1	%1.6
		I don't know/blank	43	%69.4

Yıldız et al. (2009) describes the concept of fauna as 'all of the natural animals that have adapted to and live in a particular region' (p.26). According to Table 7, the answers of some of the preservice teachers (% 25.8) related to the concept of fauna were adequate and the answers of only a few (3.2%) were considered as acceptable. However, the responses given by majority of the preservice teachers (71.0%) were inadequate/incorrect. Some of the responses to the concept of fauna are:

PT23: *'Fauna involves all of the animals in a particular region.'* (adequate)

PT9: *'The system composed of animals is called fauna.'* (acceptable)

PT8 *'A small unit within the flora.'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of '*habitat*,' and the results obtained through the content analysis of their responses are shown in Table 8.

Table 8. Codes about the concept of habitat

Theme	Categories	Codes	f	%
Habitat	Adequate	An environment where an organism/living beings live	26	%38.3
		An environment where living and non-living things live	4	%5.8
	Acceptable	An environment where plants live	3	%4.4
		An environment where people live	2	%2.9
	Inadequate/ Incorrect	Nature/environment	6	%8.8
		Groups/types of living beings	5	%7.4
		The Science of Animals	1	%1.5
		Life of the living beings	1	%1.5
		Sub-branch of the fauna	1	%1.5
		I don't know/blank	19	%27.9

Habitat can be defined as 'the habitat of the individual belonging to a species, the place where he lives or is found when looked for, or the location where the living being lives (Yıldız et al., 2009, p.25). In Table 8, the responses given by some of the preservice teachers according to the codes (38.3%) obtained through content analysis of the answers to the concept of habitat were evaluated in the category of adequate responses. The fact that 26 preservice teachers defined the concept of habitat as the place where a living being lives in accordance with the definition in the literature is regarded as a high rate when considering the answers given to other concepts. This situation can be related to the frequent expression of the concept of habitat in international conferences, and press and broadcasting tools. The responses given by a few (13.1%) of the preservice teachers were regarded as acceptable, but the majority (48.7%) of those answers were inadequate/incorrect. Some of the responses given by preservice teachers to the concept of habitat are as follows:

PT26: *'To me, habitat is the environment where a particular species live.'* (adequate)

PT31: *'An environment in which living and non-living things reside'* (acceptable)

PT35: *'A community composed by a type of species'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of '*species*,' and the results obtained through the content analysis of their responses are shown in Table 9.

Table 9. Codes about the concept of species

Theme	Categories	Codes	f	%
Species	Adequate	.....	
	Acceptable	Living beings with same/similar features	17	%26.5
		Type/variety	8	%12.5
	Inadequate/ Incorrect	Species	17	%26.5
		Unit of classification	5	%7.8
	Living/non-living groups	6	%9.4	

The concept of species is defined as 'a group of individuals who have the potential of reproduction among themselves in the nature, and which produce viable and fertile offspring, but cannot produce such offspring with the members of other species (Reece et al., 2013, p.489). According to Table 9, it was found out that preservice teachers did not know the adequate and correct definition of the concept of species, which is one of the most common and popular concepts, and that some of the preservice teachers (26.5%) had acceptable responses whereas the majority of them gave inadequate/incorrect answers (73.5%). Some of the answers given by preservice teachers about the concept of species are as follows:

PT13: *'It consists of living species with particular and similar features.'* (acceptable)

PT22: *'A species is the variety of living and non-living things.'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of '*population*', and the results obtained through the content analysis of their responses are shown in Table 10.

Table 10. Codes about the concept of population

Theme	Categories	Codes	f	%	
Population	Adequate	A group in which living beings of same species gather together	15	%24.2	
	Acceptable	...	...	...
	Inadequate/ Incorrect		Group of living beings / population	6	%9.8
			The number of species	4	%6.4
			An environment where living beings live	4	%6.4
			The density distribution of living beings	2	%3.2
			Statistical population	1	%1.6
			Interaction of living beings	1	%1.6
			A sub-branch of species	1	%1.6
	Living conditions	1	%1.6		
		I don't know/blank	27	%43.6	

The population is 'a biological group composed of individuals of the same species who occupy a certain environment within a particular time' (Akman, Keteneoğlu, Kurt, & Yiğit, 2012, p.3). The answers of the preservice teachers to the question asked in order to determine whether they knew the concept of population were analyzed and given in Table 10. According to the data in Table 10, it was determined that a few (24.2%) of the preservice teachers who participated in the research had adequate knowledge about the concept of population while the majority (75.8%) of them had inadequate/incorrect knowledge. Some of the answers given by preservice teachers about the concept of population are as follows:

PT13: *'The group of living beings composed of same species is called population.'* (adequate)

PT14: *'I guess it is a group of living beings or population.'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of '*community*', and the results obtained through the content analysis of their responses are shown in Table 11.

