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Global Warming and Measures to be Taken: Pre-Service Science Teachers' Views

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Abstract

Insensitivity to environmental pollution and the environment has become a wide-ranging problem recently. One of the most important reasons for confronting with such a problem is due to the fact that individuals see the nature as a boundless resource. To composing favorable behavior to the living area, teachers are required to be competent with the aim of creating awareness about it. This generating awareness on environment and gaining permanent behavior as they have key roles in training individuals sensitive to environment starting from pre-school education. This study aims at what preservice science teachers' views on environmental awareness and sensitivity. Used qualitative research method, which was conducted on pre-service science teachers', 3 and 4 grade, is to see how they awareness, perceptions and understating of effects of global warming and measure to be taken. Open ended questions were used to obtain data of the study. Research scope is 36 preservice science teachers who were selected randomly. According to their views made up there categories. Based on this research results, it was determined that environmental education preservice science teachers receive is not enough; moreover, they have difficulty in distinguishing the concepts.

Keywords: Global warming, Preservice science teachers, Teachers' views, Measures to be taken, Environmental problems

1. Introduction

The natural balance may be disrupted by various reasons. One of the greatest factors in the disruption of natural balance is environmental pollution. Environmental pollution may be defined as the damaging of the air in nature, water and the natural balance of soil as a result of various human activities (Bozkurt & Cansüngü -Koray, 2002; Dolu & Ürek 2015; Hao et al., 2008; Howden et al., 2007). Insensitivity to environmental pollution and the environment has become a wide-ranging problem recently. One of the most important reasons for confronting with such a problem is due to the fact that individuals see the nature as a boundless resource (Karataş, 2014).

Individuals keep living without recognizing nature or environment is influenced by human behaviors. However, what is worth indicating that living unconsciously causes not only environmental problems, but also global warming (Çabuk & Karacaoğlu, 2003; Erten, 2005). Global warming is defined as an increase in the average temperature of the Earth's atmosphere as a result of the sustained increase of the natural greenhouse effect arising because of various human activities. The concept of global warming has increasingly become significant today (Adedeji, Reuben, & Olatoye, 2014; Şenel, 2008; Bony et al., 2006).

Several changes are thought to occur with a continuing rise in temperature around the world. Some of these potential changes are as such; a rise in temperature, an increase in floods as a result of glaciers' melting, an increase in the number of forest fires and the disruption of the natural balance. Thus, it is predicted that these events are much more than just a human health issue; it is a wider issue that ecological balance will be disturbed (Patz et al., 2005; Haines et al., 2006; Ozturk, 2002). In this regard, certain measures are to be taken regarding global warming for a livable world in the future.

The idea that various environmental problems could be avoided only if people receive quality environmental education has become a substantial issue in a globalized world. Both national and international organized congresses, conferences, works conducted by various associations, environmental education classes provide for creating a social consciousness (Ozdemir, 2007). Starting from pre-school through university, students are informed about nature and the environment both in "Environmental Science" course and several other courses.

The purpose of environmental education courses taught, especially in schools is to inform students about nature and the environment; moreover, it is to provide students with permanent environmental consciousness and awareness (State Planning Organization -DPT-, 1994; Pooley & O'Connor, 2000). In this way, an increase in temperature caused by environmental pollution may be prevented and global warming is likely to be avoided.

For the realization of this purpose, preservice science teachers are directly exposed to *Environmental Science* course. This will both create environmental awareness and charge preservice science teachers of significant roles (Tanriverdi, 2009). In particular, increasing students' awareness about environmental pollution and having students gain sensitivity to the environment are among the major duties of science teachers (Çabuk & Karacaoğlu, 2003; Sever, 2013; Summers et al., 2000). Individuals with a certain education and awareness play a more active role in the solution of environmental problems (Ozdemir & Yapıcı, 2010; Pooley & O'Connor, 2000). Therefore, science and technology teachers' responsibility increase in this regard. Only when this mission achieves success, will the number of educated individuals increase and thus to contribute to environmental awareness (Gayford, 2002; Harlen&Holroyd, 1997; Kahraman et al., 2008).

