RESEARCH ARTICLE

Investigation of Turkish Seventh Grade Students' Awareness about Nature

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Abstract

The aim of this study is to determine Turkish middle school seventh grade students' awareness about the biotic and abiotic factors which constituted nature and to examine the effects of various variables including gender, living place, the mother' and father' educational level and socio-economic status. For this purpose, The Awareness of Nature Scale is used. A total of 427 students living in rural and urban part of Kutahya provience participated in the study. The gathered data is analysed by using frequency tables and percentages. Besides, independent sample T-test and Analysis of Variance (ANOVA) are used for examining the effect of various variables. The results revealed that middle school seventh grade students' awareness about biotic and abiotic factors is insufficient. No statistically significant effect for gender is detected. The students who live in the urban areas are found to be more aware of the biotic and abiotic factors when compared to the students who live in rural. Moreover, the students who have educated parents and high family income are found to be more aware of the biotic and abiotic factors.

Keywords: Abiotic factors; awareness; biotic factors; nature; middle school students

Introduction

Everything that is formed without human involvement, is described as nature and the entities including soil, underground resources, water, air, plants and animals, living organisms are accepted as the components that form the nature (Keles & Hamamcı, 1993). While the entities including air, water and soil are known as abiotic factors, the entities including microorganisms, plants and animals are known as biotic factors. Biotic and abiotic factors are tied with undetectable bonds and there are ongoing and mutual connections among these factors (Cepel, 2006; Basoglu, 2014). In any case that these mutual connections are flawed by any reason, the natural balance among these factors will be deteriorated (Yildiz, Yilmaz & Sipahioglu, 2005). The individuals who have higher awareness about nature are expected to have better understanding of the nature. Moreover, the individuals who are knowledgeable about the biotic and abiotic factors that form the nature will be more responsible towards their environment and the problems related with environment.

The number of related studies with respect to environment have increased lately. Specifically, environmental problems, and participants' attitudes, perceptions towards

environmental problems have become a topic for investigation both in national (e.g., Ahi, Balci & Alisinanoglu, 2017; Demirbas & Pektas, 2009; Guven & Uyanık, 2012; Higde, Oztekin & Sahin, 2017; Tuncer, Sungur, Tekkaya & Ertepinar, 2004) and in international contexts (e.g., Bunting & Cousins, 1985; Hinds & Sparks, 2008; Liefländer, & Bogner, 2014; Loughland, Reid, Walker & Petocz, 2003; Prokop, Tuncer & Kvasničák, 2007). While most of these studies focused on attitudes of students from various age groups (primary school, middle school, college students and pre-service teachers), the effects of many factors including age (Liefländer & Bogner, 2014: Loughland et al., 2003: Kellert, 1985), gender (Aydin & Cepni, 2012, Erol & Gezer, 2006: Loughland et al., 2003), parents' education level (Aydin & Cepni, 2012: Erol & Gezer, 2006), parents' monthly income (Aydin & Cepni, 2012), and places that the participants live in (rural or urban) (Aydin & Cepni, 2012, Buyuksahin & Demirci-Guler, 2014: Hinds & Sparks, 2008: Tuncer et al., 2004), have been investigated.

The literature investigating these factors present us the aforementioned factors influence individuals' environmental concerns, attitudes and awareness. For instance, Van Liere and Dunlap (1980) emphasized that the factors including occupation, family income and education level are positively associated with the students' environmental concerns. In a similar manner, the studies investigating the effect of age reported that the younger students had more positive attitudes when compared to older students (Liefländer & Bogner, 2014: Loughland et al., 2003: Kellert, 1985). On the other hand, studies exploring the effect of gender presented conflicting results. While some studies reported that girls were more sensitive to environment implying that they held positive attitudes towards environment and environmental problems (Aydin & Cepni, 2012; Erol & Gezer, 2006; Loughland et al., 2003), there also were other studies reported no gender difference (Ahi et al., 2017; Liefländer & Bogner, 2014; Meydan & Dogu, 2008). Other line of research investigating the effect of living in rural or urban on student attitudes revealed similar conflicting results. While some studies reported that the student living in rural are more sensitive and more aware about the nature and the plantations as well as animals living in the nature (Bunting & Cousins, 1985; Hinds & Sparks, 2008; Kellert, 1985), other studies reported students living in urban areas are more aware about their environment (Buyuksahin & Demirci-Guler, 2014; Tuncer et al., 2004).

