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Secondary School Students' Key Concepts and Drawings about the Concept of Environment

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KEYWORDS Environment. The Concept of Environment. Environment-related Drawings. Secondary School Student

ABSTRACT The purpose of the present study is to determine the elementary school secondary level students' environment-related key concepts and drawings. The study was carried out with 171 (88 females, 83 males) students from three different schools in the city of Sakarya in 2012-2013 school year. Out of the participants, 35 were fifth grade students, 40 were sixth grade students, 54 were seventh grade students and 42 were eighth grade students. Though the study was a qualitative one, open-ended questions developed by the researchers were used to collect data and content analysis was employed for the analysis of the data. The analyses revealed that the most commonly used environment-related concepts are "tree, flower, and forest". When the students' drawings were analyzed, they were grouped under four main headings as ''Model 1, the environment as a place where animals/ plants live-a natural place"; ''Model 2, the environment as a place that supports life"; ''Model 3, the environment as a place impacted or modified by human activity"; and ''Model 4, the environment as a place where animals, plants, and humans live" .Among these, the most frequently encountered one in the students' drawings was ''Model 3, the environment as a place impacted or modified by human activity". Moreover, the students' drawings were also analyzed in relation to gender variable, and it was found that the drawings of female students exhibit more variety than the drawings of the male students. In light of the findings of the study, some suggestions were made for researchers and further research.

INTRODUCTION

The concept of environment is perceived in different ways in different cultures. There is no generally agreed definition of environment. Though the scope of the definition of the concept of environment should be quiet comprehensive; in general, environment can be described as all of the biotic and abiotic (social, cultural, historical, climatic and physical) factors affecting living things or groups of living things throughout their life time. Environment surrounding a living thing is a place where it conducts every type of social, biological, cultural and economic activities and meets nutritional, reproductive and sheltering needs. Environment encompasses all the living and non-living things and the physical, chemical and biological factors affecting them (Yucel and Morgil 1998; Shepardson et al. 2007; Yildiz et al. 2008).

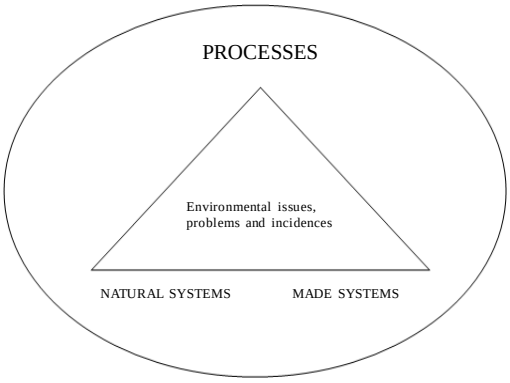

Fig. 1. Possible model of environment (Shepardson et al. 2007)

Particularly as of 19th century, with the advancements in the field of technology and the

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developments in industry, people started to be confronted with many global and local environmental problems. When the environmental problems reached to a level threatening the human-nature balance, greater attention was paid to environmental issues and more efforts were made to find solutions to these problems. It was recognized that the problems could only be overcome with the cooperation of governments, experts and individuals and education could play an important role in this regard. Therefore, for the first time, environmental movements were emphasized in a conference held in Stockholm in 1972 and the idea of environmental education was mentioned in Switzerland. Then, following some works performed in the field of environmental education, in Environmental Education Conference held in Belgrade and Tiflis Declaration issued in 1978, importance and objectives of environmental education were mentioned (Mamat and Mokhtar 2010; Gautreau and Binns 2012). According to Tiflis Declaration, the general objective of environmental education is to create a world society that is aware of the environmental problems and attempts to solve the existing problems and prevents the potential ones with the required information, attitude, motivation and interpretations in cooperation and to attach great importance to the education of individuals with environmental literacy (Mamat and Mokhtar 2010; Gautreau and Binns 2012; Erdogan et al. 2011). In line with this objective, nations started to include environment-related learning outcomes in their education programs to inform individuals about environmental issues and instill positive attitudes and behaviors towards environment in their citizens (Geok et al. 1998; Carrier Martin 2003; Shepardson et al. 2007; Tuncer et al. 2007; Ulucinar Sagir et al. 2008; Esa 2010; Gautreau and Binns 2012).

