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RESEARCH ARTICLE

Determination of Pre-service Teachers' Awareness of Plants

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Abstract

Human beings do not usually recognize plants although they exist widely in their environment. This condition has been described as plant blindness in literature. The main purpose of this study is to examine pre-service elementary teachers' awareness of plants. Moreover, the study examined from which sources student-teachers gained knowledge about plants. This study was designed as a survey model. The data of the study were obtained from the questionnaire consisting of two open-ended questions. The study group of this research consisted of 308 student-teachers. The participants receive teacher training at a state university located in Turkey's Aegean coast. Frequencies and percentages were calculated for the data analysis. The results of this study revealed that pre-service elementary teachers have got symptoms of plant blindness. The source of knowledge for plants is not usually formal science education. In addition to this, the results of this study suggest that student-teachers have a tendency to form aliveness concept with animistic and anthropocentric perspectives. In the light of these results, it is highlighted that there is a need to support pre-service elementary teachers' awareness of plants to prevent young children's plant blindness.

Keywords: plant blindness, plant awareness, plants.

Introduction

Plants are very important for ecosystems. Plants produce energy necessary to maintain their vital activities by performing photosynthesis. The food produced by plants is the first level of food chain in an ecosystem. In addition to this, photosynthesis forms the basis of carbon-oxygen-cycle in nature. In other words, all living things need plants for two vital activities like nourishment and respiration. Moreover, plants are home for many living beings like some birds, insects, and etc. Plants prevent erosion and also help reduce the damage caused by the wind in the environment. Man used plants to treat many illnesses. According to the data of World Health Organization (WHO), nearly 20.000 different plant species have been used for medicinal purposes (Toksoy, Ayyıldız, & Gümüş, 2003). Plants are raw materials for soap, varnish, oil paint, cream and many industrial fields. Due to these reasons, the whole life depends on animals and it has become a motto (Wandersee, Clary, & Guzman, 2006).

People do not know for sure how many living species exist on Earth. However, it is estimated that more than 10 million living creatures exist on the planet. 6.7 million of species are invertebrates (e.g, insects, arthropoda, mollusks). It is estimated that there are 5 million insect species. Nearly 80.00 of species are vertebrates (e.g, mammals,

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birds, and reptiles). 5.500 of the vertebrates are mammals. It is estimated that nearly 400.00 plant species exist on the planet. 350.00 of plant species are flowering plants (angiosperms) (Chapman, 2009). These numbers demonstrate the importance of plants for biodiversity of the planet.

Turkey has a rich vegetation and high endemism due to its climate, rugged topography, high altitude, and ecosystem diversity (e.g, forest, steppe, coast, sea and wetland). Turkey hosts more than 10.00 plant species. More than 3.000 of plant species (approximately 35%) that grow in our country are endemic plants. Three quarters of all plant species existing in Europe also grow in Turkey. Wild relatives of many agricultural plant species like cherry, apricot, almond, fig, wheat, chickpea, lentil, apple, pear, and chestnut are of Turkish origin. Turkey is also home of many ornamental plant species (Organisation for Economic Co-operation and Development [OECD], 2008).

Many plant species nearly all over the word are under serious threats due to the reasons like deforestation, air, water, and land pollution, unconscious industrialization, overgrazing, and rapid population growth. According to the Living Planet Report published by The International Union for Conservation of Nature (IUCN) in 2012, the biodiversity of the world declined by 30% between 1970 and 2008 (Living Planet Report, 2012). IUCN prepares the list of the animal and plant species that became extinct and are endangered and this list is known as The Red List. The Red List is the world's most comprehensive inventory of global conservation status of biological (animals and plants) species. According to The IUCN Red List of Threatened Species published in 2006, 16.118 biological species are endangered in the world. More than 13 plant species became extinct in the 19th and 20th centuries in Turkey and 8 of these plant species are endemic. 250 plant species are likely to become endangered (The Ministry of Environment,2001; İskender, Zeynalov, Ozaslan, İncik, & Yayla, 2006). These data reveal that our world and country have become uninhabitable places. The governments, national, and international organizations develop strategies to conserve environment. But, as stated by Fancovicova and Prokop (2011), if a society is not aware of floristic richness of its environment, it is almost impossible to love and conserve that natural richness.