Both various measures against global warming and environmental problems causing global warming are taken at national and international levels. Global warming is progressing within a systematic process by which education is regarded as an effective preventive factor in both national and international arenas. Providing that individuals have enabled a functional education, awareness and successful experiences related to the environment, they would generate positive attitudes towards the environment.
To composing favorable behavior to the living area, teachers are required to be competent with the aim of creating awareness about it. This generating awareness on environment and gaining permanent behavior as they have key roles in training individuals sensitive to environment starting from pre-school education. This study aims at what preservice science teachers' views on environmental awareness and sensitivity. If we learn their thoughts, we get inform about next generation teachers 'ideas on global warming and to be taken the measures. Because these participants will be teachers in the future, their ideas are significant. Sure, this study is qualitative research therefore it is limited with participants.

2. Methodology of Research

2.1. General Background of Research

The aim of this qualitative study, which was conducted on pre-service science teachers', 3 and 4 grade, is to see how they awareness, perceptions and understating of effects of global warming and measure to be taken. Qualitative research is designed to reveal specific instances and phenomena with its real-life context through a holistic, in-depth and realistic perspective by means of qualitative data collection methods such as observation, interviews and document analysis (Patton, 2014; Merriam, 2013; Yıldırım & Sımsek 2009).

2.2. Sample of Research

Open ended questions were used to obtain data of the study. Research scope is 36 preservice science teachers who were selected randomly from Ataturk, Konya Selçuk and Eskişehir Anadolu Universities Faculty of Education and who study at the third and fourth grade in the Department of Science Teaching. 23 of the participants (64%) were female, while 13 (36%) of them were male; 18 of them are fourth graders while the rest is a third-year student. Semi-structured interview questions were presented to an expert and six questions were determined after necessary arrangements for the quality of questions.

2.3. Instrument and Procedures

The questions were administered to the preservice science teachers. So that each participant can respond to the questions independently and with ease, paper was submitted to the preservice science teachers. It was also stated that privacy policy is to be obeyed. In addition, preservice teachers were given sufficient time and answer sheets were not taken back until the time when they expressed that they completed it. Preservice science teachers responded the open-ended questions individually. Written documents involving one or two pages which include the answers of preservice teachers about what global warming is and what measures are to be taken individually

are divided into categories and subcategories. Interview questions are composed of three main categories such as the negative effects of global warming, measures to be taken individually and measures to be taken as a social basis.

2.4. Data Analysis

The responses of preservice science teachers to the semi-structured questions about global warming and the measures to be taken in this regard were analyzed through qualitative research techniques. All of the preservice science teachers' written responses were divided into categories and subcategories. Afterward, categories were constantly compared in order to generate common categories. During this process, written documents of 36 preservice science teachers were firstly numbered, then the responses for each were coded and they were united under the common theme. Considering the frequency of identified common themes, their frequencies were shown in tables. It was presented to the expert view ensuring the reliability of the determined basic coding and categories. The required arrangements were made and the final shape was prepared. For the reliability, we showed experts these views to debate and agreed.

3. Results of Research

In this section, the negative effects of global warming, measures to be taken individually and measures to be taken as a social basis were examined based on the questions asked to the preservice science teachers.

3.1 Negative Effects of Global Warming

Frequency (f) distribution related to the question "how does global warming adversely affect the natural environment?" is presented in Table 1.