While most of the aforementioned studies focused on students' attitudes about environment and environmental problems (e.g., Ahi et al., 2017; Aydin & Cepni, 2012; Loughland et al., 2003), there are limited studies that investigated students' awareness. These studies mainly focused on students' awareness about plants or biodiversity (e.g., Yalcinkaya, 2012). Even the nature comprised of biotic and abiotic factors together, there are limited study that focused on students' awareness about biotic and abiotic factors. In fact, Chapman and Sharma (2001) reported that students tended to perceive themselves apart from nature. They believed that the environment and their lives are separate entities. Same finding was reported by numerous studies (Ahi et al., 2017; Chapman & Sharma, 2001; Desjean-Perotta, 2013; Moseley, Desjean-Perotta & Utley, 2010). For instance, investigating pre-service science teachers' mental models about environment by using teacher-generated drawings, Ahi et al. (2017) reported that many teachers did not include human beings as part of environment and tended to draw biotic factors with no interaction with other factors in the environment. Thus, we believe that regardless age (students or pre-service teachers), individuals tended to perceive themselves apart from the biotic and abiotic factors comprising the nature. Increasing individuals' awareness about environment and all the issues related with environment is possible with exploring individuals' awareness about the biotic and abiotic factors. As individuals' awareness about environment tended to decrease with respect to age (Loughland et al., 2003, Van Liere & Dunlap, 1980), it becomes more important to determine young individuals' awareness about biotic and abiotic factors. Thus, we explored middle school seventh grade students' awareness about biotic and abiotic

factors. In addition, we also explored the effects of some factors which are found in literature including gender, living in rural or urban, family income, parents' occupation and parents' education level. As environmental education aims to raise young generations with required knowledge and skills in order to live in harmony with nature and develop positive attitudes towards environment (North American Association for Environmental Education, [NAAEE], 2004), it is crucial to determine young students' awareness about the biotic and abiotic factors that comprises the nature.

Specifically, this study aimed to answer the following research questions:

1. What is the seventh-grade students' awareness about biotic and abiotic factors?

2. Are there any significant differences between seventh grade students' awareness with respect to factors including gender, living in rural or urban, parents' education level and family income?

Context of the Study

At the time of data collection 2013 science curriculum was being used in elementary schools. In Turkey, middle school science curriculum beginning grade 3 to grade 8 has been revised in 2013 and the revised curriculum strongly emphasized the importance of scientific literate individuals who are have required knowledge, skills, positive attitudes, perceptions and values towards science as well as have understanding about the relationship among science, technology, society and environment relationship. These individuals, also, expected to have science process skills which can lead them to discover the nature and enable them to understand the science and environment relationship (Ministry of National Education [MONE], 2013). When the objectives about the nature in the science curriculum examined, it could be seen that the objectives related to nature are appeared from beginning grade 3. The biotic and abiotic factors are introduced in grade 3. The objectives related to microorganisms and their importance are found in grade 4 program. Classification of living things, microorganisms as well as fungi types are appeared in grade 5. Moreover, the students learn how soil is formed, the importance of water, soil and air as well as the pollution types during fifth grade. Students learn the plant classification (phanerogam and cryptogram) and animal classification (fish, amphibians, reptiles, birds and mammals) in grade 6. In grade 7, the students are expected to learn all the previous objectives and expected to develop an understanding about the biotic and abiotic factors comprising the nature (MONE, 2013). Thus, we preferred to focus on seventh grade students' awareness about the nature.

Another revision in science curriculum has taken place from the beginning of 2017. However, the revised curriculum also emphasized the role of nature beginning from the third grade. Similar to 2013 science curriculum, the biotic and abiotic factors are still placed in grade 3. The objectives related to microorganisms are moved to grade 5. The objectives related to fungi types and classification of living things as animals, plants, fungi and microorganisms are still placed in grade 5. While objectives related to environmental problems are found in grade 5, 6, 7 and 8; the objectives related to plant and animal classification are removed in this revised curriculum.

Methodology

This study aimed to investigate seventh grade middle school students' awareness about the biotic and abiotic factors and whether there are any significant differences with respect to a list of variables (gender, living in rural or urban, parents' education level and family income). In order to investigate these research questions, this study was designed as using survey model. Cross-sectional survey type which the data is collected at one point of time is used in present study (Fraenkel, Wallen & Hyun, 2011).