Table 11. Codes about the concept of community

Theme	Categories	Codes	f	%	
Community	Adequate	The condition in which the population of two or more species live in the same region.	3	%4.8	
	Acceptable	...	...	...
	Inadequate/ Incorrect	Assemblage		2	%3.2
		A sub-branch of population		1	%1.6
	I don't know/blank		56	%90.4	

The community is 'a biological system of populations belonging to different species, living in a particular environment, under certain ecological conditions (Akman et al., 2012, p.3). In Table 11, it was found that very few (4.8%) of preservice preschool teachers had adequate knowledge about the concept of community while a large part of them (95.2%) had inadequate/incorrect knowledge. Some of the answers given by the preservice teachers about the community concept are as follows:

PT32: *'Community is the condition where the population of two or more species live in the same region,'* (adequate)

PT8: *'The sub-branch of population'* (inadequate/incorrect)

Preservice teachers were asked to define the concept of '*biodiversity*', and the results obtained through the content analysis of their responses are shown in Table 12.

Table 12. Codes about the concept of biodiversity

Theme	Categories	Codes	f	%
Biodiversity	Adequate	...	...	...
	Acceptable	Variety of Living Beings	34	%54.9
		Variety of Species	7	%11.2
	Inadequate/ Incorrect	A biological concept	1	%1.6
		The number of living beings	1	%1.6
		Biological variety	1	%1.6
		Plant diversity	1	%1.6
		Biological diversity of humans	1	%1.6
		I don't know/blank	16	%25.9

Biodiversity can be expressed as 'an interaction of genes, species, ecosystems and ecological phenomena in a particular region' (Odum & Barrett, 2008, p.37). When Table 12 is examined, it is seen that none of the preservice teachers was able to define the concept of biodiversity adequately, while the majority of them (66.1%) defined it as acceptable and the rest (33.9%) defined it inadequately/incorrectly. Some of the answers of preservice teachers about biodiversity are as follows:

PT6: *'The diversity of living beings in the surrounding environment is called biological diversity.'* (acceptable)

PT8: *'Biological concepts as a whole'* (inadequate/incorrect)

The preservice teachers were asked to define the concept of '*food chain*', and the results obtained through the content analysis of their responses are shown in Table 13.

Table 13. Codes about the concept of food chain

Theme	Categories	Codes	f	%
Food Pyramid	Adequate	The system in which the living beings feed on each other	9	%14.5
	Acceptable	The system that shows what the living beings eat	6	%9.7
	Inadequate/ Incorrect	Categorizing the food	13	%20.9
		Necessary food for human beings	10	%16.1
		I don't know/blank	24	%38.8

The food chain is defined as ‘the process of transferring energy from producers to the end consumers (Odum & Barrett, 2008, p.108). The preservice preschool teachers were asked their opinions on the food chain. Some of them (14.5%) were observed to have adequate knowledge about the food chain and a few of them (%9.7) were found to have acceptable level of knowledge while the majority of them (75.8%) were found to have inadequate/incorrect knowledge. Some of the answers given by the preservice teachers about the concept of food chain are as follows:

PT43: ‘The hierarchical order in which each living being feeds on another living being under it’ (adequate)

PT10: ‘The table showing what the living beings are fed on.’ (acceptable)

PT5: ‘The group of food that we need to take daily’ (inadequate/incorrect)