Human beings are unable to recognize or see plants despite their common existence around them. Wandersee and Schussler (2001) conceptualized the term plant blindness to describe the people's lack of awareness of plants and neglect of plants. Many studies in literature exhibit that mostly children and adults suffer from the symptoms of plant blindness. For example, Gatt, Tunnucliffe, Borg and Lautier (2007) reported that 4 - 5 year old Maltese children were not as enthusiastic as they were about animals while they were talking about plants. Patrick and Tunnicliffe (2011) focused on 4 - 10 year old American and English children's naming animals and plants around them in their study. The results of this study revealed that beginning at very early ages, children recognize the animals in their environments and they named animals at the age of 8. However, children could not achieve the same success with the plants. Tunnicliffe (2001) analyzed the talk among the 7-11 year old children visiting a botanical garden throughout their visit. It was found in this study that only 7% of the talk was about the plants. Yorek, Şahin and Aydın (2009) carried out a study with the 9th grade students and they asked the participants to write 10 living things that come to their minds. The findings of their study revealed that students did not include any plants in their lists. Schussler and Olzak (2008) in their study compared the botany students and psychology students' recall of plant and animal images at college level. The results of their study demonstrated that taking a botany course was not effective in knowing plants by name. Moreover, the results of this study revealed that botany

education was not adequate to place plants in children's conscious perceptions. There also other studies which suggest that schools are usually not children's only source of knowledge about plants (e.g. Gatt et.al., 2007; Jewell, 2002; Patrick & Tunnicliffe, 2011; Tunnicliffe, 2001). Due to all these reasons, there is a need to prevent plant blindness beginning at very early ages (Wandersee, Clary, & Guzman, 2006) and adult education is very important to achieve this purpose (Gatt et al., 2007). It is not enough but required for teachers not to have the symptoms of plant blindness to promote children's awareness of plants. The main purpose of this study is to determine the pre-service elementary teachers' awareness of plants. The study sought answers to these two research questions:

1. What is pre-service elementary teachers' awareness of plants like?
2. From which sources do pre-service elementary teachers acquire knowledge about plants?

Methodology

The purpose of this study is to examine pre-service elementary teachers' plant blindness. Survey model was used in the research study. Survey is used to describe and explain the characteristics of a phenomenon or a population being studied in detail. In this model, a phenomenon or a population being studied cannot be manipulated. The population or phenomenon is examined under their natural conditions (Çepni, 2007). There are other research methods which examine the existing situation and present it as is. But, surveys are used to qualify the characteristics of an extensive sampling. In this method the main purpose is to make generalizations by examining a large group (Büyüköztürk, Kılıç Çakmak, Akgün, Karadeniz, & Demirel, 2014). Because many pre-service elementary teachers' existing conditions about plant blindness were examined, this study was designed as a survey model.

Working Group

The working group of this research study consisted of 308 student-teachers studying in a university located in Turkey's Aegean coast. The university where the study was carried out is a state university. The university's faculty of education has been training teachers for 16 years. The faculty of education has undergraduate, masters and doctoral programs. Primary education teacher training lasts four years in Turkey. All of the participants in the study were studying in primary education teacher training program in education faculty. Student-teachers studying between the 1st and 4th grades participated in the study. There were between 80 and 95 students in each education level. However, the data could not be gathered from nearly 10-15 student-teachers in each education level. The information about the working group of the research was presented in Table 1.

Table 1.

Demographic characteristics of the pre-service elementary teachers in the working group

Grade	***Girls***		***Boys***		***Total***	
	f	*%*	*f*	*%*	*f*	*%*
Grade 1	60	19.5	18	5.8	78	25.3
Grade 2	59	19.1	21	6.8	80	26.0
Grade 3	52	16.9	19	6.2	71	23.1
Grade 4	55	17.9	24	7.8	79	25.6
Total	226	73.4	82	26.6	308	100.0