Sample

A total 427 seventh grade middle school students from 15 different public schools living in rural and urban areas of Kutahya which is located in Aegean part of Turkey participated in the study. The sample constituted of 197 boys (46.1%) and 230 girls (53.9%). Among 15 public schools, while six schools were located in urban areas, the other nine schools were located in rural areas of the city. With respect to living in rural or urban, 225 (52.7%) of participants lived in urban and 202 (47.3%) of them lived in rural. The education levels of parents were presented in Table 1.

Table 1.

Distribution of parents' education levels

Parents' education level	Father's education level (%)	Mothers' education level (%)
Illiterate	.2	1.9
Primary school	23.2	41.9
Elementary school	27.2	34.9
High school	35.4	15
Undergraduate degree	12.2	5.9
Graduate degree (Master, PhD)	1.9	.5

When parents' education level examined, it can be seen that majority of the students' parents did not have a graduate degree. While more than a quarter of students' fathers were graduated from high school (35.4%), 15% of their mothers graduated from high school. Very few were reported to be illiterate (0.2% and 1.9% respectively).

With respect to family monthly income, 14.8% of participants' family income was under minimum wage determined by the Turkish Ministry of Labor and Social Security (TMLSS) (0-1000 Turkish Liras-TL). The minimum wage of 2017 was determined as 1404 TL by TMLSS. While more than a quarter's family received minimum wage (30.4%), 26.2% of them received a wage slightly over the minimum wage (1500-2000 TL). 16.2% of participants' family received a wage between 2000-3000 TL. Only 12.4% of the families received a wage over 3000 TL. This implies that the participating students were mid-social class in Turkey.

Data collection tools

Nature awareness scale which was developed by the Kiraz (2016) was used in the study as data collection tool. The scale consisted of two parts. The first part is the demographic information page that includes questions regarding participants' demographic characteristics including gender, the place that the participants lived in (rural or urban), the family income and parents' education levels. The second part is the Nature Awareness scale which also consisted of two parts. In first part, we used written items about the biotic and abiotic factors. In second part, we used visuals in order to examine whether the participants were able to determine the biotic and abiotic factors living in the nature presented in the visuals.

Nature Awareness Scale

Nature awareness scale was developed by Kiraz (2016) was used in this study. It consisted of two parts: While there were items about the biotic and abiotic factors in first part, there were visuals about plants, animals and microorganisms in the second part. The aim of using visuals in second part was determine whether the participants were able to determine the biotic and abiotic factors living in the nature presented in the visuals. For this purpose, an item pool was created by considering the objectives in the science curriculum which was revised in 2013. Two science teachers and three experts in science education department reviewed the items and the visuals in the scale for ensuring content validity. Accordingly, 63 written items and 23 visuals were found in the scale. The scale was dichotomously scored (1 point for correct answers and 0 point for incorrect answers) for written items. The scale was initially pilot tested with 35 seventh grade students. The data obtained from pilot study was subjected to ITEMAN Item analysis program. Item discrimination index (D) and item difficulty index were computed by using ITEMAN. The discrimination index lower than .19 were removed as suggested by Crocker and Algina (1986). Accordingly, the final form of the Nature awareness scale consisted of 40 written items and 23 visuals. Some visuals consisted more than one question. For instance, regarding animals, students were asked to determine whether the visuals are vertebrate or invertebrate. In second part, we asked students to determine the class of the animal presented in the visual (bird, fish, Amphibia, reptiles or mammals). Thus, the students can get a score of maximum 40 points from the visual part of the scale. As a result, a student who answered both parts of the scale (written items and visuals) correctly could get a score of maximum 80 points.

While item difficulty index was computed as .50 indicating a medium difficulty (Oosterhof, 2001), the item discrimination index was computed as .48 implying the scale was constructed with reasonably good items (Ebel & Frisbie, 1986). The scale has a medium difficulty and had a discrimination index over than .20 was considered to be good (Oosterhof, 2001). Finally, the reliability coefficient Kuder Richardson-20 (KR-20) was computed as .82 which is over .70 recommended by Fraenkel et al. (2011). Thus, the scale was considered to reliable as well.

Data analysis

Descriptive statistics were used for describing students' awareness about the items in the Nature Awareness Scale. Students' answers were analyzed by using frequency table. Then inferential statistics (independent sample t-test and Analysis of Variance) were run after checking normality and linearity assumptions (Pallant, 2010). The skewness and kurtosis values were found between +2 and -2 which show the data was not skewed from normal curve. The Kolmogorov-Simirnov test result showed that the data was normal ($p > .05$).