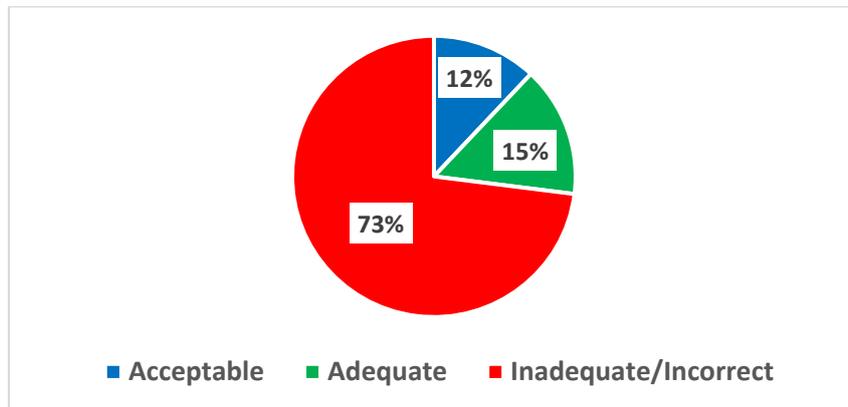


Figure 1. Percentage of all codes obtained from the preservice teachers' responses to the basic concepts related to environment.

According to the definitions by the preservice teachers in the study on some certain basic concepts related to the environment, which were categorized as inadequate/incorrect knowledge, the majority of the participants (%73) were observed to have inadequate/incorrect knowledge about environmental concepts. In addition, a few (15%) of the preservice teachers were observed to have been able to make an adequate and similarly a few (12%) of them were able to make an acceptable definition about the concepts related to the environment. The reason for such an outcome can be attributed to the fact that the majority of the preservice teachers had not taken any lessons related to the environment, had not participated in the activities related to the environment, nor had they been a member of a non-governmental organization related to the environment (Table 2).

Conclusion, Discussion and Suggestions

A total of 62 (54 female and 8 male) preservice preschool teachers participated in this study, which examined their extent of knowledge on some common basic concepts related to environmental phenomenon. Most of the participants (67.8%) were observed not to have taken any courses related to the environment during their education. It was found that more than half of the preservice teachers (53.3%) had not participated in any activities related to the environment (social, cultural, sports etc.). Likewise, nearly all of the preservice teachers (88.8%) were found not to be members of any organization (club, society, groups, activities, organizations, associations, foundations, etc.). Similar to the results obtained in this study, Akbaş (2007) also investigated the environmental phenomenon in preservice science teachers and found that approximately half of the preservice teachers (1st and 4th grade) who participated in the research had not taken any courses about the environment during the university education, but the majority of them (79.5%) were observed to have taken courses about the environment in secondary or high school.

In this study, preservice preschool teachers were asked to answer some common concepts related to environment and ecology such as environment, ecology, ecosystem, flora, fauna, habitat, species, population, community, biodiversity and food chain. It was aimed to reveal the preservice teachers' extent of knowledge about such concepts. According to the results of the study, the majority of the participants were observed to define the basic concepts of environment, ecology and ecosystem as inadequately/incorrectly. The number of respondents who gave adequate or acceptable definitions was very low. When we look at the definitions given by the respondents about the concepts of flora, fauna and habitat, it was found that the majority of the preservice teachers defined these concepts as inadequately/incorrectly. However, almost half of the preservice teachers were observed to have defined the concept of habitat in the category of 'adequate' responses. It was found that preservice teachers mostly defined the concepts of *species*, *population* and *community* in an inadequate/incorrect manner. There was no preservice teacher who could define the concept of *species* in the category of 'adequate' responses. It was also observed that the respondents could not define the concept of *biodiversity* in an adequate way, but they defined it in the acceptable category in general. However, they mostly defined the concept of *food chain* in the inadequate/incorrect category.

As a result, on analyzing the definitions which were given by the preservice teachers on some common basic concepts related to the environment and ecology, and which were categorized as adequate, acceptable and inadequate/incorrect, the majority of the respondents (73%) were found to have inadequate/incorrect knowledge related to such basic concepts. In addition, it was found that a few (15.0%) of the preservice teachers had acceptable definitions and only very few (12.0%) of them were able to make adequate definitions about environmental concepts.

The fact that school curricula lacked necessary contents about the environment, that the majority of the preservice teacher had not ever participated in any activities related to the environment (social, cultural, sporting, etc.), or any civil society organizations (club, community, organization, association, foundation, etc.), that practical environmental regulations in universities were lacking or not satisfactory, and that activities to integrate educational practices with nature were not sufficient may have led to such consequences.