Gathering Data

The data of the study were obtained via questionnaire consisting of two open-ended questions. The first question was "Write down the names of 10 living things that come to your mind first." This question was adapted from the study of Yoreket al. (2009). Yoreket al. (2009) in their study aimed at exploring how the 9th grade students composed their understanding of living things. Their questionnaire consisted of other questions apart from this question. Based on the findings obtained from this question in the questionnaire, they stated that their participants were likely to have the symptoms of plant blindness. Due to this reason, it was considered that this question could be used to identify the participants' plant blindness. Permission was taken from Yorekto use this question. Moreover, his opinion was asked whether or not this question could be practised with the pre-service elementary teachers. The participants were asked in the second question of the questionnaire to write their source of knowledge for every living thing they wrote. The questionnaire questions were put in a table in order to gather data thoroughly. The participants wrote down the names of living things that came to their minds in one of the columns of the table. They wrote down from which source they gained knowledge about that living thing on the right column of this column. The data collection tool was introduced to take opinions of a team of experts, consisting of a biology educator, a science teacher, and a language expert. The piloting of the questionnaire was carried out with six student-teachers and three teachers who did not participate in the study. This questionnaire was used by Çil (2015) in another study.

The questionnaire was implemented by the second author of this study. No time limit was given to complete the questionnaire. The participants answered the questions in the questionnaire within the time they needed. The participants usually finished the questionnaire in 10-15 minutes. The data were collected in 2015-2016 academic year.

Analyzing Data

Content analysis was used for the analysis of the qualitative data gathered from this research study. Content analysis is to make inferences based on coding and categorization of qualitative data (Stemler, 2001; Yıldırım & Şimşek, 2005). The responses given to the first question of the questionnaire were analyzed to find answers to the first research question. While analysing the first question of the questionnaire, firstly frequencies and percentages for each living thing in the participants' lists were calculated. The most frequently and the least appreciated living things were tried to be determined by the participants with this way. Then, the living things written down by the participants were classified into kingdoms of living things. There were five kingdoms in participants' list of living things and these were animals, plants, fungi, protists, and monerans. Appreciation frequency and percentages for each kingdom was calculated. Finally, the perspectives the participants used to make the list of living things were tried to be identified. In this process, a method similar to Yörek, Ugulu and Aydın (2016) was followed. The participants who ranked human beings as first in the list of living things and who wrote mostly animals in the rest of the list were categorized as the ones who had anthropocentric perspective. The ones who wrote animals in the first five ranks of the living things' list were categorized as the ones who had animistic perspective. Frequencies and percentages of anthropocentric and animistic categories were calculated.

The responses given to the second question in the questionnaire were analyzed to find answers to the second research question. The participants were asked to write where they learned about each living thing in their lists with this question of the questionnaire.

While analyzing this question, firstly all of the sources of knowledge expressed by the participants were listed. Then, similar knowledge sources were integrated. For example, such expressions as they existed where I lived and I saw it were integrated. Then, these sources of knowledge were tagged. For example, the sources of knowledge mentioned a short time ago were tagged as real-life experiences. Frequencies and percentages of knowledge sources were calculated.

The research data were analyzed by the second author of this paper. The analyses were checked by the first author.

Findings

This study sought answers to two research questions. The findings obtained for each research question were given under separate titles.

Findings related to the pre-service teachers' plant awareness

The responses of the participants to the first question of the data collection tool were analysed in three steps in order to finds answers to this research question. The findings obtained were presented in table 2, 3, and 4. Table 2 presents the most frequently appreciated living things by the pre-service elementary teachers.

Table 2.
Pre-service elementary teachers' most frequently appreciated living things

Living thing(s)	*f*	*%*
Dog	205	66.5
Cat	200	64.9
Bird	120	38.9
Lion	108	35.0
Snake	102	33.1
Fish	83	26.9
Human	71	23.0
Tiger/Cheetah	35	21.7
Cow	64	20.7
Horse	60	19.4
Elephant	56	18.1
Chicken	54	17.5
Monkey/Mouse	46	14.9
Daisy*	43	13.9
Tree*/Rose*/Rabbit/Ant	41	13.3
Dolphin	37	12.0
Crocodile	36	11.6
Turtle/Whale	32	10.3
Sheep/Squirrel	29	9.4
Worm/Bear/Penguin	27	8.7
Donkey	26	8.4
Butterfly/Goat	25	8.1
Shark/Bee/Chamaeleon	22	7.1
Flower*/Eagle/Insect/Wolf	21	6.8
Octopus/Housefly	19	6.1
Fox/Pigeon/Lizard	17	5.5
Equus/Deer/Parrot/Panda	16	5.1

*Name of plant specimen. The table showed 5% and more value.