Every individual has a right to live in a healthy and balanced environment and it is the duty of every individual to develop and protect environment and contribute to the solutions of the environmental problems. Students have some prior knowledge before attending any educational institution. This prior knowledge can become barriers preventing students from obtaining and constructing new information (Mintzes et al. 1998; cited in Bahar 2003). Hence, besides traditional teaching methods, alternative teaching methods and techniques can be employed to present environmental topics to students. Renewed science and technology course teaching programs aim to integrate environmental education to inform students about environmental issues and make them environmentally literate people. Therefore, education is closely associated with the fulfillment of tasks and responsibilities that should be assumed by individuals to solve environmental problems. Creation of environmental awareness in individuals starts with education and is closely connected with the prior information of individuals. Within the renewed teaching programs, environmental education is given through the incorporation of environmental objectives into the main disciplines and sub-disciplines of environment. When the elementary education program is examined, it is seen that within the framework of the courses of life sciences, environment education is given under these units "Health Growth" and "Living Things in our Environment" in 1st, 2nd and 3rd grade life sciences courses; "World of Living Things", "Diversity of Living Things", "Man and Environment" in 4th grade; "Diversity of Living Things", "Man and Environment" in 5th grade; "Living Things and Life", "Diversity of Living Things", "Man and Environment" (Water and Water Pollution, Air and Water Pollution) in 6th grade; "Diversity of Living Things", "Man and Environment" (Soil and Soil Pollution, Matter Cycle), "Heat (Fuels and Environment) in 7th grade; "Structure of Matter", "Reproduction of Living Things and Heritage", "Man and Environment" (Causes of Environmental Destruction, Residues and Wastes), "Earth and Underground Resources" (Main Gases Polluting the Air and Elimination of their Sources, Purification of Water) in 8th grade (Soran et al. 2000; Unal and Dimiski 1999; Yucel and Morgil 1998). Children's environmental perceptions are one of the issues extensively investigated in the past and being investigated at present. The research emphasizes the fact that students' interests in and attitudes towards environment have undergone positive change and they have become more conscious (Palmer 1995).

Research conducted in America and England reports that children aged 4-6 years old already have some information about environment and can explain the concept of recycling and some other basic environmental concepts. Some other studies also reveal that there is an improvement in students' environmental knowledge (Bonnet and Williams 1998).

When the studies looking at students' environmental key concepts and drawings are analyzed, it is seen that there is a lack of research. Bonnet and Williams (1998) carried out 50-minute semi-structured interviews with 5-6 years old children in England to investigate their environmental attitudes and perceptions. In a similar way, Shepardson et al. (2007) investigated the environmental models in the minds of 1182 students in America in relation to grade level and place of residence (city center, slum areas, rural areas) by using the open-ended questions developed by the researchers.

The purpose of the present study is to determine the secondary school students' environmental key concepts and the models in their drawings of environment.

MATERIAL AND METHODS

Model

The present study employed one of the qualitative research designs, case study. A case study deals with a few topics concerning to one main topic holistically within its own borders.

Current topic that is dealt within its own borders in a case study is an empirical study method that is used when boundaries between phenomenon and current context is not obvious with certain lines, and more than one source of evidence or data are available (Yildirim and Simsek 2008).

Participants

As indicated in Table 1, the study was carried out with 171 (88 females, 83 males) students from three different schools in the city of Sakarya in 2012-2013 school year. Out of the participants, 35 are fifth grade students, 40 are sixth grade students, 54 are seventh grade students and 42 are eighth grade students.

Table 1: Student profile

Grade level	*Gender*		*Total*
	Female	*Male*	
5th grade	19	16	35
6th grade	22	18	40
7th grade	32	22	54
8th grade	19	23	42
Total	88	83	171

Data Collection Tool

Open-ended questions developed by the researchers were used to determine the students' environmental key concepts and drawings. In order to ensure that the data reflect the reality and that the research findings contribute to the validity, the topic to be researched was attempted to be analyzed as unbiased as possible. For this purpose, the open-ended questions developed to collect data were exposed to the scrutiny of 3 academicians that are experts in science and environmental education. In line with the feedback taken from the experts, new questions were added and the existing ones were revised and some of them were discarded.