Findings

Findings are presented under two headings as Descriptive statistics and Inferential Statistics.

Descriptive statistics

In this part, students' answers to the Nature Awareness Scale was presented. Of a possible 80 correct response in the scale, students attained a mean of 53.15 (*SD*=8.87) implying a moderate level of awareness. Students' answers with respect to biotic factors (plants, animals, microorganisms and fungi) are presented in Table 2.

Table 2.

Students' responses to the items related with biotic factors

Sample Items	Correct answer (%)	Incorrect answer (%)	Do not know (%)
Plants			
1. Seeds are alive	61.2	16.6	22.2
2. Fruits only grow on trees	15.5	77.5	7
3. Seeds cannot photosynthesize during germination.	30.9	28.6	40.5
Animals			
4. Human beings are classified as animals	58.8	28.6	12.6
5. Mice breastfeed their offspring	39.3	23.9	36.8
6. Any flying animals with wings are classified as birds	32.6	55.5	11.9
Microorganisms			
7. All the microorganisms are harmful	18.3	60.2	21.5
8. We can see microorganisms with bare eyes	22.5	63.2	14.3
9. There are bacteria in yoghurt	66.3	15.7	18
Fungi			
10. Bread mold is alive	55.6	16.4	29
11. Parasol mushrooms are plants	51.1	27.6	21.3

When Table 2 examined, it could be seen that students' awareness of biotic factors in the nature varied. Regarding plants, more than half of the students (61.2%) were aware about the seeds being alive. But the remaining percentage was either did not know or gave incorrect response. In a similar manner, majority of students (77.5%) believed that the fruits only grow on trees which is actually wrong. More than a quarter (30.9%) knew that the seeds cannot photosynthesize during germination. With respect to animals, half of the students (55%) were aware that not all the flying animals are classified as birds. On the other hand, most of the students did not know that mice breastfeed their offspring (60.7%) and that the human are classified as animals (41.2%). When compared to previous biotic factors (plants and animals), students were more knowledgeable with respect to the items about microorganisms. Students were aware that not all the microorganisms are harmful (60.2%), they cannot see the microorganism with bare eyes (63.2%) and there are bacteria in yoghurt (66.3%). Lastly, while nearly half of the participants were aware that the bread mod is alive (55.6%), majority of them were not aware that parasol mushrooms are not plants (72.4%).

Students' awareness with respect to the biotic factors (soil, air and water) was examined in following section.

Table 3.

Students' responses to the items related with abiotic factors

Sample Items	Correct answer (%)	Incorrect answer (%)	Do not know (%)
Soil			
1. Soil is formed in a long time	88.8	2.6	8.7
2. There can be countless number of organism in the soil	80.1	5.6	14.3
3. Dead plant and animal remains make the soil rich and fertile	55	16.2	28.8
Air			
4. Water vapor is found in the air	70.7	8.4	20.8
5. Life cannot exist without atmosphere	73.5	6.1	20.4
6. The ozone layer protects the living things from sun's harmful rays	69.6	8.7	21.8
Water			
7. Aquatic animals can live without getting oxygen	32.3	45.2	22.5

8.	Natural mineral water is an example to surface water	32.8	27.9	29.3
9.	The clouds are formed from evaporation of water	60.2	14.8	25.1

Close examination of the items related to abiotic factors revealed that students were more knowledgeable when compared to biotic factors. Majority of student were aware that the soil is formed in a long time (88.8%) and there are countless organisms living in the soil (80.1%). On the other hand, half of them were aware that dead plant and animal remains make the soil rich and fertile (55%). In a similar manner, majority of students were aware the existence of water vapour in the atmosphere (70.7%), the importance of atmosphere for life (73.5%) and the role of ozone layer (69.6%). While half of them were aware that aquatic animals cannot live without oxygen (45.2%), 60.2% did know that the clouds are formed from evaporation of water. Whereas more than a quarter knew that the natural mineral water is an example to surface water (32.8%).

In second part of the scale, some pictures were presented to the students about animal and plant classification. First, the students were asked to determine whether the given pictures are classified as plant or not. If they thought the picture belonged to a plant, they were asked to determine if the plant is a phanerogram or cryptogam. Their answers were presented in Table 4.

Table 4.