When Table 2 is examined, it is seen that dog and cat take place in more than half of the participants' list of ten living things. A bird is included in nearly 40% of participants' favourite living thing's list. There are no plants among the ten living things with the highest frequency. The plant with the highest frequency is daisy. A daisy is included in only 14% of the participants' favourite living thing's list. Table 3 summarizes the distribution of pre-service elementary teachers' list of ten living things considering the kingdoms of living things.

Table 3.
Pre-service elementary teachers' most frequently appreciated kingdoms of living things

Kingdoms of living things	***f***	***%***
Kingdom of animals	44	92
Kingdom of plants	4	8
Kingdom of fungi	0	0
Kingdom of protists	0	0
Kingdom of monerans	0	0
Total	48	100

When Table 3 is examined, it is revealed that there are 48 different living things in participants' list and only 8% of them are plants. The perspectives pre-service elementary teachers used to approach the aliveness concept were presented in Table 4.

Table 4.
Pre-service elementary teachers' animistic and anthropocentric perspectives

Perspective	***f***	***%***
Animism	125	40.5
Anthropocentrism	35	11.3
Total	160	51.8

Table 4 shows that there are animals in the first five ranks of the 40% of participants' list of ten living things. Human is ranked first in 11% of participants' favourite list of living things.

Findings related to the pre-service elementary teachers' source of knowledge about plants

Table 5 presents the sources of knowledge pre-service elementary teachers gained knowledge about plants.

Table 5.
Sources of pre-service elementary teachers' knowledge about plants

Source of knowledge	***f***	***%***
Real-life experiences	173	56.1
Formal science teaching	18	5.8
Television	14	4.5
Book	10	3.2
Documentary	8	2.5
Magazines	6	1.9
Parents	3	0.9
Internet	2	0.6

When Table 5 is examined, it is found that more than half of the participants' sources of knowledge about plants are their real-life experiences. The ratio of formal science education which pre-service elementary teachers got throughout their lives is only 6% for being a source of knowledge about plants. The ratio of the parents and internet for being source knowledge about plants is not even 1%.

Discussion

Plants are very important for the whole ecosystems on the planet. Because mankind uses nature roughly nearly everywhere in the world, the floristic richness is under threat. There is need for individuals to conserve floristic diversity. The aim of this study is to examine pre-service elementary teachers' awareness of plants.

One of the main qualities of plant blind individual is that he does not take notice of plants around him (Wandersee & Schussler, 2001). Due to the altitude differences in short distances, climate change from the coast to the inland, and its position between Europe and Asia, the country where this study is carried out has a rich flora and high endemism. It is determined that the city centre where the university is located has 86 family, 327 genus and 555 species in its flora. Some plants found in the city centre flora are used in dyeing. Madder (rubia tinctorum) and weaving have an important place in region's art, culture, and tourism (Etikan, Sevinç, & Balcı, 2009). Oil has been produced from many plants in the city centre flora. This oil is used for making soap, cream, and so on (Küçükala, Durmuşkahya, & Koray, 2010). The university campus where this study was carried out has large forest and green areas. Ceylan (2009) carried out a study to determine university campus flora and identified 62 family and 233 genus, 275 species, 72sub-species and 39 varieties. When the responses to the first question of the questionnaires used to gather data in this research study were evaluated, it was found that unfortunately the pre-service elementary teachers' list of living things did not include examples from this rich flora (Table 2).

Secondly, the pre-service elementary teachers' list of living things mostly involved animals (Table 2 and 3). Most of the pre-service elementary teachers' list of living things included animals in the first five ranks, in other words, they approach the concept of aliveness with animistic perspective (Table 4). This condition suggests that pre-service elementary teachers are more interested about learning animals than plant and they neglect plants. This is one of the characteristics of plant blind individuals.