Data Analysis

Content analysis was employed to analyze the collected data. Content analysis is a technique used to conceptualize the written data and collect the emerging concepts under appropriate themes by logically sequencing them (Yildirim and Simsek 2008). The students' environmental key concepts, detectable grammar rules and symbols were analyzed. Raw data obtained from the key concepts written by the students were coded and categorized through inductive analysis. Classifying the data under the determined categories made them meaningful for the reader. Coding and categorization operations were repeated by one of the researchers. In this way, unnecessary coding were discarded based on the problem statement and purpose of the study and new coding were added where they were needed. For the labeling of the categories, the researchers worked together. As a result, tables where the opinion of every participant could be seen were created and these tables are presented in the finding section. In the analysis of the students' drawings, classifications (models) developed by Shepardson et al. (2007) were used.

FINDINGS

For each question asked, the data obtained from the participants are presented in tables. The Students' Key Concepts Stated for the Concept of Environment. The students' key concepts for environment are presented in Table 2.

Table 2: The students' key concepts for environment

Theme	*Concepts*	*5th grade*	*6th grade*	*7thgrade*	*8thgrade*	*Total*
Human	Human	3	5		1	9
	Child	2	1			3
	People polluting the earth	1	2			3
	Happy people			11		11
	People playing		1			1
Pollution	Pollution		3	12		15
	Air pollution	1	4	4	2	11
	Water pollution	1	2	2	2	7
	Soil pollution	1	4			5
	Environmental pollution			3	7	10
	Garbage	1	4	7	8	20
	Solid waste	1		2		3
	Exhaust		2	1	2	5
	Factory waste	1	1			2
	Factory smoke	1		2	2	5
	Polluted environment	3				3
	Light pollution	1				1
	Noise pollution	1				1
	Water pollution	1	1	2	2	6
	Global warming	1				1
	Ozone layer depletion			1	1	2
	Plastic bottle				1	1
	Plastic				1	1
	Poisonous gas			1		1
Living Things	Living thing	3				3
	Endangered living things	1	1			2
Plants	Plant	2	4	1	1	8
	Grass	2	3	4	3	12
	Flower	6	14	10	7	37
	Tree	9	17	22	20	68
	Vegetable/fruit		2			2
Animals	Animal	4	7	8	2	21
	Insect		6	4	1	11
	Butterfly	1	2	1	1	5
	Bird	1	3		1	5
Nature	Nature	6	8	16	6	36
	Naturalness	1	1			2
	Natural disaster		3	1	1	5
	Voice of nature			2		2
	Natural living habitat		3	1		4
	Order			1		1
	River	3	3	4	1	11
	Sea	4	7	3	10	24
	Lake	3	5	7	10	25
	Mountain	2	3	2	3	10
	Moon	1				1
	Cloud	1			1	1
	World	1			1	2
	Universe			1		1
	Sun	1	1	2	1	5
	Air		2	1		3
	Fertilizer			1		1
	Clean air		4	4	2	10
	Season		1			1
	Oxygen				1	1
	Water		3	1	1	5
	Forest	6	6	7	8	27
	Soil	1	2	2		5
	Green area	3	1	3	1	8
	Earth			1		1
	Nature trip	1				1

Table 2: Contd...

Theme	*Concepts*	*5th grade*	*6th grade*	*7thgrade*	*8thgrade*	*Total*
	Natural phenomena				2	2
	Natural life				2	2
	Diversity	1				1
	Picnic	1	2			3
	Chopped trees		1			1
	Wind			1		1
	Burnt forests		1			1
Construction	House/building	7	3	6		16
	Garden	1	1	2	1	5
	Dam	1				1
	Street	1		1		1
	Bridge		1			1
	Park	1	1	1		3
	Picnic area			1		1
	Road				1	1
	Technology				1	1
Protection	Environmental protection		3		2	5
	Protection of nature	1				1
	Garbage can			1	2	3
	Garbage collection		1			1
	Recycling	1		1		2
	Clean future				4	4
Environment	Hygiene	2	3	2		7
	Clean environment	6	4	7	5	22
	Polluted environment		3	2	1	6
	Place of residence	5		2	1	8
	Peaceful environment				2	2
Living/Life	Living/life	1	1	3	2	7
	Family		2	1	1	4
	Feelings			1		1
	Happiness	1		2		3
	Health	1		1		2
	Healthy life		2			2
	Illness		1			1
	Freedom			1		1
	Society			1	2	3
	Social life			1		1
	Friends			1		1
	Course				1	1
	Teacher				1	1
	War				1	1
Harmful Substance	Alcohol		1	1		2
	Tobacco		2			2
Possession	Car	2		4		6
Total		116	175	202	144	637