Students' answers to the pictures about plant classification

Samples in the pictures	Plant (%)	Not plant (%)	Phanerogam (%)	Cryptogam (%)
Rose	99.3	.7	97.4	1.9
Apple	87.4	12.6	74.7	12.6
Sword fern	96.3	3.7	14.5	81.7
Parasol mushrooms	54.3	45.7	7	47.3
Pine	92.3	7.7	24.8	67.4

A great majority of students were aware of that rose, apple, pine and sworn ferns were classified as plants. On the other hand, half of them thought that parasol mushrooms were also classified as plants which is actually incorrect (54.3%). After classifying the pictures as plant or not plants, they also classified the plants as a phenerogram or cryptogam. While great majority were aware of that rose is phanerogam (97.4%), 74.7% were aware that the apple is also classified as phanerogam. Whereas only a quarter knew that pine is classified as phanerogam. Lastly, 81.7% were aware that sword fern is cryptogam.

The other pictures found in the scale belonged to animal classification. Five animal examples were presented and students were asked to classify which classes those animals belong to. After determining the animals' classes, they were asked to determine whether these animals were vertebrate or invertebrate. While great majority were aware that the rabbits are mammals (83.6%), nearly half thought that the bats and hedgehogs are also mammals (48.5% and 50.8% respectively). On the other hand, 45.2% of

students thought that bats belong to bird class. With respect to vertebrate and invertebrate classification; the students were aware that the rabbits, the bats and the hedgehogs are vertebrates (96.3%, 73.3% and 70.5% respectively).

Inferential statistics

For investigating second research question of this study, we used independent sample t-test and analysis of variance (ANOVA). First, the effect of gender was investigated. Independent sample t-test was conducted in order to investigate the effect of gender and living place (rural or urban). There was no significant difference in awareness scores for boys (M = 53.12, SD = 8.02) and girls M = 53.16, SD = 8.52; t(424) = -.042, p= .97 implying that the gender did not affect the students' awareness about the biotic and abiotic factors. The t-test results with respect to students' scores living in rural and urban revealed that the students living in urban had higher mean scores (M = 54.99, SD = 8.56) when compared to the students' mean scores living in urban (M = 51.09, SD = 7.45); t(424) = 5.03, p < .05. This result implied that the students living in urban were found to be more aware about the biotic and abiotic factors comprising the nature (see, Table 5).

Table 5.

T-test results with respect to students' living in rural and urban

Living place					
	N	Mean	Standard Deviation (SD)	t	p
Urban	225	54.99	8.56	5.03	.00
Rural	202	51.09	7.45		

p<.05

In order to investigate parents' education level, one-way between groups ANOVA was used. First, the effect of mothers' education level was investigated. The ANOVA results revealed that there was a statistically significant difference in students' awareness about nature with respect to the students' mothers' education level; F(5, 421) = 8.06, p < .001. Post-hoc comparisons using Scheffe test revealed that the students' whose mothers holding graduate degree (X=60.48, SD=6.78) had significantly higher scores in the scale than the students whose mothers were illiterate (X=45.37, SD=9.88), primary school graduate (X= 52.48, SD = 8.16) and middle school graduate (X= 51.98, SD = 7.95). In a similar manner, students whose the mothers holding high school diploma had significantly higher scores (X= 55.75, SD = 7.55) than the students whose mothers were illiterate (see, Table 6). Altogether, these results indicated that the students with more educated mothers were found to be more aware with respect to the biotic and abiotic factors comprising the nature.

Table 6.

Analysis of variance results with respect to mothers' education level

	Sum of squares	df	Mean Square	*F*	*p*	Difference*
Between groups	2548.23	5	509.65			*5*-1
						5-2
Within groups	26634.77	421	63.27	8.06	.00	*5*-3
						4-1
Total	29182.99	426				

(Illiterate=1, primary school=2, middle school=3, high school=4, undergraduate degree=5, graduate degree=6)

*Italics indicates education level in which differences mostly appeared in favour

We, then, examined the effect of fathers' education level. The ANOVA results revealed that there was a statistically significant difference in students' awareness about nature with respect to fathers' education level; $F(5, 421) = 7.18$, $p < .001$. As shown in Table 7, the post-hoc comparisons using Scheffe test showed there were significant differences between the students' mean scores whose fathers had graduate degree ($X= 57.50$, $SD = 7.87$) and had primary school degree ($X = 52.33$, $SD = 7.91$) as well as whose fathers were illiterate ($X = 52.53$, $SD = 8.12$). Fathers' education level was also found to be an effective variable on students' awareness about the nature. In a similar manner, there was significant difference between the students' mean scores whose fathers had high school degree ($X = 53.83$, $SD = 8.02$) and had primary school degree ($X = 50.53$, $SD = 8.12$). The mean differences among fathers' education level indicated that the students who had more educated fathers were more aware about the nature.

