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Climate Change, Education and Biology Teacher Candidates

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Abstract

Today, young people's environmental attitudes are seen as particularly important in solving environmental problems. Therefore, it is necessary to accept that effective environmental education is important for school-age children. A sustainable life cycle is only possible if individuals adopt a lifestyle that is respectful and tolerant to the environment, based on ecological balance. For this reason, sustainable lifestyles must be in a way that does not harm the living conditions of underdeveloped societies and other living creatures in nature. However, although environmental problems are well known by society in these societies, there are always fundamental differences between scientific environmental values and environmental values adopted by society.

For this reason, it is possible to say that the training and achievements of Biology teachers, who are the essential elements of biology and environmental education in high schools, are important in teaching students' awareness, attitudes and behaviors towards environmental problems. In this study, it has been discussed how to make prospective biology teachers more sensitive to the environment, global warming and climate change. how the basic Biology knowledge and environmental attitudes of teacher candidates can be made more useful to high school students.

Based on this study, it is possible to say that prospective biology teachers are generally aware of the relationship between environmental changes and climate change. However, in the education of Biology teachers, discussing how the environment, global warming, greenhouse gas effects and the resulting gradual climate changes can be minimized by providing education to local schools is becoming increasingly important in biology education.

Key words: *Climate change, education, biology, teacher candidates*

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Introduction

Although it is possible to say that social awareness about the causes of environmental problems and their solutions is increasing day by day, it is possible to say that it is not enough for every segment of society to produce solutions based on universal environmental values (Schultz & Zeleznky, 2002). The main source of environmental problems is the incompatibility of individual demands with social values, and social values often play a decisive role in the emergence of environmental problems (Karp, 1996, Dunlap et al., 2001).

It is known that social values make important contributions to the solution and perception of environmental problems. Therefore, the individual and social behaviors and environmental protection policies observed today largely stem from individual behaviors. Today, young people's environmental attitudes are seen as particularly important in solving environmental problems. Therefore, it is necessary to accept that effective environmental education is important for school-age children.

It is expected that societies globally will be able to continue their existence in a life cycle that is at peace with nature and does not destroy nature, as in the past. A sustainable life cycle is only possible if individuals adopt a lifestyle that is respectful and tolerant to the environment, based on ecological balance. For this reason, sustainable lifestyles must be in a way that does not harm the living conditions of underdeveloped societies and other living creatures in nature. In this context, the environment that individuals and societies will receive becomes of great importance in protecting nature and environmental values. In societies sensitive to

environmental values, these values are taken into consideration in schools, homes and workplaces, and the environment is taken as a basis in all activities.

However, although environmental problems are well known by society in these societies, there are always fundamental differences between scientific environmental values and environmental values adopted by society. Even in countries known to be environmentally friendly, the failure to determine the content of environmental policies well and the failure to develop a universal environmental education policy with broad participation adopted by all segments of society causes problems in determining policies to prevent global warming and climate change.

Today's students are especially important in solving environmental problems, as the attitudes of tomorrow's active members of society towards the environment will contribute more. Therefore, it seems that effective environmental education is very important for school-age children. Today, managers, environmentally sensitive organizations and institutions need to make more efforts to reactivate the negative attitudes and behaviors that have developed towards the environment in a positive direction. Although we see and say what is right individually and socially, it is known that attitudes and behaviors are not in this direction. For this reason, it is possible to say that the training and achievements of Biology teachers, who are the essential elements of biology and environmental education in high schools, are important in teaching students' awareness, attitudes and behaviors towards environmental problems.

Today's most complex environmental problem is global climate change and global warming, and this human-induced increase in greenhouse gases and CO_2 in the atmosphere poses a serious problem for the future (Dietz et al., 2007). The environmental undesirable effects of carbon emissions into the atmosphere have been known for a long time, and it is known that environmental factors are the main factor in the emergence of global warming and climate change. It becomes important at this point that some sanctions are implemented by all countries to reduce carbon emissions into the atmosphere. For this purpose, it becomes important to impose some sanctions to compensate for the damage caused to businesses and organizations that are effective in releasing carbon gas into the atmosphere. However, considering that this will harm the country's economies, these and similar sanctions are not implemented or partially implemented by the administrations.