*Each student used more than one concept in their responses.

Some excerpts from the students' responses are presented below to give some examples of their key concepts:

''When I hear the word "environment", I remember the concept of beauty, people throw their wastes on ground, factories dump their wastes into rivers and exhaust gases emitted by cars …. If none of them did not happen, everything would be more beautiful..'' (Student 1, 5th grade).

''… Trees, grass, flowers, sun, cloud, moon, star come to my mind ..'' (Student 2, 6th grade)

''What comes to my mind is environmental pollution ...'' (Student 3, 6th grade).

''When I hear the word "environment", trees, houses, flowers, insects, human beings and roads come to my mind. Of course, all of these are beautiful … I want environment to be clean, without waste and dust.'' (Student 4, 7th grade).

''… Factory wastes, human wastes, exhaust gas emitted by cars, littering, global warming

and water pollution come to my mind... (Student 5, 8th grade).

The key concepts used by the students to define the concept of environment are presented in Table 2 under the related themes. The concepts written by the students are subsumed under these themes: "Human beings, living things, pollution, plants, animals, construction, protection, environment, living/life, harmful substances, and possession'. When Table 2 is examined, it is seen that each student used more than one concept to define the concept of environment and these concepts varied depending on the grade level. While the concepts used varied depending on grade level, the highest variation was observed for 7th and 8th graders. The sequence of the concepts most frequently stated by the students are as follows: Tree (f=68), Flower (f=37), Nature (f=36), Forest (f=27), Lake (f=25) and Sea (f=24). In addition to these concepts, many other concepts such as technology, recycling, ozone layer depletion, global warming, and environmental pollution were among the concepts stated by the students. It is seen that the concepts stated by the students were mostly collected around the themes of Nature (33 concepts) and Pollution (19 concepts). Under these two themes, there is a more variety of concepts when compared to the others. When the other themes were examined, it was found that they have a similar variety of concepts. Under the heading of harmful substances, there are only two concepts mentioned which are alcohol and tobacco.

The Students' Drawings of Environment

Examples of students' drawings are as follows.

When the students' drawings of environment were classified, the data presented in Table 3 were obtained. When the students' drawings were analyzed, they were classified under four different models. It is seen that each model has some sub-headings. The analyses conducted revealed that the highest number of draw-

Table 3: Classification of the students' drawings of environment

Theme		*5th grade*		*6th grade*		*7thgrade*		*8th grade*		*Total*
		K	*E*	*K*	*E*	*K*	*E*	*K*	*E*	
Model 1: A Place Where Animals/Plants Live, a Natural Place	Place where animals/plants live	3	3	4	4	6	2	1	1	24
	Natural place, nature	3	4	3	1	3	1		1	16
	Living and nonliving	1	1	1	1			1		5
	Cycling of matter					1				1
	Energy transfer									
Model 2: Supports Life	Supports animal life									
	Supports human and animal/plant life	4	1	2					7	
	Supports human life		1							1
	Supports animal/ plant life			1	1				1	3
	Supports human and animal life			1						1
Model 3: A Place Impacted or Modified by Humans	Place were only people live (Builtenvironment)	2	1	1	3	2	1	1		11
	Polluted environment	9	6	10	6	16	9	7	15	78
Model 4: A Place Where Animals, Plants,and Humans Live	Place where animals, plants, andpeople live	5	1	1	4	5	3	4	3	26
Total		23	21	23	22	33	16	14	21	173