Table 1: Adverse effects of global warming upon natural environment

The Responses of Preservice Science Teachers	Frequency (f)
Climate change occurs	19
Drought occurs	12
Glaciers melt, sea level rises	12
Some of the species extinct	8
Ecological balance is disrupted	8
Living space is reduced	7
Ozone layer is depleted	4
Water resources are depleted	4
Acid rain occurs	2
Famine occurs	3

When the responses of preservice science teachers were examined, it was revealed that nineteen participants expressed that climate change will occur due to the greenhouse effect as a result of global warming. On the other, twelve participants emphasize that global warming will lead to drought in the future while two of them believe that glaciers melt dues to global warming as time progressed and accordingly sea level rises. Eight participants are of the opinion that global warming will lead to the extinction of some species by upsetting the ecological balance; the other eight participants mention that global warming will upset the ecological balance. Besides, seven participants state that living spaces of species are reduced because of global warming while four respondents think that the ozone layer depletion will occur due to the same reason. In addition, four participants indicate that global warming would lead to the depletion of water resources; two participants points out it will lead to the occurrence of acid rain whereas three participants explain that this would lead to famine.

One of the preservice science teachers *(S3)* expressed his/her opinion about glaciers melt with the increase in temperature, drought, floods as such *"First, climate changes will occur, then glaciers will melt due to floods in some areas, drought in some places and an increase in temperature."* With regards to the extinction of species, another preservice teacher *(S5)* mentions that *"The areas for people to live may be eradicated and many useful species may disappear."* In addition, some of the responses indicate that prospective teachers have various misconceptions about this issue. For instance, four participants attribute the depletion of the ozone layer to

global warming. Moreover, there are two preservice teachers who think acid rain occurs due to global warming. Thus, it is inevitable to determine that some preservice teachers have various misconceptions concerning the results of global warming.

This can be exemplified by the responses of the preservice teachers as follows *"Ozone layer is depleted, drought occurs."(S22) and "Ecological balance is disrupted, so many species extinct living in the world, it leads to a rise in sea level, ozone layer is depleted."*(S25). To determine the relationship between global warming and environmental pollution, frequency (f) distribution relevant to the question "what is the relationship between global warming and environmental pollution?" is presented in Table 2.

Table 2: The responses relevant to global warming and environment relationship

The Responses of Preservice Science Teachers	Frequency (f)
Depletion of the ozone layer triggers global warming	10
Emissions of greenhouse gasses lead to global warming	8
Global warming destroys forest and vegetation	4
Food chain is disrupted due to global warming	4
Drought increases and water scarcity will occur due to global warming	3
Acid rain is caused by global warming	3
Global warming causes air pollution	2
Global warming causes water pollution	1

When the responses of preservice science teachers were examined, it was clarified that ten participants view that the depletion of the ozone layer triggers global warming. However, three respondents think that acid rain is caused by global warming. Whereas two participants stress that global warming causes air pollution, one participant underlines global warming causes water pollution. Considering the responses; it seems that a number of preservice teachers have misconceptions about the relationship between environmental pollution and global warming. This may be due to the fact that participants have difficulty in establishing a relationship between the depletion of the ozone layer which constantly remains on the agenda and global warming. When the responses of other participants are examined; eight participants emphasize that emissions of greenhouse gasses lead to global warming while four respondents indicate that global warming destroys forest and vegetation. Besides, four participants signify food chain is disrupted due to global warming; on the other, three participants mention that drought increases and water scarcity will occur due to global warming.

One of the preservice teachers Express his/her opinion about how global warming affects the environment as such "The direct *cause of global warming is air pollution. The world is warming up since greenhouse gases emitted into the atmosphere increase the retention of heat in the world and in the atmosphere. "(S7).* With reference to the idea that forest and vegetation is destroyed by global warming, a preservice teacher states that "If global warming increases, then flooding may occur. Many trees in nature and plants may not exist. *"(P15)* Another preservice teacher implies that "*Global warming will damage the ozone layer. Ozone layer keeps the sun's rays. If this layer is damaged, the weather may be warmer or cooler. "(O26).*

3.2. The Measures to Be Taken Individually Related to Global Warming

Frequency (f) distribution of responses relevant to the first measure to be taken as individually *"how can we encourage individuals to take measures against global warming?*" is shown in Table 3.