Similar to the results obtained in a study conducted with chemistry teaching students, Yücel and Morgil (1998) also found that the participants did not know the concepts of environment, flora and fauna. In a study conducted by Soran et al. (2000), a questionnaire was applied to the university students studying biology and chemistry in order to measure their extent of knowledge on the environment. As a result of

the application, it was determined that the extent of knowledge of university students was not adequate. Likewise, Yılmaz, Morgil, Aktuğ and Göbekli (2002), found in their study that very few of the participants were able to give an accurate and acceptable answer to the concept of environment. In his study on preservice teachers' environmentally-friendly behavior, Erten (2005) found out that preservice teachers were not knowledgeable about many basic environmental concepts. In another study by Timur and Yılmaz (2011), which was conducted to measure the environmental knowledge of preservice science teachers, the level of environmental knowledge of preservice teachers was found to be at moderate level. In addition, it was found that there was a statistically significant difference between preservice teachers' environmental knowledge, and their academic averages and their mothers' education levels, while there was no significant difference in relation to gender and fathers' education levels. The results obtained in the present study are similar to those of the studies (Benton, 1994; Fraj-Andres & Martinez-Salinas, 2007; Frick, Kaiser & Wilson, 2004; Kaplowitz & Levine, 2005; Pe'er, Goldman & Yavetz, 2007; Tuncer et al., 2009; Yılmaz, Morgil, Aktug & Göbekli, 2002) in the literature showing that the environmental knowledge of preservice teachers is not sufficient. However, in the study conducted by Sadık and Çakan (2010), it was found that although students studying biology at university had adequate environmental knowledge, their opinions and behaviors about the environment were not at the desired level yet.

In the present study, the fact that that the vast majority of preservice teachers defined the concept of environment by associating it with a narrow physical environment, defined the concept of ecology as environmental science, and they were not able to define the concept of ecosystem and other concepts adequately is an outcome that must be well evaluated. Yücel and Morgil (1998) state that this situation stems from the fact that there is no systematic functioning in our country for developing environmental consciousness, positive attitudes and behavior in individuals in the process from primary to university level. In addition, researchers also state that the acquisition of environmental awareness and environmental concepts should start with preschool period (Erten, 2003; Ünal & Dımişki, 1999; Yücel & Morgil, 1998). Yılmaz et al. (2002) state that environmental education should be given to individuals at various levels of primary, secondary and tertiary education starting from preschool science education programs due to the interdisciplinary nature of environmental education.

As is known, information, perceptions, attitudes and behavior related to the basic concepts of environment and ecology are significantly formed in early childhood. One of the most important actors in this period is the preschool teachers. Teachers' knowledge of the basic concepts of environment and ecology, and their positive attitudes and behavior towards the environment significantly affect the children. A training system to enable individuals to participate actively in environmental issues should be developed for raising individuals with environmental consciousness who will actively participate in environmental issues. It is possible to develop environmental consciousness in individuals through raising awareness. Raising environmental awareness in individuals is possible with environmental education which will be given in accordance with all levels (Çabuk & Karacaoğlu 2003). Erten (2005) states that preschool teaching education curricula should include applied environmental education courses so that preservice teachers who take this course in their undergraduate education can feel themselves satisfactory in environmental education when they are teachers and they can provide an effective environmental education. In addition, it is recommended that training programs be developed to attract the attention and interests of university students towards the environment and environmental problems (Demir & Yalçın, 2014).

When the results obtained from this study and other results obtained from the studies in the literature examining the knowledge, attitudes and behavior of preservice teachers are evaluated together, it can be recommended that the curriculum should be enriched in terms of environment and ecology. It is also advisable to conduct practical environmental activities in which preservice teachers actively participate,

to carry out activities that integrate educational practices with nature, and to encourage preservice teachers to participate in the activities of environmental NGOs.

