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8TH GRADE STUDENTS' LEVEL OF KNOWLEDGE ABOUT BIODIVERSITY AND ITS CORRELATION WITH DIFFERENT VARIABLES

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ABSTRACT

Nearly 14 million species are estimated to exist on Earth, of which 1.8 million have been identified, and new species are being added to the world of science every day. Therefore, scientists are aware that there are still unidentified species living globally. Biodiversity is a wide concept encompassing all living things in our living space. This study aims to determine the level of knowledge of 8th-grade students about biodiversity and some variables that may impact it. The study's sample consisted of 286 students studying in the 8th grade of all secondary schools in Oltu district of Erzurum province in the 2022-2023 academic year. The survey model was used in the study. For the data collection tool, the "Biodiversity Achievement Test" and "Plant and Animal Recognition Questionnaire" were used for the students to recognize the plants and animals in their immediate surroundings. The data were analyzed through the SPSS program. As a result of the data analysis, it was concluded that girls were more successful in biodiversity. The rate of students' recognition of plants in their immediate environment (39.44%) was lower than the rate of recognition of animals (64.07%).

Keywords: *Science Education, Students, Biodiversity, Biodiversity Education, Cognitive Structure*

INTRODUCTION

Our world hosts a large number of living and non-living beings. The separation of Pangea, a single continent about 200 million years ago, caused lifeforms to scatter to various places, where they either continued their vitality or disappeared (Polat, 2017). The continents separated from the single mainland Pangea, shifted due to plate movements, and periodically collided with each other, causing the formation of high mountains and related climate changes (Sakınç, 2022). The formation of different climates and vegetation has also contributed to the emergence of new species by developing living things adapted to life (Kabaklı, 2017). On the other hand, many species have completely disappeared from the earth. Afterwards, nature renewed and revitalized life (Tan Gülcan, 2021).

Human beings, who have developed in this process, have been closely interested in these living communities existing in nature where they started to live, and from time to time, they have caused the number of living species to decrease and even disappear (Sakınç, 2022). Human beings, who supplied themselves with food by hunting and gathering in the early ages, developed themselves in this regard over time and learned the geography of the place where they lived and created a lifestyle accordingly. Recognizing the living creatures in their near and far surroundings and adding them to their lives, human beings started to use them for their benefit as they observed them and discovered another dimension of survival (Ateş, 2009). While doing this, human beings have sometimes hunted consciously and sometimes unconsciously, causing the generations of these species to be endangered (Tan Gülcan, 2021). According to inconclusive data, it is thought that there are between 13 and 14 million species on

our planet, and 1.8 million of these species have been identified, and new species are being identified in the scientific world every day (Yüce, 2022). Despite the unidentified species, the extinction of living species is endangered due to human and natural causes, and as a result, some of them have disappeared and some are under threat of extinction (Demirayak, 2002). Scientists estimate that one plant and animal species is lost worldwide every 20 minutes. This disappearance also means the loss of populations and gene pools. Although the disappearance may seem like a minor loss, over a large period, it causes many species to be endangered (Braus & Champeu, 1994).

Biodiversity is defined as the diversity of living organisms arising from terrestrial, aquatic, and other ecosystem differences, as well as intraspecific and interspecific differences (Keating, 1993, cited in Şahin, 2018).

Biodiversity in Türkiye

Türkiye has benefited greatly from this biodiversity due to the temperate zone effect and elevation changes over short distances (Biodiversity Monitoring and Assessment Report, 2012). Türkiye is home to many species of plants, animals, fungi, and other living things and also harbors more than 3500 endemic species (Şenkul & Kaya, 2017).

Türkiye is highly affected by biodiversity due to its geographical location (Demir, 2013). The plate movements and continental uplifts occurring in certain periods caused changes in climate and vegetation at short distances (Polat, 2017). However, the Anatolian peninsula has the characteristics of a transit route for various species, offering a favorable environment for life thanks to features such as frontal precipitation and four seasons due to its latitude and temperate zone characteristics (Bağcı, 2022).

Türkiye is located in the center of Asia, Europe, and Africa continents, as well as being located in the Mediterranean, Iran-Turanian, and Euro-Siberian phytogeographic areas (Seven, 2020) and being surrounded by seas on three sides, has caused it to have a rich habitat and species diversity. The climate change and vegetation change in Türkiye, even at short distances, and the fact that it can reach altitudes between 0 and 5000 meters is another factor that increases the diversity of living things (Seven, 2020). Due to its location in the middle of two Genetic Diversity Centers, Türkiye acts as a warehouse by hosting many plant species (Arslan, 2017).