Table 7.

Analysis of variance results with respect to fathers' education level

	Sum of squares	df	Mean Square	*F*	*p*	Difference*
Between groups	1862.74	5	465.68			*4*-2
						4-3
Within groups	27296.64	421	64.84	7.18	.00	*3*-2
Total	29159.37	426				

(Illiterate=1, primary school=2, middle school=3, high school=4, undergraduate degree=5, graduate degree=6)

*Italics indicates education level in which differences mostly appeared in favour

As part of second research question of this study, whether family income does effect students' awareness was investigated. While the students whose family income were under minimum wage got a score of 49.79 ($SD = 6.77$), the students whose families received minimum wage got a mean score of 52.48 ($SD = 7.50$). The students who had families receiving a wage between 2000-3000 TL ($X= 54.43$, $SD = 7.86$) had higher mean scores than the students who had families just slightly over the minimum wage ($X = 53.56$, $SD = 9.39$). Lastly, the students who had families receiving over 3000 TL got a mean score of 56.19 ($SD = 8.28$). It was noted there were an increase in mean scores

when the family income increased. Thus, we performed ANOVA in order to determine the existed differences were statistically significant. The results were shown in Table 8.

Table 8.

Analysis of variance results with respect to family income

	Sum of squares	df	Mean Square	F	p	Difference*
Between groups	1389.58	4	347.40			*5-*1
						4-1
Within groups	27793.42	422	65.87	5.28	.00	
Total	29183	426				

(Below the minimum wage (under 1404 TL) = 1; minimum wage = 2; slightly over the minimum rage (1500-2000 YL) =3; the wage between 2000-3000 TL= 4; the wage over 3000 TL = 5)

*Italics indicates family income in which differences mostly appeared in favour

The ANOVA results revealed that there was a statistically significant difference in students' awareness about nature with respect to family income; $F(4, 422) = 5.28$, $p < .001$. Scheffe test showed there were significant differences between the students' mean scores whose family received over 3000 TL ($X = 56.19$; SD = 8.28) and had family income lower than the minimum wage ($X = 49.79$; SD = 6.77). Likewise, the students who had family income between 2000-3000 TL ($X = 54.43$, SD = 7.86) had significantly higher mean scores when compared to the students who had family income lower than the minimum wage. It can be concluded that students who had higher family income tended to be more aware about the biotic and abiotic factors comprising the nature.

Discussion

This study aimed to investigate seventh grade students' awareness about biotic and abiotic factors and whether the factors including gender, living in rural or urban, parents' education level and family income have significant effect on students' awareness. With this respect, we first discussed the findings related to students' awareness about biotic and abiotic factors.

The descriptive statics about biotic and abiotic factors revealed that participants' awareness varied with respect to factor being investigated. The students were mainly unaware about the biotic factors comprising plants, animals, microorganisms and fungi. For instance, more than half of the students were not aware that the fruits do not only grow on trees. While most of the students were able to identify the most of the plants correctly, they were less aware of the plant is phanerogam or cryptogam. Most of the students thought that pine is cryptogam as they do not see flowering plants like in apple or rose. Actually, pines are gymnopserms and the seeds are not enclosed in fruits, thus, most of students thought that the pines are not seed bearing plants. In fact, previous studies related with plants and plant identification also reported similar results (Anderson, Ellington & Jones, 2014; Bebbington, 2005; Gatt, Tunnicliffe, Borg ve Lautier, 2007; Yakisan, Selvi & Yuruk, 2007). While Yakisan et al. (2007) reported that students had difficulties in identifying cryptogam and phanegoram plants, Anderson et al. (2014) reported that students tended to draw flowering plants more when compared to other type of plants. Likewise, Bebbington (2005) also indicated that while students were able to recognize some plants such as daisies which the students commonly encounter in

children's books, only a few students were able to identify more than three wild flowers. These findings implied that the students could identify the plants as having flowers and tended to ignore other phanerogams which do not produce flowers (gymnosperm). Another explanation about students' insufficient knowledge regarding plant is that the plants are not well covered as animals in national curriculum as Bebbington (2005) refereed. Most of the students in present study also thought that seed can photosynthesize during germination which is reported to be a common misconception in the literature (Toman, Odabasi Cimer & Cimer, 2015).