References

- Akman, Y.; Keteneoğlu, O.; Kurt, L. & Yiğit, N. (2012). *Ekolojik sentez*. Ankara: Palme Yayıncılık.
- Altın, M. (2001). *Biyoloji öğretmeni adaylarında çevre eğitimi*. (Yayınlanmamış yüksek lisans tezi). Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.
- Aydın, F. & Kaya, H. (2011). Sosyal Bilimler Lisesi öğrencilerinin çevre duyarlılıklarının değerlendirilmesi. *Marmara Coğrafya Dergisi*, 24, 229-257.
- Ballantyne, R. & Bain, J. (1995). Enhancing environmental conceptions: An evaluation of cognitive conflict and structured controversy learning units. *Studies in Higher Education*, 20(3), 293-304. doi: 10.1080/03075079512331381565.
- Barnes, H. (1989). *Structuring knowledge for beginning teachers*. In Reynolds, Maynard (Ed.), Knowledge Base for Beginning Teachers. New York: Pergamon.
- Baş, T. & Akturan, U. (2008). *Nitel araştırma yöntemleri NVivo 7.0 ile nitel veri analizi*. Ankara: Seçkin Yayıncılık.
- Benton Jr. R. (1994). Environmental knowledge and attitudes of faculty: Business versus arts and sciences. *Journal of Education for Business*, 70(1), 12-16. doi: 10.1080/08832323.1994.10117717.
- Bertiz, H.; Doğan, A. & Erten, S. (2017). Fen Bilimleri öğretmen adaylarında dramanın çevre bilinci oluşturmadaki rolü. *International Online Journal of Educational Sciences*, 9(4), 1052 -1074. doi: 10.15345/iojes.2017.04.012.
- Bilir, V. (2015). *Eğitim ve fen fakültesi öğrencilerinin korozyon-çevre ilişkileri kavramalarını algılamalarının çevre bilinci üzerine etkileri*. (Yayınlanmamış doktora tezi). Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.
- Büyüköztürk, Ş.; Kılıç, E.; Akgün, Ö.; Karadeniz, Ş. & Demirel, F. (2012). *Bilimsel araştırma yöntemleri*. Ankara: Pegem Yayınları.
- Corcoran, P. B. & Wals, A. E. J. (2004). *The problematics of sustainability in higher education: an introduction*. Higher Education and The Challenge of Sustainability: Problematics, Promise and Practice (Eds: Corcoran, P. B. & Wals, A. E. J.). Kluwer Academic Publishers.
- Corney, G. (2000). Student geography teachers' pre-conception about teaching environmental topics. *Environmental Education Research*, 6(4), 313-329. doi: 10.1080/713664695.
- Cropley, A. (2002). *Qualitative research methods: An introduction for students of psychology and education*. University of Latvia: Zinatne.
- Çabuk, B. & Karacaoğlu, C. (2003). Üniversite öğrencilerinin çevre duyarlılıklarının incelenmesi. *Ankara Üniversitesi Eğitim Bilimleri Fakültesi Dergisi*, 36(1-2), 189-198.

Çevre Müsteşarlığı (1990). Türkiye Çevre Eğitim ve Öğretimi Ulusal Çevre Stratejisi ve Uygulama Planları Semineri, Ankara.

Davis, J. (1998). *Young children, environmental education and the future*. In Graves, Norman (Ed.) Education and Environment. World Education Fellowship, London.

De Haan, G. (1991). *Ökologie-Handbuch Grundschule*. Weinheim und Basel.

Demir, E. & Yalcın, H. (2104). Türkiye’de çevre eğitimi. *Türk Bilimsel Derlemeler Dergisi*, 7(2), 7-18.

DiEnno, C. M. & Hilton, S. C. (2005). High school students’ knowledge, attitudes, and levels of enjoyment of an environmental education unit on nonnative plants. *The Journal of Environmental Education*, 37(1), 13-25. doi: 10.3200/JOEE.37.1.13-26.

Erten, S. (2004). Çevre eğitimi ve çevre bilinci nedir, çevre eğitimi nasıl olmalıdır? *Çevre ve İnsan Dergisi*, Çevre ve Orman Bakanlığı Yayın Organı. Sayı 65/66. Ankara.

Erten, S. (2005). Okul öncesi öğretmen adaylarına çevre dostu davranışların araştırılması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 28, 91-100.

Erten, S. (2006). Enerji tasarrufu davranışında ortaya çıkabilecek psikolojik ve sosyolojik engeller. 25. Enerji Verimliliği Konferansı, 23-24 Şubat, Hacettepe Üniversitesi, Ankara.