Human beings, being aware of the diversity in their environment, have realized that this richness is priceless and that it is possible to solve their problems with the naturally existing living and non-living environment. This requires human beings to know their near and far environment well, to understand the biodiversity in their environment, and to be able to identify the living species in their environment. This issue is becoming increasingly important in the world and is included in education systems starting from the pre-school period, and aimed to raise individuals who are responsible towards nature. To raise environmentally conscious individuals, respectful of the living things around them, act with the logic of a sustainable environment, and protect biodiversity, it has been stated that addressing environmental education and science education together can emerge as a unifying effect that brings science and society together (Weelie & Wals, 2002).

THE AIM OF THE STUDY

In this study, the knowledge levels of 8th-grade students about biodiversity, the effects of different variables on their knowledge levels, and the plants found in their immediate environment were analyzed.

METHODOLOGY

The Research Model

This study aims to determine the knowledge levels of 8th-grade students about biodiversity and the effects of different variables on their knowledge levels. For this purpose, the survey model was used. Quantitative and qualitative research methods were utilized in the study.

Sample of the Study

The sample of this study consists of 286 students studying in the 8th-grade of all secondary schools in Oltu district of Erzurum province in the 2022-2023 academic year.

Data Collection Tools

1. Personal information form

The first part of the measurement tool is the "Personal Information Form," which includes demographic information. This form includes questions about gender, school, the presence of pets, and whether the participants have ever participated in a project involving concepts such as nature/ecology/creatures. The form aims to examine the level of conceptual knowledge in terms of demographic information.

2. Biodiversity achievement test

The 27-item "Biodiversity Achievement Test" developed by Özata Yücel (2013) was applied to reveal the students' level of knowledge about biodiversity. The reliability coefficient of the achievement test was calculated by the developer (KR-20) and found to be 0.82. The average discrimination of the items was 0.49, and the average difficulty was calculated as 0.59 by the developer.

3. Plant and animal recognition questionnaire

The students' familiarity with the species around them was measured by applying the "Plant and Animal Recognition Questionnaire" prepared by the researcher. "All of the plants in the first part of the "Plant and Animal Recognition Questionnaire" were photographed by the researcher. "The photographs of the wild goat (URL 1), hawk (URL 2), partridge (URL 2), and red fox (URL 3) were taken from the specified websites. The rest of the animals were photographed by the researcher. During the analysis of the questionnaires, the answers given for plants and animals belonging to the same genus were accepted as correct in line with expert opinions.

Data Analysis

The data obtained from the sample group were analyzed using the SPSS 18 program. Firstly, it was analyzed whether the data showed a normal distribution, and it was seen that the data did not show a normal distribution. Since the data were not normally distributed, the Kruskal-Wallis H and Mann-Whitney U tests were used as nonparametric tests. While analyzing the data, descriptive analysis was also performed, and frequency distributions and percentages were calculated.

FINDINGS

Descriptive Statistical Results of the Students Participating in the Study

Table 1 illustrates the demographic characteristics of the 286 students who participated in the study.

Table 1. *Frequency and Percentage Distributions of the Demographic Characteristics of the Students Participating in the Study*

		f	%
Gender	Female	147	51.4
	Male	139	48.6
Presence of pets	Yes	93	32.5
	No	193	67.5
**School*	S1	17	5,9
	S2	17	5,9
	S3	55	19,2
	S4	38	13,3
	S5	47	16,4
	S6	112	39,2
Participation in the nature project	Yes	172	60,1
	No	114	39,9
Biodiversity area	Knows	52	18.2

	Doesn't know	234	81,8
Total		286	100

**S: School Variable (S1, S2, S3, S4, S5, S6-six different secondary school)*

An analysis of Table 1 reveals that 51.4% of the students participating in the study were female, and 48.6% were male. It was determined that 32.5% of the students had a pet, while 67.5% did not have a pet. Examining the distribution of the students participating in the study in terms of schools, it was determined that 5.9% of the students studied at S1, 5.9% at S2, 19.2% at S3, 13.3% at S4, 16.4% at S5, and 39.2% at S6 secondary school. When the participation of the students in any nature project was analyzed, the rate of participation in the project was 60.1%, while the rate of non-participation was 39.9%. At the same time, when questioned whether they knew a natural area related to biodiversity in Erzurum province, 81.8% of the students stated that they did not know, and only 18.2% stated they knew.