In addition to these, the pre-service elementary teachers' lists of living things include flower and tree (Tablo 2). It can be stated that the pre-service elementary teachers perceive all of the flowering plants as only one plant. Similarly, it can be mentioned that they also perceive different tree species as only one plant. Wandersee and Schussler (1999) suggest that people's identification of many plant species as single plant is due to their perception of them as background. It is like people's seeing the forest as a whole but not being able to realize the diversity in it. And this is one of the signs of inability to see plants. Due to all these reasons, it can be argued that the pre-service elementary teachers suffer from the symptoms of plant blindness. This result is similar to the results of research studies which interpreted young children (Gatt et al., 2007; Fancovicova & Prokop, 2010; Kinchin, 1999; Patrick & Tunnicliffe 2011) and college students' (Schussler & Olzak 2008) awareness of plants in literature. Moreover, it is similar to the results of the studies which examined the high school students' cognitive structures about aliveness concept (Yorek et al., 2009; Yorek et al., 2016).

In literature people's neglect of plants and being more interested in learning about animals were tried to be explained depending on different reasons. These reasons

can be grouped into three categories. The first reason is the functions of brain and the underlying ways for its perception. Human brain perceives different things in its environment. Plants are not usually different or extraordinary things (Strgar, 2007). The second reason is the concrete features that living things have. For example, while animals move suddenly, plants are perceived as stationary by the people (Allen, 2003; Tunnicliffe, 1996) and animals have features like communicating with sound and reacting to people (Kinchin, 1999; Strgar, 2007). The third reason is science and/or biology education given in schools. Plants are frequently emphasized in the curricula but teachers are zoochauvinists in biology teaching in their classes. Moreover, teachers spare less time for teaching plants. While giving examples from living things, they rarely use plants. Course books include less information about plants and when compared to animals, they provide images and specific labels for fewer plants (Schussler & Olzak, 2008). It seems that it is not likely to change the concrete features the livings beings possess. Thus, it can be a good solution to design and implement instructions which focus on plants' extraordinary features and emphasise all the kingdom of living things together to prevent plant blindness.

The second research question of this study is to determine from which sources the pre-service elementary teachers learned about the plants included in their list of ten favourite living things. The findings of this research study indicate that the pre-service elementary teachers' source of knowledge about plants is not usually science education which they take throughout their lives in schools. The pre-service elementary teachers usually gain their knowledge about plants via their real- life experiences (Table 5). These results are similar to the results in literature (Gatt et al., 2007; Jewell, 2002; Patrick & Tunnicliffe, 2011; Tunnicliffe, 2001; Tunniciiffe & Reiss, 2000). The point that draws attention here is that as mentioned before, the place where this study is carried out has rich vegetation. The participants have an opportunity to see many different plants on the campus where they receive teacher training. But, considering the findings obtained from this study, it is not possible to state that the participants have really seen these plants. On the other hand, the pre-service elementary teachers state that they acquired knowledge about plants via their real-life experiences. It can be stated that the pre-service elementary teachers' awareness of plants developed based on their real-life experiences in their childhood than adulthood. Fancovicova and Prokop (2010) state that early ages are important for individuals' development of ecological awareness. Especially, it is highly likely that the transition ages from abstract to concrete forms of thinking are critical periods to understand and appreciate both animals and plants' roles in habitat.

Conclusion and Suggestions

1. The data and analysis presented in this research revealed that pre-service elementary teachers have an inability to see plants despite their existence around them. It can be stated that the pre-service elementary teachers' plant blindness need to be treated so that they can teach plants effectively to their students.
2. Science education which the pre-service elementary teachers take throughout their lives is not usually their source of knowledge. Because of that, it can be suggested that instruction which will support plant awareness in each level of education from elementary school to university is required. It can be an effective way to compare plants' extraordinary features with students in these instructions.
3. It can be stated that learning about plants may have developed at very young ages and especially with children's real-life experiences. Individuals must be exposed to instruction which will appeal to their different sense organs at very early ages like planting, growing, touching, smelling, and tasting plants and

develop a different perspective towards plants and this can make contribution to promoting awareness of plants.

4. It is really disappointing that families are usually not the source of knowledge for plants. This result can exhibit that schools and teachers have more responsibilities and roles in teaching plants. Parents' participation can be encouraged for plant instruction organized for children in elementary education. Moreover, parents can be encouraged to continue this education in school at home.

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