*Some drawings of the students include two or more models

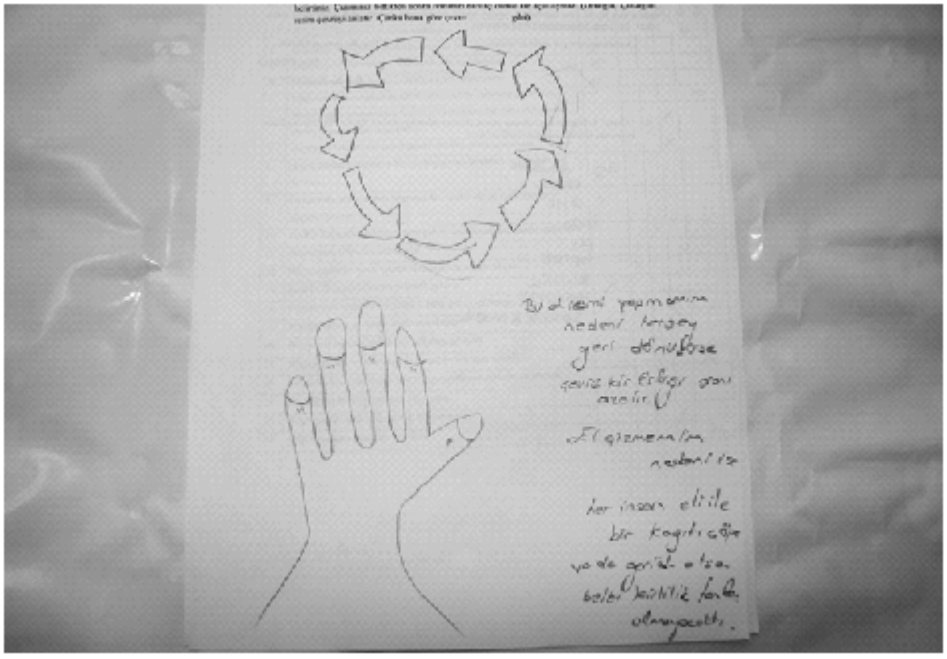

Fig. 2. 7th grade student's drawing

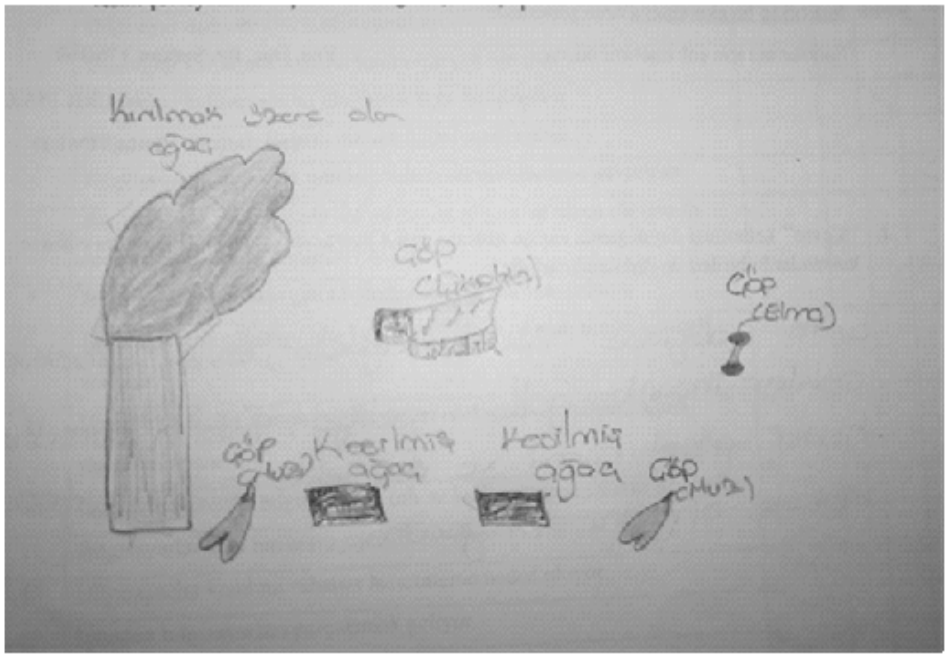

Fig. 3. Model 1. The environment as a place where animals/plants live - A natural place