Table 2 shows the statistics related to students' biodiversity achievement levels.

Table 2. *Statistics on Students' Biodiversity Achievement Levels*

	N	The Lowest	The Highest	Mean	Std. Dev.
Achievement Test Score	286	1	24	10.16	4.81

As seen in Table 2, per the results of the 27-question achievement test for the students, the highest score was 24, and the lowest score was 1. In other words, no student answered all of the questions incorrectly, but there were no students who answered all of them correctly. The mean was 10.16, and the standard deviation was 4.81.

Statistical Results in Terms of Different Variables

Table 3. illustrates the results of the Mann-Whitney U analysis for the differentiation of achievement test scores according to gender variables.

Table 3. *Mann-Whitney U Test Results of Gender and Biodiversity Achievement Test Scores*

	Gender	N	Item no.	Total Item	Z	U	p	**η2**
Achievement Test Score	Female	147	159,44	23438,00	-3,36	7873,00	0,001	11,29
	Male	139	126,64	17603,00				
	Total	286						

Table 3 reveals that the achievement test scores of the students showed a statistically significant difference according to their gender ($p<0,05$). According to the achievement test score, female students were more successful than male students (159,44>126.64). The effect size for gender ($\eta 2= 11.29$) was calculated, and it was seen that the effect of gender on achievement in biodiversity was quite low.

Table 4 shows the results of the Mann-Whitney U analysis for the differentiation of achievement test scores according to the variable of the presence of a pet taken care of.

Table 4. *Mann-Whitney U Test Results of Biodiversity Achievement Test Scores with the Presence of a Pet Taken Care of*

	Pet	N	Item no.	Total Item	Z	U	p
Achievement Test Score	Yes	93	132,81	12351,00	-1,52	7980,00	0,13
	No	193	148,65	28690,00			
	Total	286					

Table 4 reveals that there is no statistically significant difference in achievement test scores according to whether the students have pets that they take care of or not (p>0.05). It can be said that whether the student has a pet that they take care of or not does not affect the biodiversity achievement test score.

Table 5 illustrates the results of the Kruskal Wallis-H test analysis for the differentiation of achievement test scores according to the school variable.

Table 5. *Kruskall Wallis-H Test Results of Biodiversity Achievement Test Scores with the School of Education*

	*School	N	Item no.	X^2	df	p	**η2**	Intergroup difference	**η2**
Achievement Test Score	S1	17	145,53	16,099	5	0,007	13,6	S2<S1 S2<S3 S2<S4 S2<S5 S2<S6	23,78
	S2	17	76,56						
	S3	55	164,05						
	S4	38	144,12						
	S5	47	130,89						
	S6	112	148,34						
	Total	286							

**School Variable (S1, S2, S3, S4, S5, S6-six different secondary school)*

Table 5 reveals that the biodiversity achievement test scores of the students showed a statistically significant difference according to the schools they attended (p<0.05). As the Kruskal Wallis-H test revealed a significant difference between the groups, Mann-Whitney U analysis was conducted to determine the groups with differences. According to the results of the Mann-Whitney U test, it was determined that the biodiversity test achievement scores of the students studying at S2 secondary school were significantly lower than the biodiversity test achievement scores of the students studying at other secondary schools. There was no statistically significant difference between the other schools.

The effect size (η2= 23.78) was calculated to determine how much of the total variance was explained by the significant difference. Accordingly, it was seen that the effect of the schools in which the students studied on their achievement towards the subject of biodiversity was quite low.

Results From the Questionnaire on Recognition of Plants and Animals in Their Near Environment

1. **Results from the plant ıdentification questionnaire**

Table 6 presents the frequency and percentage distributions of the students' responses about whether they recognize the plants in their immediate surroundings whose pictures were given and the top three plants they most often confused with the plant whose picture was given.

