

Environmental consciousness and education relationship: Determination of how environment-based concepts are placed in Turkish science curricula

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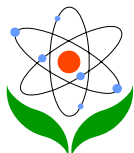
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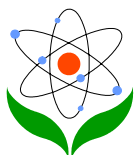
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Introduction

Environment has become a most popular area since the last three decades. Environmentalists are supposed to play a great role in urgent environmental issues such as ozone depletion, greenhouse effect, global warming, air pollution, and the like. Environmental chemistry, which combines the application of chemical principles with an effort to maintain and enhance environmental quality, is representative of these changes. These factors indicate the clear link between human being and environmental chemistry. It is noteworthy that many of these issues involve understanding chemical reactions and this makes environmental chemistry a particularly important and topical discipline. The world's leadership is demanding of the chemistry community, the often competing outcomes of the continued development and production of massive amounts of chemicals that improve the human standard of living, and the responsible management, reduction, treatment, and disposal of chemicals (Aram, 1995).

Environmental problems are due to a combination of several factors. These factors cause both environment and health problems. Some of the problems faced by humankind directly or indirectly are ozone depletion, greenhouse effect, acid rain, global warming, air-water pollution, and fossil fuel combustion. The chemical materials and processes are the most important among these. In addition, the exceed using of fossil fuels (coal, oil, and natural gas) cause several environmental problems. Noticing the bad effects of chemistry and traditional energy sources on environment and human life, environmentalists are trying to find solutions for a better life. For this, teaching about environment issues and the preservation of the world's environment has become increasingly important across the globe (Ko and Lee, 2003). Those efforts show the importance of humans' awareness about these problems in taking precautions. This awareness should be recognized by all countries for the safe of next generations. During the last decades the trend for environmental protection has expanded in various areas including education. Paraskevopoulos et.al. (1998) state that (a) if people are aware of the need for and the ways of protecting the environment they will act to preserve it, (b) schools should assume responsibility for educating about environmental protection and (c) environmental education can be effective as a part of a school curriculum. Increased concern about the environment has paralleled the development of environmental education in the world. With this regard, both

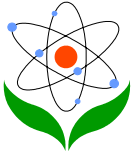


developed and developing countries have taken this reality into consideration in designing curricula for all schools. Some arrangements have also been made in science education curricula in Turkey as a developing country in last decades. Of the various subjects taught in secondary schools, science is often perceived as one that can make a significant contribution to environmental education (Ko and Lee, 2003). Therefore, our primarily aim in this study is to determine how the Turkish science curricula contain environmental concepts after some of the attempts on environmental issues in the world were presented.

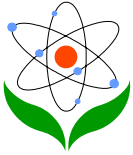
There have been steady developments of national and international declarations relevant to environmental issues. The first attempt in this regard was the Stockholm Declaration recognized the interdependency between humanity and the environment. The most important results emerged from the declaration were to provide fundamental right to freedom, equality and adequate conditions of life in an environment and to improve the environment for present and future generations (UNESCO, 1972). In addition, this declaration stated the need of environmental education from grade school to adulthood. After this first attempt, a number of similar assemblies were made. In these meetings, some decisions were taken for environmental issues in local and global scale. These meetings are given in Table 1 chronologically.

Table 1. Chronology of Some Declarations about the Environment

Year	Location	Declaration
1972	Stockholm / Sweden	The Stockholm Declaration
1977	Tibilisi/ Russia	Tibilisi Declaration
1990	Talloires/ France	The Talloires declaration
1991	Halifax / Canada	The Halifax declaration
1992	Rio de Janeiro / Brazil	United Nations Conference on Environment and Development
1993	Kyoto / Japan	The Kyoto Declaration
1993	Swansea / Wales	Swansea Declaration
1994	Geneva / Switzerland	CRE-Copernicus Charter
1997	Thessaloniki / Greece	Declaration of Thessaloniki