With respect to animals, most of the students knew that the human beings classified as animals. Whereas, they had difficulties in understanding that the mice are mammals which breastfed their offspring and any flying animals with wings cannot be classified as birds. In a similar manner, only half of the students were able to identify the bats are mammals in visuals. This finding is parallel with the findings of similar study which reported that students had difficulties in animal classification and they believed that flying animals like butterflies and bats are classified as birds as well as believing that penguins, seals and dolphins are fish (Dikmenli, Cardak & Turkmen, 2002). This may be related with students' insufficient understanding about animal classification which can stem from students' daily life experiences.

Students in our sample also have moderate understanding regarding microorganisms. Even they knew there are bacteria in the yoghurt, they indicated all the microorganisms are harmful and the microorganisms can be seen by bare eyes. This common misconception about all the microorganisms as being harmful supports the findings of previous studies which showed that the microorganisms were regarded as pathogens (Williams & Gillen, 1991; Gillen & Williams, 1993). Students also were moderately knowledgeable about the fungi. Half of the students did not know that the bread molds are alive and thought that the fungi were plants. This might be due to students' understanding about the mushrooms are grown in the soil, so do the vegetables. Thus, they could think the fungi are plants. Indeed, previous studies (Anderson et al. 2014; Tunnicliffe & Reiss, 2000) also reported similar findings. The interviews conducted with students showed that the students believed that mushrooms are plants as because they are eatable and collected from the soil (Anderson et al. 2014). This can be another explanation as being eatable make the mushroom belong to plant class because plants are also eatable for most students.

When the descriptive results regarding abiotic factors are examined, it could be seen that students were more aware about the abiotic factors including soil, air and water when compared to biotic factors. Actually, this finding contradicts Prokop et al.'s (2007) finding which reported that students tended to draw biotic factors including animals and plants more frequently when compared to abiotic factors such as sun or soil. On the other hand, some studies suggested that students were aware what is needed for a plant to stay alive. Thus, they were aware of the abiotic factors as Tunnicliffe and Reiss (2000) indicated. In similar manner, Anderson et al. (2014) also stated that students were aware about the abiotic factors including sunshine, water and soil which are needed for plants.

The second research question of this study investigated whether factors including gender, living in rural or urban, parents' education level and family income affect students' awareness. Statistical analyses did not reveal any gender difference with respect to students' awareness. In fact, Van Liere and Dunlap (1980) explained that there is no consensus about whether gender is associated with participants' environmental concerns. They reviewed a wide range of past studies and reported that the gender was not substantially associated with environmental concerns. While there were studies which support lack of relationship between gender and environmental concerns (e.g., Ahi et al. 2017; Meydan & Dogu, 2008), there were other studies which

reported contradicting results with Van Liere and Dunlap's (1980) study (e.g., Aydin & Cepni, 2012; Erol & Gezer, 2006; Loughland et al. 2003). In some of these studies, girls were reported to be more concerned toward environment and environmental problems (Erol & Gezer, 2006; Loughland et al. 2013). Whereas, Aydin and Cepni (2012) reported vice versa.

Regarding the residence (living in rural or urban), the students living in urban were found to be more aware about the biotic and abiotic factors comprising the nature. This finding supports the previous studies which reported that students living in urban areas were more aware about the nature and the plantations as well as animals living in the nature (Buyuksahin & Demirci-Guler, 2014; Tuncer et al. 2004; van Liere & Dunlap, 1980). There could be two explanation about students' awareness living in urban: First, the students in the urban areas could be more aware about the effects of industrialization on the environment (Tuncer et al. 2004). The second explanation is the individuals living in urban are faced with the effects of environmental problems more frequently when compared to their counterparts living in rural (Van Liere & Dunlap, 1980). Whereas, there are other studies which reported no effect of residence (Erol & Gezer, 2006) and reported that children in rural had more positive attitudes towards environment (Hinds & Sparks, 2008, Kellert, 1985). Hinds and Sparks (2008) explained the reason of rural children holding more positive attitudes as those children are more connected to the environment they live in.

We revealed that parents' education level affected students' awareness towards nature. The students with more educated parents were tended to be more knowledgeable about the biotic and abiotic factors. In line with this finding, Aydin and Cepni (2012) reported that students with more educated fathers held more positive attitudes towards environment. Van Liere and Dunlap (1980) also reported a positive association between environmental concerns and education level. They explained this positive association as educated and upper/middle classes fulfilled their basic needs and thus, more concerned with environmental issues. Indeed, in our study, we also found that the students who had higher family income tended to be more aware about the biotic and abiotic factors comprising the nature. Even Van Liere and Dunlap (1980) indicated existence of a positive association between environmental concerns and education level, they failed to report a positive association between income and environmental concern.