Table 6. *Frequency and Percentage Table for Recognizing Plants*

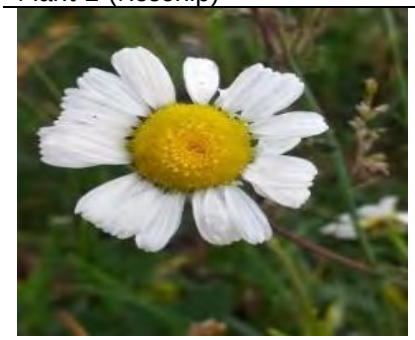
		f	%	Confusable Plant
	*False*	275	94,4%	Lavender (f=44) Grapes (f=20) Orchids (f=12)
	True	16	5,6%	
	Total	286	100%	
Plant 1 (Arabian hyacinth)				
	*False*	59	20,7%	Tomato (f=3) Cranberry (f=3) Lavender (f=1)
	True	227	79,3%	
	Total	286	100%	
Plant 2 (Rosehip)				
	*False*	8	2,8%	Flower (f=1)
	True	278	97,2%	
	Total	286	100%	
Plant 3 (Chamomile)				
	*False*	112	39,1%	Tree (f=50) Sycamore (f=12) Oak (f=5)
	True	174	60,9%	
	Total	286	100%	
Plant 4 (Pine)				

Table 6. *Frequency and Percentage Table of Plant Identification (Continued)*

		f	%	Confusable Plant
 Plant 5 (Dandelion)	*False*	*190*	*66,4%*	Camomile (f=24) Flower (f=8) Fever plant (f=3)
	True	96	33,6%	
	Total	286	100%	
 Plant 6 (Sow thistle)	*False*	265	92,6%	Aculeus (f=30) Thorn flower (f=15) Echinops ritro (f=9)
	True	21	7,3%	
	Total	286	100%	
 Plant 7 (Mentha longifolia)	*False*	256	94,4%	Weed (f=16) Nettle (f=8) Basil (f=5)
	True	16	5,6%	
	Total	286	100%	
 Plant 8 (Basil)	*False*	70	24,5%	Mint (f=7) Weed (f=3) Begonia (f=1)
	True	216	75,5%	
	Total	286	100%	
 Plant 9 (Red poppy)	*False*	189	66%	Rose (f=12) Flower (f=7) Tulip (f=4)
	True	97	33,9%	
	Total	286	100%	

Table 6. *Frequency and Percentage Table of Plant Identification (Continued)*

		f	%	Confusable Plant
 Plant 10 (Barberry)	*False*	241	84,3%	Cranberry (f=35) Gırgat (f=13) Silverbush (f=7)
	True	45	15,7%	
	Total	286	100%	
 Plant 11 (Hawthorn)	*False*	231	80,7%	Dog brier (f=54) Gırgat (f=50) Pomegranate (f=34)
	True	55	19,3%	
	Total	286	100%	

Table 6. presents the students' answers regarding their level of recognition of the plants in their immediate surroundings, and the plants originating from the same genus were also accepted as correct in line with the expert opinions received. An analysis of the frequencies showed that the most recognized plant was "Chamomile" with a rate of 97.2% (f=278). "Rosehip" was the second most recognized plant, with a rate of 79.3% (f=227). The answers "Rose" and "Silane" given by the students instead of rosehip were accepted as correct because they came from the same origin (Korkmaz & Özçelik, 2015). The third most recognized plant was "Nettle" with a rate of 75.5% (f=216).

When the misrecognition or non-recognition rates of the plants were examined, "Bluebell" ranked first with a rate of 94.4%. Examining the answers given by the students, it is seen that this plant, which is mostly left blank, is mostly confused with "Lavender". At the same time, among the answers given to this plant, the term "Crow's onion" used in Erzurum region was accepted because it is widely used in folk language (Bulut, 2005), while "Hyacinth" was accepted as correct on the grounds that it belongs to the same family (Gürsoy & Şık, 2010). When the rate of wrong answers or left blank was analyzed, it was seen that "Mentha longifolia" had a rate of 94.4%. The options "Pennyroyal" and "Mint" among the answers given for this plant were accepted as correct on the grounds that the genus name was the same (Güler, 2004). Secondly, the rate of wrong answers or left blank was 92.7% for "Sow thistle." The third plant that was answered incorrectly or left blank was "Barberry" with a rate of 84.3%. Looking at the answers given instead of this plant, it is seen that it is confused with plants such as "Cranberry" and "Silverbush". At the same time, the terms "Kızanbık", "Kızambık" (Bulut, 2005) and "Kızamık" (Kökler & Çetinkaya, 2022) were accepted as correct because they are used in Erzurum region.