The Tibilisi Declaration was one of the most important moments in the evolution of international declarations related to EE. In this declaration, it was discussed EE principals and some international strategies of action including some advises for education in all levels, informing and educating the public were offered (Wright, 2002). In another declaration, the Talloires Declaration, it was stated the importance of higher education firstly. It concluded that universities must work together towards environmental sustainability (UNESCO, 1990). The Halifax Declaration's main goal was to consider the role of universities in improving the capacity of countries to address environment and development issues. The most important results of this declaration were; i) recognizing the key role of universities in the world at serious risk of irreparable environmental damage, ii) reconstructing environmental policies and practices to contribute to sustainable environmental development on national and international levels (Wright, 2002). United Nations Conference on Environment and Development, named Agenda 21, was related to environmental sustainability, specifically addresses issues related to sustainability in education (UNESCO, 1972). The three main results were: (a) reorienting education towards sustainable development; (b) increasing public awareness of environmental issues; and iii) promoting environmental training among educators. The Kyoto Declaration stressed the ethical obligation of universities to the environment and sustainable development principles. A final feature of the declaration was its challenge to universities not only promotes sustainability through environmental education, but also through the physical operations of a university (The KYOTO Declaration, 1993). The Swansea Declaration included the need for universities to review their physical operations, the desire for environmentally literate students and faculty, and an emphasis on the ethical obligations universities have to present and future generations (UNESCO, 1993). The CRE-Copernicus Charter was developed by the Conference of European Rectors (CRE). The Charter stressed the need for a new frame of mind and set of environmental values within the higher education community (CRE-Copernicus, 1994). The Thessaloniki Declaration argued that the concept of environmental sustainability must be linked with poverty, population, human rights, and health. With regard to formal education, this declaration affirmed that all subject disciplines must address issues related to the environment and sustainable development and that university curriculum must be reoriented towards a holistic approach to education (UNESCO, 1997).



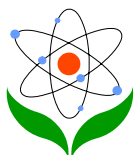
Three main points emerged from these meetings related environment were; (i) to introduce bad factors that effect environment, (ii) to make citizens conscious about the environment, and (iii) to put environmental concepts into curricula.

Several of the environmental problems presently faced by humankind are directly or indirectly caused by misusing of environment and unconsciousness of the society about environmental education. Although the environmental consciousness results from the interaction between the society and family, formal education given in this process is also important in increasing the environmental consciousness of the society. Environmental education goes beyond providing students with simple information about environmental issues. As defined in the National Project for Excellence in Environmental Education; “*environmental education is a process that aims to develop an environmentally literate citizenry that can compete in our global economy, has the skills, knowledge, and inclinations to make well-informed choices, and exercises the rights and responsibilities of members of a community*” (NAAEE, 2001). The scientific and technological issues surrounding environmental problems epitomize why teaching scientific literacy is so vital to environmental science courses (Gill and Burke, 1999). Professionally-executed environmental education is a comprehensive process to help people understand the environment, their place in it, environmental problems and related issues (Dove, 1996; Archie and McCrea, 1998). And also, according to Papadimitriou (2004), today educators are convinced that research in pupils’ understanding of many aspects of environmental issues will be valuable to teachers so as to teach pupils more effectively by taking the research findings into account. It may therefore necessitate an in-depth evaluation of the course curricula of any environmental education program. When the developed countries’ curricula are examined, it is seen that environment based concepts are included in these contexts. But it is impossible to say the same for underdeveloped and developing countries.

Turkish Educational System

Turkish Educational System consists of four main periods:

- *Pre-school education*: Pre-school education consists of the period in which children are not old enough to attend primary school and covers six years (between the 0 to 6). Families pay a monthly fee to pre-school educational institutions.

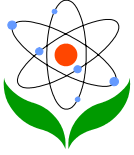


- *Primary education*: Primary education institutions consist of eight-year schools in which education is uninterrupted. It constitutes the period of education of children in the 6-14 age groups and free of charge in public schools. Science lessons are implemented between 4th and 8th level.
- *Secondary education (lycees)*: This is at least a 3-year program following the primary school education. It covers for ages of 14-17. This education is noncompulsory and free of charge.
- *Higher education*: The aims of higher education are to educate individuals who will contribute to the development of the country in various fields. It changes 2 or 6 years after secondary education.

Turkey has been deploying efforts aimed to improve its educational system, educational programs infrastructure education equipment and to recruit qualified staff in order to train Turks to contribute to the culture and technology of the world. With this aim in mind, the main education plan covering the years 1996-2010, has been changed to make education more flexible to meet personal, national and global requirements (TMNE, 1998). Parallel to growing population, the number of students and schools are increasing rapidly year by year in Turkey. The aim of the current science curricula of Turkey is similar to that of developed countries, but the implementation is still suffering because of inadequacies in the implementation process, such as poor teacher preparation, ineffective teaching methods, lack of teaching aids, and crowded classrooms (Keser, Özmen and Akdeniz, 2003). The numbers of teachers, students, and schools belonging to 2004-2005 period in Turkey are given in Table 2.