Erten, S. (2003). 5. sınıf öğrencilerinde “çöplerin azaltılması” bilincinin kazandırılmasına yönelik bir öğretim modeli. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 25, 94–103.

Fraenkel, J. R.; Wallen, N. E. & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th Ed.). New York: McGraw-Hill.

Fraj-Andrés, E. & Martínez-Salinas, E. (2007). Impact of environmental knowledge on ecological consumer behavior: An empirical analysis. *Journal of International Consumer Marketing*, 19(3), 73-102. doi: 10.1300/J046v19n03_05.

Frick, J.; Kaiser, F. G. & Wilson, M. (2004). Environmental knowledge and conservation behavior: Exploring prevalence and structure in a representative sample. *Personality and Individual Differences*, 37(8), 1597-1613. doi: 10.1016/j.paid.2004.02.015

Gruenewald, D. A. (2003). The best of both worlds: A pedagogy of place. *Educational Researcher*, 32(4), 3-12. doi: 10.3102/0013189X032004003.

Harris, F. (2004). *Conserving biodiversity resources*. In Harris, Frances (Ed.), Global Environmental Issues, pp. 95–113 (Chichester: Wiley).

Hooper, J. K. (1988). Teachers cognition of wildlife management concepts. *Journal of Environmental Education*, 19(3) 15-19. doi: 10.1080/00958964.1988.9942758.

Hovardas, T. & Korfiatis, K. (2011). Effects of an environmental education course on consensus estimates for proenvironmental intentions. *Environment and Behavior*, 44(6).

Kaplowitz, M. D. & Levine, R. L. (2005). How environmental knowledge measures up at a Big Ten university. *Environmental Education Research*, 11(2), 143-160.

Kaya, E.; Akıllı, M. & Sezek, F. (2009). Lise öğrencilerinin çevreye karşı tutumlarının cinsiyet açısından incelenmesi. *Mehmet Akif Ersoy Üniversitesi Eğitim Fakültesi Dergisi*, 18, 43-54.

- Knapp, D. H. (1994). Validating a framework of goals for program development in environmental interpretation. Unpublished doctoral dissertation, Southern Illinois University, Carbondale, USA.
- Kruse, C. K. & Card, J. A. (2004). Effect of a conservation education camp program on campers' self-reported knowledge, attitude, and behaviour. *The Journal of Environmental Education*, 35(4), 33-45. doi:10.3200/JOEE.35.4.33-45.
- Kuhlemeier, H.; vanDen Bergh, H. & Lagerweij, N. (1999). Environmental knowledge, attitudes, and behavior in Dutch secondary education. *Journal of Environmental Education*, 30(2), 4-14. doi: 10.1080/00958969909601864.
- Lang, J. R. (1999). Tracing changes in teacher environmental education understanding. *Australian Journal of Environmental Education*, 15(16), 59-67. doi: 10.1017/S081406260002615.
- Malone, K. & Tranter, P. (2003). Children's environmental learning and the use, design and management of school grounds. *Children, Youth and Environments*, 13(2), 87-137.
- Miles, M. B. & Huberman, A. M. (1994). *Qualitative data analysis*. Thousand Oaks, CA: Sage.
- Odum, E. P. & Barrett, G. W. (2008). Ekolojinin temel ilkeleri. (K. Işık, Çev.) Ankara: Palme Yayıncılık.
- Oğuz, D.; Çakıcı, I. & Kavas, S. (2011). Yükseköğretimde öğrencilerin çevre bilinci. *Turkish Journal of Forestry*, 12(1), 34-39.
- Özdemir, O. (2007). Yeni bir çevre eğitimi perspektifi: Sürdürülebilir gelişme amaçlı eğitim. *Eğitim ve Bilim*, 32(145), 23-39.
- Özoğul, S. Ç. (1993). *Yaygın eğitim düzeyinde çevre için eğitim, çevre eğitimi*. Ankara: Türkiye Çevre Vakfı Yayınları.
- Palmer, J. A. (1998). *Environmental education in the 21st century: Theory, practice, progress, promise*. London: Routledge.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage.
- Pe'er, S.; Goldman, D. & Yavetz B. (2007). Environmental literacy in teacher training: Attitudes, knowledge, and environmental behavior of beginning students. *The Journal of Environmental Education*, 39(1), 45-59. doi: 10.3200/JOEE.39.1.45-59.
- Pooley, J. A. & O'Connor, M. (2000). Environmental education and attitudes: Emotions and beliefs are what is needed. *Environment and Behavior*, 32(5), 711-723. doi: 10.1177/0013916500325007.
- Potter, G. (2010). Environmental education for the 21st century: Where do we go now? *The Journal of Environmental Education*, 41(1), 22-33. doi: 10.1080/00958960903209975.
- Reece, J. B.; Urry, L. A.; Cain, M. L.; Wasserman, S. A.; Minorsky, P. V. & Jackson, R. B. (2013). *Campbell biology* (Translation Editors: E. Gündüz, İ. Türkan, 9th Ed.), USA: Pearson Education.
- Sadık, F. & Çakan, H. (2010). Biyoloji bölümü öğrencilerinin çevre bilgisi ve çevre sorunlarına yönelik tutum düzeyleri. *Çukurova Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 19(1), 351-365.
- Sanders, P. (1982). Phenomenology: A new way of viewing organizational research. *The Academy of Management Review*, 7(3), 353-360.