Table 3: Encouraging individuals regarding global warming

The Responses of Preservice Science Teachers	Frequency (f)
The harms of global warming are explained	20
Mass media are used	9
Advertising, banners and so on are used	9
Seminars are conducted	7
The conference is given	5
Training is provided	1
Events should be held	1

As shown in the table 3, twenty participants are of the opinion that the harms of global warming should be explained to individuals in order to encourage them to take measures. Nine participants point out that using advertising and banners will be effective in encouraging individuals. Differently, nine participants favor the idea that Mass media are to be effective for encouraging individuals to take measures about global warming. Still, seven participants consider seminars should be conducted for this purpose while five of them emphasize the need for holding conferences. One participant expresses that individuals may be encouraged by providing adequate training to take measures against global warming, whereas another participant thinks that various events should be organized in this regard. The views of the preservice students are significantly based upon the events for raising awareness of the public. Another response given by participants *"We need to explain the damages and effects of it on environment, humanity." (S1)* is presented as an example of explaining the harms of global warming. Participants are given to this question, described the response given as examples of global warming. Another expression of preservice teachers in terms of individual encouragement *"It is required to raise the awareness of the public. We may use media mass for this purpose. "(S9)* is an example of the frequency distribution of the mass media. As another example, "*we need to inform, we need to do advertising." (S18)* can be given. Frequency (f) distribution of preservice teachers 'responses relevant to another measure to be taken as individually *" what kind of activities should be performed so as to encourage individuals for the participation of social responsibility projects on global warming?* " is presented in Table 4.

Table 4: Encouraging individuals to participate in projects on global warming

The Responses of Preservice Science Teachers	Frequency (f)
Remarkable campaign should be held	13
Seminars should be held	7
The conference should be held	7
Newspapers, magazines and posters should be used	7
The award-winning campaign, advertising should be used	4
Short films should be watched	2

As presented in Table 4, thirteen of the participants lay emphasize on the idea that remarkable campaign is to be held while seven of them stated that seminars should be held. Likewise, seven participants expressed that holding conferences will be effective; seven respondents assert that using newspapers, magazines and posters will be enough to encourage individuals. In addition, four participants emphasized the importance of using advertising and two of them said that use of short films will be more effective.

When the responses of preservice teachers were analyzed in general, it was observed that remarkable events and various information activities may encourage individuals for participating in the projects. Some of the participants' responses to the question are as such *"To shoot short films about nature." (S14), "Newspapers and television should be given more space. Tours and festivals should be organized. "(S20)," Public can be illuminated through seminars and encourage them to take responsibility. "(S22).*

3.3. Measures to be Taken As a Social Basis Related to Global Warming

Frequency (f) distribution of preservice science teachers' responses relevant to the first measure to be taken as a

social basis *"what are the responsibilities of countries considering the effects of* rapidly developing technology on nature*?* " is shown in Table 5.

Table 5: The responsibilities of countries in fighting global warming

The Responses of Preservice Science Teachers	Frequency (f)
Technology should be developed without harming environment	16
The public should be informed	7
Measures for energy saving should be taken	5
Social responsibility projects should be supported	4
Water-saving measures should be taken	3
Society should be encouraged on recycling	1
Transportation should be encouraged by public transport	1

Table 5 shows that sixteen participants consider that it is the responsibility of countries to control the development of technology without harming nature. Besides, seven participants believe that countries are responsible for raising awareness of the public; 5 participants mention the importance of taking measures for energy saving; 4 of them expressed that social responsibility projects should be supported. On the other hand, three participants said that taking measures on water saving is the main task of the countries, while one of them emphasized the significance of encouraging individuals about recycling. One participant stated that countries are required to encourage individuals for using public transport in transportation. When other responses are generally analyzed, it was found that energy-saving, water saving and recycling will cause environmental pollution and global warming unless measures have been taken. Concordantly, the main measures to be taken by countries should be against the reasons for global warming.