Table 2. Current Situation in Education in 2004-2005 Periods

Levels of Education	Number of Students	Number of Teachers	Number of Schools
Pre-school	434.711	22.030	16.016
Primary school	10.565.389	388.025	35.558
Secondary school	3.039.449	167.949	6.811
Higher education	2.073.428	79.555	78
Total	16.112.977	657.559	58.463



It is seen from the Table 2 that the number of the students constitutes nearly the quarter of the Turkish populations which is above 70 million. If the formal environmental education given to these students is efficient, this contributes to gain environmental consciousness to whole population. From this point of view, the necessity of including the environment-based concepts into the formal education curricula, especially science curricula, is obvious. Because environment-based concepts are generally situated into the science curricula, determination of how environment-based concepts take part in the Turkish science curricula is aimed in this study.

Methodology

Turkey has a central educational system. In this system, all of the programs are designed by the Ministry of National Education and distributed to the implementing institutions. As a part of this system, the textbooks written by different writers should be approved by the commission called Talim Terbiye Kurulu and these approved books are chosen as classroom textbooks. Based on this, in this study, science, physics, chemistry and biology textbooks in all levels were examined by document analysis method. Document analysis method is based on the examination of the written sources in respect of some determined criteria (Yin, 1994). In this study, ten different textbooks used in public schools were examined and environment-based concepts in these books were determined. Textbooks at all levels were examined and the topics relating to environment were tried to be determined during the analyzing process.

Results

Collected data from textbooks were presented in three categories: Science curriculum, biology curriculum, physics and chemistry curriculum. Results are presented in Table 3.

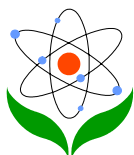
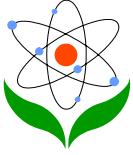


Table 3. Environment-Based Concepts in Turkish Science Textbooks

Textbooks	Chapters related environment
Science	
Grade 4	To know our environment, human and environment
Grade 5	Living creatures and their interaction with nature
Grade 6	Environment and plant
Grade 7	Ecosystem, to become a conscious environment friend
Grade 8	---
Biology	
Grade 9	Ecology
Grade 10	---
Grade 11	---
Physics	---
Chemistry	---

Science Curriculum (between 4th and 8th level in primary education)

When the 4th-8th level science textbooks are investigated, as seen from the table 3, the subjects related to environment are not seen in the 8th course books. In others (4th -7th), it was determined that the environment is restricted by only one unit or subject. It was also seen that the related subjects are dealt very generally and superficially. In grade 4, science textbook includes the unit of “to know our environment, human being and environment”. In this section, under the heading “environmental recognition” knowledge about environment, elements forming environment, between human beings and environment relationship are taken into consideration, and some basic information related to environment is given to students. In grade 5, there is one unit called “living beings and their interaction with nature”. In this unit, living beings in natural habitat and interactions among them are examined. Having said this, direct explanations about environment are not made, interactions between living beings and environment



and nature are covered, and especially benefits of decomposing livings to the environment are examined instead. In grade 6, the section of “environment and plant” is located in the textbook. In this section, having introduced plants, the profits provided by plants to environment and human beings are mentioned. In grade 7, environmental subjects are encountered in detail among the grades. In this section, the effects of ecosystem and ecosystem degradation on the environment are covered in detail, and the subjects such as erosion, water and air pollution, energy inadequacy are touched on as well.

Physics & Chemistry Curriculum (Secondary education)

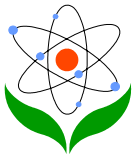
In the course books in related areas, no subjects were determined related to environment.

Biology Curriculum (Secondary education)

When the biology 9th-11th level textbooks were investigated, related to environmental subjects, under the title of ecology, some theoretical information were given to the students only in the 9th level textbooks.