- Schmidt, J. E. (2007). From intentions to actions: The role of environmental awareness on college students. *UW-L Journal of Undergraduate Research*, 10, 1-4.
- Short, P. C. (2010). Responsible environmental action: Its role and status in environmental education and environmental quality. *The Journal of Environmental Education*, 41(1), 7-21. doi: 10.1080/00958960903206781.
- Simmons, D. (1993). Facilitating teachers' use of natural resources: Perceptions of environmental education opportunities. *The Journal of Environmental Education*, 24(3), 8-16. doi: 10.1080/00958964.1993.9943497.
- Soran, H.; Morgil, İ.; Yücel, S.; Atav, E. & Işık, S. (2000). Biyoloji öğrencilerinin çevre konularına olan ilgilerinin araştırılması ve kimya öğrencileri ile karşılaştırılması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 18, 128-139.
- Timur, S. & Yılmaz, M. (2011). Fen bilgisi öğretmen adaylarının çevre bilgi düzeylerinin belirlenmesi ve bazı değişkenlere göre incelenmesi. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 31(1), 303-320.
- Tsekos, C. A. & Matthopoulos D. P. (2009). Ethics, science and the environment: The need for a new environmental worldview. *International Journal of Environmental Studies*, 66(6), 679-687. doi: 10.1080/00207230903028326.
- Turgut, N. (2009). *Çevre politikası ve hukuku*. Ankara: İmaj Yayınevi.
- Türkiye Çevre ve Şehircilik Bakanlığı (2015). Atık Yönetimi ve Yönetmeliği. Resmi Gazete, Sayı: 29314.
- Uzun, N. & Sağlam, N. (2006). Ortaöğretim öğrencileri için çevresel tutum ölçeği geliştirme ve geçerliliği. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 30, 240-250.
- Ünal, S. & Dımişki, E. (1998). UNESCO uluslararası çevre eğitimi programına (IEEP) göre ortaöğretim çevre eğitimi için öğretmenlerin yetiştirilmesi. *Marmara Üniversitesi Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi*, 10(10), 299-308.
- Ünal, S. & Dımişki, E. (1999). UNESCO-UNEP himayesinde çevre eğitiminin gelişimi ve Türkiye'de ortaöğretim çevre eğitimi. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 16-17: 142-154.
- Yıldırım, A. & Şimşek, H. (2016). *Sosyal bilimlerde nitel araştırma yöntemleri*. Ankara: Seçkin Yayıncılık.
- Yıldız, K.; Sipahioğlu, Ş. & Yılmaz, M. (2009). *Çevre bilimi ve eğitimi*. Ankara: Gündüz Eğitim ve Yayıncılık.
- Yılmaz, A.; Morgil, F. İ.; Aktuğ, P. & Göbekli, İ. (2002). Ortaöğretim ve üniversite öğrencilerinin çevre, çevre kavramları ve sorunları konusundaki bilgileri ve önerileri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 22, 156-162.
- Yücel, A. S. & Morgil, F. İ. (1998). Yükseköğretimde çevre olgusunun araştırılması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, 14, 84-91.