In fact, as Gandhi said, *"the earth is capable of meeting everyone's needs, but it is never possible to meet the demands of the greedy."* The essence of all environmental problems lies in the unwillingness of individuals and societies to accept a more modest lifestyle. Today, it is known that environmental problems arise from global warming, excessive energy needs, and excessive population growth, and that this is the main source of environmental problems, especially in underdeveloped societies. It is known that developed countries do not make enough technological investments for the on-site destruction and reuse of the waste materials they produce. The most important environmental problems of underdeveloped countries are the infrastructure and environmental problems that arise due to internal migration due to excessive population growth and rapid urbanization. In this context, industrialization and urbanization are seen as the main environmental problems of underdeveloped societies.

Due to poverty, in these societies there is rapid plunder and destruction of the environment to provide economic resources. The loss of green areas is one of the main reasons for global warming, and the inability of plants to convert CO_2 released into the atmosphere into nutrients and oxygen through photosynthesis causes global warming. Global warming causes unconscious destruction of natural resources, and the use of non-recyclable plastic-derived waste materials and increased exhaust gas emissions are seen as the most important causes of global warming and climate change.

In this study, it will be discussed how to make prospective biology teachers more sensitive to the environment, global warming and climate change. In addition, it will be evaluated how the basic Biology knowledge and environmental attitudes of teacher candidates can be made more useful to high school students.

Discussion and Conclusions

The sustainability of their populations depends on achieving a balanced population structure and the sustainability of this balance. While the world population was 2.5 billion half a century ago, it doubled in a 40-year period and then reached 7 billion. If growth continues in this way, the world population is expected to reach 9 billion in 2050. It is not possible for this population to sustain its ecological and biological continuity (The Ashai Glass Foundation, 2007).

The data obtained reveals that poverty will increase due to the increase in population and the environment will be destroyed accordingly. Food scarcity emerges as the most important problem that increases poverty. Increasing poverty, destruction of the natural environment, and expansion of slum areas constitute the essence of environmental problems and, accordingly, global warming. The basis of global warming lies in the excessive food need and consumption resulting from excessive population growth. Stabilizing population growth may play a key role in solving many environmental problems. However, it seems very difficult to stabilize population growth and change the traditional living conditions of societies without increasing education standards.

It is possible to say that environmental awareness has an important place in the acquisition of the individual's attitude and habits towards the environment, primarily through the education and interactions received in the family, then on the street and at school. The most important institutions where environment-living relations are discussed scientifically are schools. In schools, it is essential for the individual to recognize and evaluate the environment in which he lives in a spiral structure and to examine the direct or indirect relationships of living things to each other in his environment.

Environmental education is very important, and within the spiral structure, basic environmental concepts gained in previous education stages are examined in detail. For this reason, it is of great importance to what extent biology teacher candidates, who teach living things and all the beings around us in a scientific dimension, know the basic concepts and environmental problems related to the environment and how the basic environmental problems are perceived by the teacher candidates. It is known that prospective biology teachers consider air pollution, genetically modified foods and excessive human pollution of the earth as the most important environmental problems (Özdemir, 2024).

However, they seem to agree that pollution of rivers and seas, traffic, extinction of species, climate change and overuse of earth resources are among the important environmental problems. However, it is a matter of debate how prospective teachers interpret air pollution and global warming caused by air pollution, and the climate change thought to occur as a result, and its possible effects on the environment.

The release of unwanted gases into the atmosphere, which is one of the main causes of air pollution, is one of the important issues on the agenda of all societies and countries since the 1980s. For this purpose, the Kyoto protocol was signed. Although it is an obligation for the countries that signed the Kyoto protocol to reduce carbon emissions into the atmosphere, it seems a bit difficult to say that this is fully complied with. It is known that countries with increasing industrial development, such as China and India, which have the highest carbon emissions, and the United States of America, have violated the Kyoto protocol. In order to reduce global warming, technological cooperation is required between developed countries and developing countries to reduce CO2 emissions into the atmosphere. However, it is seen that developed countries avoid spending for this purpose (Krosnick et al., 2006).