Conclusions, Limitations and Implications

To conclude, this study focused on identifying seventh grade students' awareness about biotic and abiotic factors comprising nature as well as determining the effects of various factors which are reported to be related with students' environmental attitudes and concerns including gender, residence (living in rural or urban), family education level and family income. The results revealed students' awareness about biotic and abiotic factors were insufficient. This result left us bigger question: How can we increase our students' awareness about biotic and abiotic factors? In fact, previous studies also reported that the students tended to perceive themselves apart from the nature (e.g., Ahi et al. 2017; Chapman & Sharma, 2001, Desjean-Perotta, 2013; Moseley et al., 2010). Unless increasing their awareness towards the factors comprising the environment they live in, it would be difficult to hold positive attitudes toward environment as well as take responsibility of their actions in environmental problems. Previous studies also reported that students' positive attitudes towards environment tended to decrease with age (e.g., Loughland et al., 2003, Kellert, 1985; Van Liere & Dunlap, 1980). Thus, it is a necessity to focus on students' awareness about the biotic and abiotic factors beginning from early ages. With this study, we tried to present some significant findings which can lead both national and international environmental educators and science teacher educators as

well as science teachers to focus on biotic and abiotic factors more in their lessons, national science programs and in their courses.

This study also had some limitations which can prevent our findings to further generalize Turkey population. As we specifically focused on seventh grade students' awareness of biotic and abiotic factors living in rural and urban areas of Turkey, the researchers needed to choose a location for data collection. the selection of location was done conveniently. Thus, in future, we propose more locations to collect data in order to increase the generalizability of the study.

Even we presented some significant findings, our findings were quantitative and were limited to the items found in the instrument which was developed by Kiraz (2016). Thus, conducting qualitative or mixed method studies for presenting more evidences about students' awareness of biotic and abiotic factors will be useful to get more in-depth views about the students' awareness.

The literature reported that extracurricular activities including school garden projects (e.g., Urey & Cepni, 2014), eco-schools (e.g., Chapman & Sharma, 2001) and field trips (e.g., Prokop et al., 2007) can be useful in enhancing students' knowledge about ecology concepts and helping students to develop more positive attitudes towards environment. Thus, it could be an effective way for science teachers to benefit from these kinds of extracurricular activities.

Teacher themselves should be aware of biotic and abiotic factors comprising the nature itself. Besides science textbooks which were reported to mainly focus on animals and neglect plants and other factors, Bebbington (2005) emphasized science teachers had little knowledge about plants and animals. Thus, another recommendation may be implementation of in-service training programs aiming to increase awareness towards biotic and abiotic factors for science teachers.

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7. Sınıf Öğrencilerinin Doğa Hakkındaki Farkındalıklarının İncelenmesi

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Özet

Bu araştırmanın amacı, 7. Sınıf öğrencilerinin doğayı oluşturan biyotik ve abiyotik faktörler konusundaki farkındalıklarını ve cinsiyet, yaşam alanı, anne-baba eğitim düzeyi, sosyoekonomik durum gibi çeşitli değişkenlerin öğrencilerin farkındalıklarına etkisini incelemektir. Bu amaçla, Kiraz (2016) tarafından geliştirilen Doğa Elemanları Farkındalık Ölçeği kullanılmıştır. Çalışmaya Kütahya ilinde bulunan köy ve şehir merkezinde öğrenim görmekte olan 427 öğrenci katılmıştır. Toplanan veriler, betimsel olarak analiz edilmiş ve T-testi ve ANOVA testleri kullanılarak çeşitli faktörlerin etkileri incelenmiştir. Sonuçlar, ortaokul 7. Sınıf öğrencilerinin biyotik ve abiyotik faktörler konusundaki farkındalıklarının yetersiz olduğunu ortaya koymuştur. Cinsiyetin etkisi bulunmazken, şehir merkezinde yaşayan ve gelir düzeyi yüksek olan öğrencilerin farkındalıklarının köylerde yaşayan öğrencilere göre daha yüksek olduğu bulgular arasındadır.

Anahtar Kelimeler: abiyotik faktörler, farkındalık, biyotik faktörler, doğa, ortaokul öğrencileri.

IEJEE
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