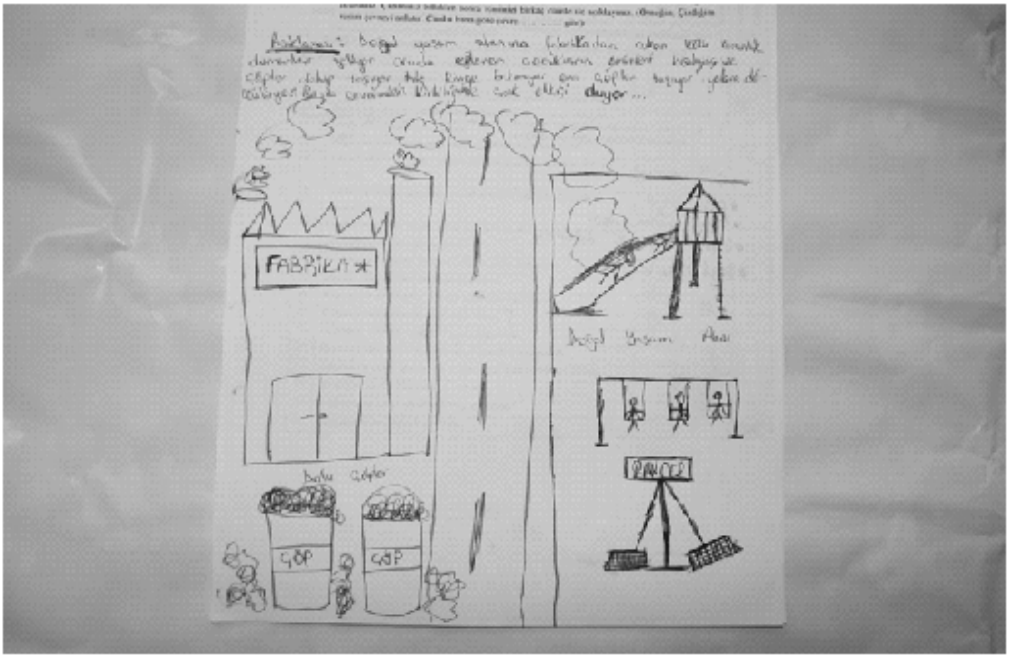

Fig. 4. 8th grade student's drawing. Model 3: The environment as a place impacted or modified by human activity

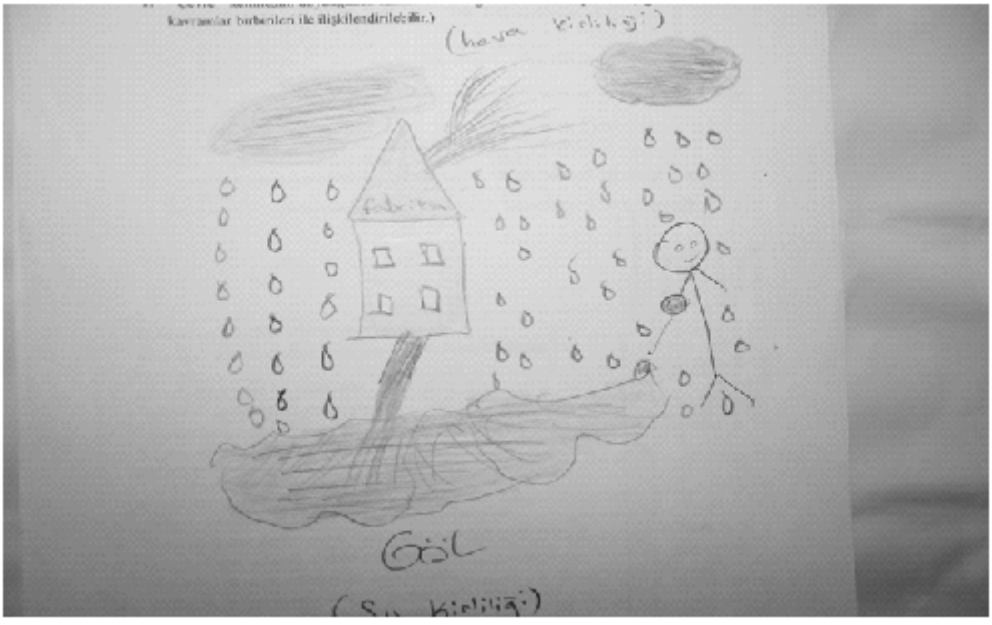

Fig. 5. 7th grade student's drawing. Model 3: The environment as a place impacted or modified by human activity