Preventing the destruction of rainforests should be the main problem of not only underdeveloped countries but also developed countries. Rainforests are the main centers where CO2 is converted into nutrients and oxygen. It is necessary to minimize global warming for the survival of the human species. For this purpose, developed countries must make significant contributions to these measures to ensure their continuity (Wood, Vedlitz, 2007). It is not difficult to guess that the recent anomalies in weather conditions are a result of global warming and that if precautions are not taken, they will trigger a global disaster in the long term (Nisbet and Myers, 2007). The effects of air pollution, global warming and the global climate change that they affect together are felt in different parts of the world day by day.

It is known that global warming is closely related to the use of fossil fuels. For this reason, activities and government support to increase clean energy obtained from natural resources, especially solar and wind energy, need to be increased in the coming periods. Survey studies show that a significant part of society recommends the expansion of solar and wind energy, while demanding the reduction of fossil fuels and nuclear energy. The education systems of the countries need to persuade students who will be responsible citizens of the future to use clean energy sources, and concrete and applicable examples must be adopted in a concise and concise manner during this persuasion phase. Similar practices can be used to protect and develop food resources. Developing natural resources and using them as a food source without harming nature will contribute to less carbon emissions and reduction of global warming (Shwom, Dan & Dietz, 2008).

Ecologically, the sustainability of living populations depends on their ability to achieve and maintain a balanced population structure. This happens when stable climatic conditions persist in a location and species that adapt to the conditions do not frequently encounter any surprising weather conditions. It was investigated whether teacher candidates made any contribution to minimizing climate change, and it was observed that although some of them participated in active studies, some of them did not participate in any studies (Özdemir, 20221).

UNFCCC recommends that the elements of "education, implementation, raising social awareness, social participation, public access to all kinds of information and cooperation" should be taken as basis in determining policies and practices regarding climate change (Mori, 2002). We see that in some countries, climate change has been determined as a priority for administrators and is widely included in party and government programs. Social support was adopted as the main factor in determining these strategies. For example, in the UK, public education about climate change has become a priority for governments and social organizations since the 1990s. Studies show that the people in this country have become more conscious about global warming over time (DEFRA, 2004, 2007).

In most countries, there is a general acceptance that climate changes are "human-induced" and the human factor is thought to be the main cause of climate change. The majority reveal that they think that global warming, deforestation, carbon emissions, transportation-related air pollution, thermal power plants and other production units are the main factors (Bostrom et al., 1994; Hinds et al., 2002). However, it is not possible to say that the public agrees on the causes of global warming. For example, in England, only 30% of the public believe that CO2 is the main gas polluting the atmosphere (Norton and Leaman, 2004).

In the USA, 18% of the public believe that fossil fuels cause atmospheric pollution and global warming (Read et al., 1994). It is seen that most of the people believe that the main factor of climate change is due to the destruction of forests, and that they do not adequately understand the importance of CO_2 emissions. The general belief is that deforestation reduces O2 production for the atmosphere and, accordingly, reduces clean air (Bostrom et al., 1994). It has been observed that most scientists believe that events such as rising sea levels and wars, which they think do not have a direct impact on global warming, may cause a decrease in oxygen on the earth (Read et al., 1994).

In a study conducted to investigate what prospective teachers know about climate change and their possible effects on environmental problems, it was determined that the candidates viewed climate change as a very important environmental problem. In addition, it was determined that the participants viewed species extinction as secondary factors and traffic and overpopulation as fewer effective factors. All these findings reveal that the causes of climate change are interpreted very differently by the public. It has been determined that the symptoms of climate change are the variability of meteorological events, irregularity in rainfall and increase in temperature. It has been observed that climate change is mostly attributed to social justice and environmental protection activities (Bulkeley, 2000).

Since the end of the last century, "global warming" has generally been tried to be explained as the increase in the rate of greenhouse gases resulting from human activities. Although the "global warming" metaphor is accepted as a priority by society in terms of global risk, it reveals that the "climate change" or "greenhouse gas" effect expressed by scientists is more complex than the public understands (Houghton, 2004). Local people generally

do not understand how the work done by people in their daily lives may affect global warming (Hargreaves et al., 2003). While much of society sees climate change as the main environmental threat, it is observed that they believe that the impact of global warming is less (Norton and Leaman, 2004). Although global warming is mentioned more in the press and among the public, it seems that these two concepts are used to mean almost the same things (Corbett and Durfee, 2004).