One of preservice science teachers' responses can be an example of the view on the development of technology without harming the environment as follows *"Technologies that do not harm nature and the environment should be developed." (S6).* Other views are presented as "*Measures should be taken for conscious society." (S21)* and *"Recycling is to be considered, public transport may be cheaper." (S24).* Frequency (f) distribution of preservice science teachers' responses relevant to the second measure to be taken as a social basis *"how are the effects of events regarding global warming from* individual struggle to the social struggle on raising awareness of the public increased*?* " is shown in Table 6.

Table 6: Increasing the effects of events on social awareness

The Responses of Preservice Science Teachers	Frequency (f)
Media, mass media should be used and training should be given	12
Newspapers, magazines and posters should be used	9
Seminars should be held	6
Conferences should be held	5
Short films should be presented about the consequences of global warming	2
The award-winning campaigns, advertising should be used	1

As shown in Table 6, twelve participants think that the use of mass media education, educating individuals will increase the impact of public awareness. In a similar way, there are nine participants who state that the use of newspapers, magazines and posters will be effective. Six participants assume that holding seminars will be efficient while five of them said that conferences will be effective in this regard. Furthermore, two participants remark that Short films about the consequences of global warming will enhance the effect of raising awareness, whereas one participant favors the idea that advertisements are better for increasing the effectiveness on global warming. Most of the responses of preservice teachers about improving the effectiveness of the awareness of the society are in regard to public awareness oriented activities. Thus, preservice teachers care about increasing the overall efficiency with emphasis on informative activities.

Some of the responses related to the use of media, mass media and training programs are as follows *"It needs to be included in the press and media and should take part in education and training." (S4).* Besides, "Mass media

can be used." *(S13)* and "Short films are effective." (S16) are examples representing this issue.

4. Discussion and Conclusion

In the current study, preservice science teachers' views on the negative effects of global warming and measures to be taken in this regard were investigated. Preservice science teachers' views on the negative effects of global warming and measures to be taken were also evaluated through their responses on six semi-structured open-ended questions designed under three main categories. Accordingly, it was observed that preservice science teachers who comment on the adverse effects of global warming think that climate change and drought will occur and sea levels will rise when glaciers melt. In addition, some of the preservice science teachers were observed to state that some of the species will extinct, ecological balance will upset, living spaces will be reduced, water supply will run out of and famine will occur. This shows that preservice science teachers are aware of the adverse effects of global warming on nature. However, some responses of preservice teachers reveal that they have misconceptions about global warming (Çimer, Çimer, &Ursavaş, 2011; Darçın, Bozkurt, Hamalosmanoğlu, & Köse, 2016; Koulaidis&Christidou, 1999). In particular, the depletion of the ozone layer and the occurrence of acid rain are considered as the indicators of these misconceptions. When the relationship between global warming and the environment is evaluated, similar misconceptions were also found (Çakır, İrez & Doğan, 2010; Groves & Pugh, 1999). Even though preservice teachers have a certain awareness and consciousness regarding global warming, it may be due to the news about the depletion of the ozone layer and global warming, they have such misconceptions (Akçam &Oluk, 2007; Shepardson, Niyogi, Choi, &Charusombat, 2009; Papadimitriou, 2004). Based upon the finding related to encouragement of individuals for taking measures individually, it is implied that most of the preservice teachers are of the opinion that individuals should be informed about global warming. Thereby, it was found that individuals will start to take measures individually if they are informed about the harms of global warming. In accordance with the responses, it was clarified that "informing" is regarded as an important factor in terms of the use of mass media, advertisement and posters, holding seminars and conferences, organizing events. Likewise, preservice teachers mention that individuals should be sensitive to gain awareness of public and participate in the events actively (Demirkaya, 2008; Kahyaoğlu & Kaya, 2012; Teksöz et al.,2010).

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