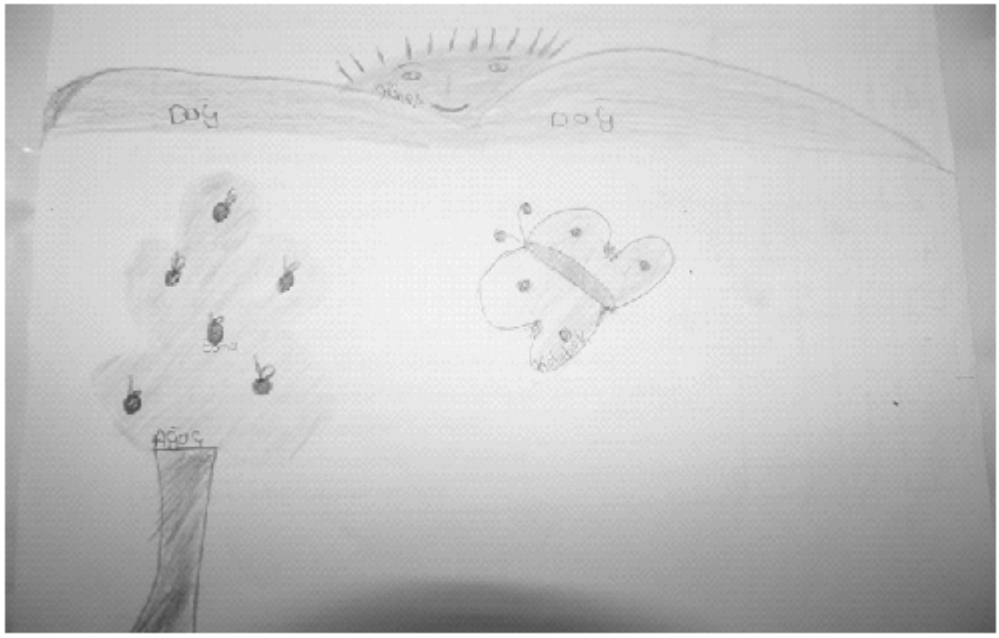

Fig. 6. 6thgrade student's drawing. Model 1: The environment as a place where animals/plants live - A natural place