Climate change is an important reality that humanity has begun to face, and they seem to accept that global warming has started recently. It is generally accepted that climate change is caused by the greenhouse gas effect caused by human activities. According to the IPCC report, current changes in climate may have occurred due to natural variability or human activities (IPCC, 2001).

It is seen that global warming is generally perceived by society as the decrease in the level of ozone in the atmosphere, the greenhouse gas effect, and the melting of glaciers and large glaciers due to warming. It is seen that climate change is mostly perceived as natural events and their environmental effects. “Global warming is seen as a concept that is considered more serious and prioritized than climate change. For this reason, the general belief, both individually and socially, comes to the fore that global warming must be combated and overcome. It seems that the prevailing opinion is that afforestation efforts are important for preventing climate change and that they will not primarily affect global warming. It is possible to observe the most obvious effects of the human factor on climate change, especially in Latin America, Europe, and African and Asian countries where local temperature changes are felt most strongly.

Many scientific studies have been conducted on climate change based on experimental, physical, sociological and socio-cultural principles (Borick and Rabe, 2010). The findings reveal that although we have obtained a large amount of data about the causes and effects of climate change, the real difficulty in understanding climate change varies in different regions of the world depending on geographical, economic and cultural differences.

The information obtained through education around the world is perhaps the most important criterion, showing the extent to which societies are aware of climate change. In addition to improving basic education in the strategy regarding climate change, societies' understanding of climate change must also be changed. Other factors may include changes in society's reflexes to climate change. Each geographical region and society have its own ability to perceive and create reflexes. For this reason, national and regional programs should regulate citizens' basic knowledge about climate change and the measures that can be taken on an individual basis. Studies on climate change have a complex structure that includes anthropology, sociology, psychology, geography and many related basic disciplines. The interaction of all these phenomena and individual behaviors and attitudes gains great importance in understanding climate change.

Based on the studies conducted, it is possible to say that the level of education is the main factor in the process of awareness about climate change (O'Connor, Bord, & Fisher, 1999). All environmental problems arise from the excessive use of natural resources by individuals and communities, and environmental education offered to students at all levels should be based on controlling individuals' consumption patterns. Only in this way can environmental well-being and protection of living diversity in nature be possible. Another issue that needs to be emphasized is that there is a contradiction between the environmental education given to students today and the responsibilities of individuals towards the environment. It is not possible to say that environmental education is sufficient for society and students at all levels. Only in this way can environmental well-being and protection of living diversity in nature be possible (Oztas & Oztas, 2016).

Environmental education in schools is of great importance, and one of the main elements of this education is undoubtedly Biology teachers. Based on the results of this study, it is possible to say that prospective biology teachers are generally aware of the relationship between environmental changes and climate change. However, in the education of Biology teachers, discussing how the environment, global warming, greenhouse gas effects and the resulting gradual climate changes can be minimized by providing education to local schools is becoming increasingly important in biology education.

References

Bostrom, A., Morgan, M.G., Fischhoff, B. and Read, D. (1994) "What Do People Know about Global Climate Change? 1. Mental Models," Risk Analysis 14(6): 959–70.

Bulkeley, H. (2000) "Common Knowledge? Public Understanding of Climate Change in Newcastle, Australia," Public Understanding of Science 9: 313–33.

Corbett, J.B. and Durfee, J.L. (2004) "Testing Public (Un)Certainty of Science: Media Representations of Global Warming," Science Communication 26(2): 129–51.

DEFRA (Department for Environment, Food, and Rural Affairs) (2004) Review of the UK Climate Change Program: Consultation Paper. London: HMSO.

DEFRA /2997) Survey of public attitudes and behaviours toward the environment: 2007 Department for Environment, Food and Rural Affairs, London (2007). Available from: http://archive.defra.gov.uk/evidence/statistics/environment/pubatt/

Dietz, T., A. Dan and R. Shwom (2007) Support for climate change policy: Social psychological and social structural influences. Rural Sociology 72:185–214.

Dunlap, R.E., C. Xiao and A.M. McCright (2001) Politics and environment in America: Partisan and ideological cleavages in public support for environmentalism. Environmental Politics 10(4):23–48.

global warming. American Journal of Political Science 51(3):552–568.