2. Results obtained from the animal recognition questionnaire

In Table 7, the frequency and percentage distributions of the students' responses about whether they recognized the animals in their immediate surroundings whose pictures were given and the first three animals they confused most with those whose picture was given are given.

Table 7. *Frequency and Percentage Table for Recognising Animals*

		f	%	Confusable Animal
	*False*	96	33,5%	Acarine (f=14) Insect (f=7) Scorpio (f=4)
	True	190	66,5%	
	Total	286	100%	
Animal 1 (Spider)				
	*False*	138	48,2%	Grasshopper (f=59) Ant (f=5) Insect (f=3)
	True	148	51,8%	
	Total	286	100%	
Animal 2 (Praying mantis)				
	*False*	4	1,4 %	Mowdie (f=1)
	True	282	98,6 %	
	Total	286	100 %	
Animal 3 (Hedgehog)				

Table 7. *Animal Identification Frequency and Percentage Table (Continued)*

		f	%	Confusable Animal
	*False*	210	71,3%	Crow (f=33) Bird (f=25) Swallow (f=4)
	True	76	28,7%	
	Total	286	100%	
Animal 4 (Magpie)				
	*False*	207	72,4%	Deer (f=128) Corinne (f=16)
	True	93	27,6%	
	Total	286	100%	
Animal 5 (Rock goat)				
	*False*	49	17,1%	Centipede (f=16) Snail (f=2) Insect (f=1)
	True	237	82,9%	
	Total	286	100	
Animal 6 (Caterpillar)				
	*False*	45	15,7%	Moth (f=3) Partridge (f=1) Praying mantis (f=1)
	True	241	84,3%	
	Total	286	100%	
Animal 7 (Butterfly)				

Table 7. *Animal Identification Frequency and Percentage Table (Continued)*

		f	%	Confusable Animal
 Animal 8 (Grasshopper)	*False*	68	23,8%	Praying mantis (f=12) Insect (f=5) Caterpillar (f=1)
	True	218	76,2%	
	Total	286	100%	
 Animal 9 (Frog)	*False*	88	30,8%	Butterfly (f=5) Snake (f=5) Insect (f=3)
	True	198	69,2%	
	Total	286	100 %	
 Animal 10 (Partridge)	*False*	174	60,8%	Duck (f=11) Pigeon (f=10) Bird (f=9)
	True	112	39,2%	
	Total	286	100%	
 Animal 11 (Fox)	*False*	25	9,8%	Wolf (f=21) Lynx (f=2) Canis aureus (f=1)
	True	261	90,2%	
	Total	286	100%	

Table 7. *Animal Identification Frequency and Percentage Table (Continued)*

		f	%	Confusable Animal
 Animal 12 (Ladybug)	False	18	6,3%	Acarine (f=2)
				Insect (f=1)
				Cicala (f=1)
	True	268	93,7%	
	Total	286	100%	
 Animal 13 (Falcon)	False	217	75,9%	Eagle (f=31)
				Hawk (f=28)
				Bird (f=22)
	True	69	24,1%	
	Total	286	100%	

According to Table 7, animals originating from the same genus were also accepted as correct based on the answers given by the students regarding their level of recognition of the animals in their immediate environment and line with the expert opinion. An analysis of the frequencies showed that the most recognized animal was the "Hedgehog" with a rate of 98.6% (f=282). The alternative answer given instead of hedgehog was "Mole" (f=1). The second animal with the highest frequency of recognition was "Ladybug" (f=268), with a rate of 93.7%. In third place was "Fox" (f=261), with a rate of 90.2%. The answer "Fennec fox" was accepted as correct because these two fox species have the same origin as a genus (URL 4).

When the rate of misrecognition or non-recognition of animals is examined, the "Falcon" (f=69) ranks first with a rate of 75.4%. Examining the answers given by the students in place of the animal, it is seen that they most often confused "Falcon" with "Eagle". The second most incorrectly answered or left blank animal was "Magpie" (f=76), with a rate of 73.4%. The third most incorrectly answered animal was "Rock goat" (f=93). According to the response rate, 72.4% of the answers were incorrect. The most common answers given instead of Rock goat were Deer (f=128) and Corinne (f=16).

DISCUSSION AND CONCLUSION

This study aimed to reveal the level of knowledge of 8th-grade students about the subject of biodiversity. The data was analyzed in line with this purpose, and various results were obtained.