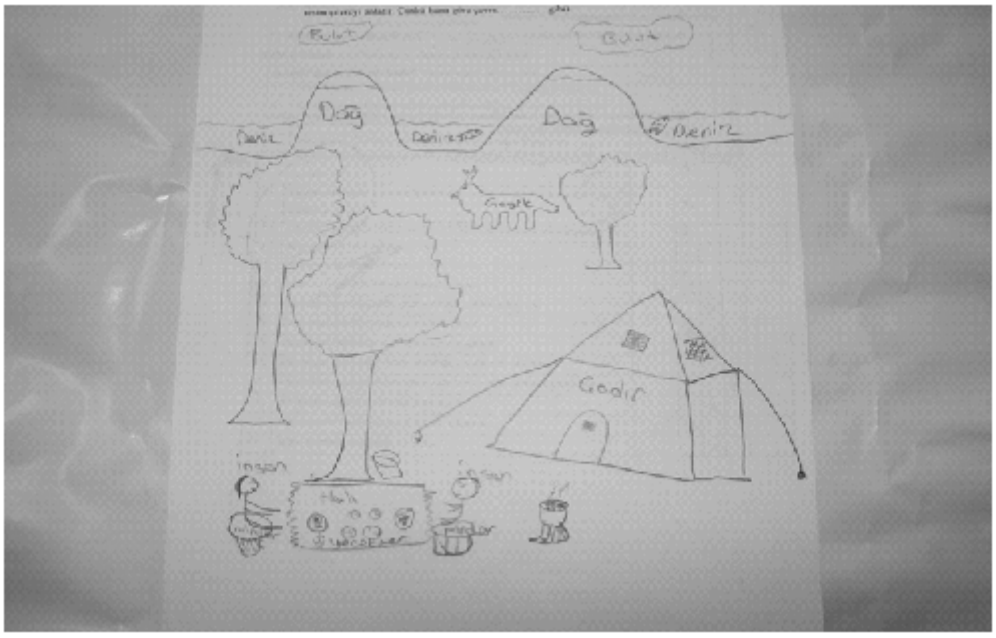

Fig. 7. 7thgrade student's drawing. Model 4: The environment as a place where animals, plants, and humans live

ings is subsumed under *Model 3: The environment as a place impacted or modified by human activity* (f=89), this model is followed by *Model 1: The environment as a place where animals/plants live - a natural place* (f=466), *Model 4: The environment as a place where animals, plants, and humans live (f=26)* and *Model 2*: *The environment as a place that supports life.* When Table 2 is examined, it is seen that only drawings suitable for the sub-heading of energy saving are missing under the heading of place where animals and plants live and only drawings suitable for the sub-heading of place where animals live are missing under the heading of place where living is going on. When the students' drawings were analyzed according to gender, it was found that though the drawings of male and female students of 5th grade (f_{Female}=23, f_{Male}=21), 6th grade (f_{Female}=23, f_{Male}=22), and 7th grade (f_{Female}=33, f_{Male}=16) are similar, the drawings of the female students exhibit more variety. However, the drawings of the 8th grade male students (f_{Male}=21) show more variety than the drawings of 8th grade female students (f_{Female}=14).

DISCUSSION

In this study, secondary school students' key concepts and drawings about environment focused on tree, flower, forest, nature, lake and sea. The reason for these concepts being the most popular among the students can be because these are the concepts frequently illustrated in textbooks of the students, some other concepts are not mentioned in these books, the schools where the study was conducted are located in city centers and students do not have many opportunities to be in natural environments.

Bonnet and Williams (1998) investigated the students' environmental concepts and perceptions, and found that the concept first coming to their mind is the concept of nature.

Students' drawings mostly focus on *Model 3: Place The environment as a place impacted or modified by human activity*. The reason for this concentration on this heading can be because the schools are located in city center, the students cannot find many opportunities to be in nature, and there is a lack of environmental illustrations in their textbooks and materials.

Shepardson et al. (2007) studied the environmental drawings and found that the students' drawings concentrate on *Model 1: The environment as a place where animals/plants live - a natural place.*

CONCLUSION

The present study looked at the secondary school students' key concepts and drawings about environment. The analyses conducted revealed that the most frequently mentioned concepts of environment by the students were found to be tree, flower, forest, nature, lake and sea.

When the students' drawings of environment were analyzed, it was found that the drawings mostly focus on *Model 3: Place The environment as a place impacted or modified by human activity*.

When the drawings of the students were examined according to gender, it was found that the drawings of the female students of 5th, 6th and 7th grades exhibit more variety when compared to the drawings of the male students. On the other hand, the drawings of 8th grade male students show more variety.

RECOMMENDATIONS

In light of the findings of the present study; it can be argued that

Some certain key concepts come to the fore in the responses of the students and the number of other concepts is relatively low. In order to create environmental concepts in the minds of students, students should be taken to field trips and proper learning environments should be created for students parallel to the subjects of the courses,

The number of the environment-related learning outcomes in science and technology course teaching programs should be increased and more visuals and illustrations should be included in the textbooks,

Alternative techniques and methods, animations, simulations allowing one to one interactions, and teaching software programs should be used in teaching of environmental issues,

Alternative assessment techniques such as mental maps, structured grids and descriptive branched tree should be used to relate the is-

sues to each other and during evaluation processes;

TUBITAK projects should be encouraged to enhance students' environmental perceptions, awareness, knowledge and attitudes;

And students and teachers' environmental literacy should be improved.

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