Hamilton, L.C. (2011) Education, politics and opinions about climate change Evidence for interaction effects, Climatic Change (2011) 104:231–242.

Hargreaves, I., Lewis, J. and Speers, T. (2003) Towards a Better Map: Science, the Public and the Media. London: Economic and Social Research Council.

Hinds, K., Carmichael, C. and Snowling, H. (2002) Public Attitudes to the Environment in Scotland 2002. Edinburgh:Scottish Executive.

Houghton, J., ed. (2004) Global Warming: The Complete Briefing, 3rd edn. Cambridge: Cambridge University Press.

IPCC (Intergovernmental Panel on Climate Change) (2001) Climate Change 2001: Impacts, Adaptation, and Vulnerability. Summary for Policymakers. Cambridge: Cambridge University Press.

Karp, D. G. (1996). Values and their effects on pro-environmental behavior. Environment and Behavior, 28, 111–133.

Krosnick, J.A., A.L. Holbrook, L. Lowe and P.S. Visser (2006) The origins and consequences of democratic citizens' policy agendas: A study of popular concern about global warming. Climatic Change doi: 10.1007/s10584-006-9068-S.

MORI (2002) "The Environment: Who Cares?" URL (consulted January 2005): www.mori.com/environment

NEETF TheNational Environmental Education and Training Foundation) (2001) Lessons from the environment – Summary of the Ninth Annual National Report C. On WWW at http://www.neetf.org/roper/roper2001-d.htm. HYPERLINK "http://www.neetf.org/roper/roper2001-d.htm.%20Accessed%2013.2.06"Accessed HYPERLINK "http://www.neetf.org/roper/roper2001-d.htm.%20Accessed%2013.2.06" 13.2.06.

Nisbet, M.C. and T. Myers (2007) Twenty years of public opinion about global warming. Public Opinion Quarterly 71(3):444–470.

Norton, A. and Leaman, J. (2004) The Day After Tomorrow: Public Opinion on Climate Change. London: MORI. Social Research Institute.

O'Connor, R. E., Bord, R. J. & Fisher, A. Risk perceptions, general environmental beliefs, and willingness to address climate change. Risk Anal. 19,461_471 (1999).

Oztas, F., Oztas, H (2016) What Do Beginner Biology Teacher Candidates Know of Genetics and Genes? Journal of Education and Practice, 7 (30):131-138.

Oztas,F, Tanrıverdi,H , Oztas, H (2014) School students dilemma about environmental rules and attitudes. Do they realy feel responsibility for the environment? Journal of Environmental Protection and Ecology 15, No 3A, 1482–1492.

Özdemir, M.M (2021) İklim Değişikliğinin Yol Açtığı Çevresel Sorunlar Hakkında Biyoloji Öğretmen Adaylarının Görüşlerinin Saptanması (YL Tezi) Necmettin Erbakan Üniversitesi, Eğitim Bilimleri Enstitüsü, *Matematik ve Fen Bilimleri Eğitimi Anabilim Dalı, Biyoloji Eğitimi Bilim Dalı-Konya.*

Schultz, P. W. (2002). Knowledge, education, and household recycling: Examining the knowledge-deficit model of behavior change. In T. Dietz & P. Stern (Eds.), Education, information, and voluntary measures in environmental protection (pp. 67-82). National Academy of Sciences.

Schultz, P.W., Zelezny, L. & Dalrymple, N. J. A multinational perspective on the relation between Judeo-Christian religious beliefs and attitudes of environmental concern. Environ. Behav. 32, 576_591 (2000).

Shwom, R., A. Dan and T. Dietz (2008) The effects of information and state of residenceon climate change policy preferences, *Climatic Change, 90:343–358DOI 10.1007/s10584-008-9428-7*

Solomon, J. (1985) Learning and Evaluation: A Study of School Children's Views on the Social Uses of Energy, Social Studies of Science, 15 (2) 343-371.

The Ashai Glass Foundation, (2007) Questionnaire on Environmental Problems and the Survival of Humankind 15-Year Summary, The Ashai Glass Foundation, July, 2017.

Wood, B.D. and A. Vedlitz (2007) Issue definition, information processing, and the politics of global warming. American Journal of Political Science 51(3):552–568.