It tried to determine the knowledge levels of the students with the achievement test applied in the research. The 27-question achievement test had an average of 10.16 correct answers. This indicates that the knowledge that students are expected to have about biodiversity is below the average score. Also, it was tried to determine whether the students had misconceptions by questioning whether they

were sure of their answers. If the student's answer to the question was incorrect and the student was sure of this answer, it was characterized as a misconception (Tunç et al., 2012). Accordingly, the question with the highest level of misconception was question number 19 (37.4%), while the question with the lowest level of misconception was question 27 (13.6%).

The student scores obtained from the "Biodiversity Achievement Test" were analyzed in terms of several variables, and whether there was a significant difference between these scores and various variables was examined. Accordingly, as the first variable, it was examined whether there was a significant difference between the achievement test score and the gender of the student, and according to the results of the research, it was determined that female students were more successful than male students, while the effect of the gender factor was found to be quite low. Bilgel Aşıcı (2014), who found a similar result, investigated various factors on biodiversity knowledge and concluded that the gender factor created a significant difference. In a study conducted with pre-service teachers, it was concluded that biodiversity awareness levels showed a significant difference in favor of women (Özyurt, 2019). In the study conducted by Bastı (2010), in which the awareness levels were determined by comparing the pictures of plants on the bench with the pictures of the tree, it was stated that the gender factor had no effect.

Considering the effect of the presence of pets, the other variable examined, on the achievement test result, it was concluded that there was no effect for this study. Fıstıkeken (2017), who examined similar variables, stated that there was a significant difference between the rate of pet feeding and gender. Şahin (2018) examined the awareness of biodiversity in terms of several variables, and as a result, it was seen that the pet feeding status caused a significant difference, and it was concluded that it was more in male students. In a similar study (Bastı, 2010), students were shown some plant pictures and asked to recognize them, and as a result, it was concluded that more than 85% of the students living in rural areas recognized these plants.

Another variable examined was whether there was a significant difference between the school where students studied and the scores they received from the biodiversity achievement test. When the six secondary schools were examined, a significant difference was observed between the schools. This result shows that one secondary school has a low level of influence. Fıstıkeken (2017), who reached a similar conclusion, found a significant difference between the school students attended and their recognition of wild animals in their environment.

An examination of whether the student participation in any nature project affected the achievement test showed that whether the student participated in any nature-themed project did not affect the score. Another study found that pre-service teachers' awareness of environmental education increased after receiving ecologically based nature education (Güler, 2009), and their awareness was enhanced by providing various training with an ecology-based summer camp project for middle school students (Karataş & Aslan, 2012). Karabal (2011) also concluded in his study that students' creativity improved with the realization of students' participation in the nature project. In a similar study, it was observed that students' awareness and love of nature increased after a four-day camp in nature (Keçici et al., 2019).

Another situation evaluated in the research is the student's recognition of the plants and animals they see in their immediate surroundings. Examining these rates, it was determined that the average rate of students' recognition of plants was 39.44%, whereas the average rate of students' recognition of animals was 64.07%. At this point, based on the answers given by the students and in line with the expert opinions received, the answers originating from the same genus and the terms used in the local language were accepted as correct. "Rose" and "Şilan" were given instead of rosehip (Korkmaz & Özçelik, 2015), "Crow's onion" was used in the Erzurum region instead of Arabian hyacinth (Korkmaz & Özçelik, 2015). (Bulut, 2005), "Pennyroyal" and "Peppermint" instead of Long leafed mint (URL 5), "Kızanbık", "Kızambık" (Bulut, 2005) and "Kızambık" (Kökler & Çetinkaya, 2022) instead of Barberry plant were accepted as correct, while "Fennec" among the answers given among animals was accepted as correct because it belongs to the same genus as the fox. This case, which was examined in similar

studies, dealt with the examination of the student awareness levels in terms of various variables (class level, parental education, place of living), and it was stated that students recognized 85% of them according to their place of living (Bastı, 2010). Şahin (2018) also examined students' plant and animal recognition levels in their immediate surroundings and found that the rate of recognition of plants and animals was 70.86%.

RECOMMENDATIONS

The sensitivity and awareness of individuals towards the environment who are aware of biological diversity, know the creatures living in their immediate and distant environment and know the benefits of these creatures for the ecosystem also increase at this level. For this purpose, it is necessary to introduce school-aged children to the living creatures in their immediate environment, to provide training on this subject, and to organize events so that they can see the living creatures around them in their natural environments.

NOTES

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