Discussion

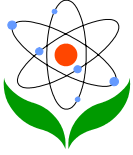
Some kind of negativeness parallel to the developments in both science and technology in the world affects the environment. By the increasing of the negativeness in the recent years, arouse the interest of people towards environment, made more groups concern about it and forced them to take some precautions. When the literature related to environment was investigated, especially it was understood that the gaining of the environmental conscious was on the front. Especially developed countries conducted many of the studies related to the pollution of air and water, acid rains, chemical wastes and global warming which were proved like the hazardous to the environment and consequently to the human health in order to make the people become conscious. Related to this subject, in the last 30 years, providing the contribution of the scientists, some kind of meetings was arranged and some radical decisions were taken. In these studies, by emphasizing the importance of the environmental conscious in order to develop the environmental conscious of the individuals, it was brought out that the environmental subjects had to take position in



every level of the primary education to the higher education. However, environmental education is still its infancy in many countries, and systematic efforts are not being made to incorporate environmental concepts in any way into the school curriculum. Although there is some efforts related to environmental education, the current status in Turkey is at the stage of just beginning and the establishment of a baseline for planning an environmental education curriculum in Turkey is an urgent need as stated by Tuncer and colleagued by blishment of a baseline for planning an environmental education curriculum in Turkey is an urgent needf just beginn (2005). When it is thought that the basis of this study is to determine the environmental concepts placed in the curriculum, the data proves that there is a great necessity to add environmental concepts to the curricula.

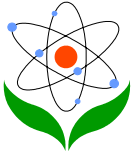
The efforts related to the education of the environment conscious were started in 1972 by the help of United Nations and also in time more progress is made. Between the related studies, it was seen that the peak point was reached in 1992 in Rio. The document of Agenda 21, which includes the necessary plans and activities, has also the sustainable development plans of the current century in order to apply the Rio conclusions (UNCED, 1992). By taking this document into consideration, in Turkey, Turkish National Environment Activism Plan prepared by The State Planning Organization (SPO) in 1997 is a useful plan according to the development plan and also the decisions are related to education. In accordance with this plan's decision, the committee of the experts who investigated the environmental facilities in the name of OECD eventuated in Turkey, submitted their opinion and suggestions are related to the subject as a report. The importance of the giving attention to the education for effective environmental protection was surely underlined in some parts of the relevant report.

Especially, the chemicals are the first reason to cause environmental pollution and its importance should be included in the units or subjects about environment of science course books. With this opinion, especially developed countries take care of these items and give more places related to the environmental subjects in their primary and secondary school curricula (Swan and Spiro, 1995). For instance, Weston Creek Primary School in Australia included environmental subject into its curriculum, name is integrated curriculum 2005, besides science and technology subjects. This program consists of 4 terms. In the 4th term called 'Earth First', they have been teaching environmental subjects and issues completely (<http://www.westonps.act.edu.au>). In



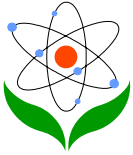
addition, The Michindoh and Goodwillie Environmental Schools in USA also include supporting environmental subjects in their primary and secondary school curricula for their summer term (<http://www.michindoh.com> and <http://www.fhps.k12.mi.us/goodwillie.htm>). According to the results of public opinion survey conducted by National Environmental Education and Training Foundation (NEETF), 95% of parents support environmental education in the schools in USA (NAAEE, 2001). Beside this, the developing countries by giving attention to the decisions from the kind of conferences in the whole world, try to make difference in the educational programs by the help of their own facilities. In this context, in Turkey, which is a developing country, some of the facilities were started but the outcomes are not in the same level as wanted.

It is well known that energy sources also cause environmental pollution. Decreasing these negative effects can be achieved by using renewable energy sources (RES) and making citizens conscious about using energy effectively. That energy-related concepts are included into science education programs at all levels is a useful way for this. It is also known that the studies in the educational programs for configuring the environment and energy concepts, which are directly related to the human livings, are really in limited numbers (Doğan and Akaydın, 2001; Keser, Özmen and Akdeniz, 2003). The results of these studies show that energy-related concepts are not given place in science curricula, adequately. With this regard, in this study, the importance of the courses in the applied sciences in primary and secondary school levels were investigated. Also it was investigated that how much attention was given to these course books. In this study, the new concepts, which are taught now in the schools like the applied science, biology, physics and chemistry, course books were added. As seen from the Table 3, in the physics and chemistry course books, no related environmental subjects were seen in the 9th-11th levels, the subject of the ecology was given in the biology course books in the 9th level. Close to this subject, the importance of the soil, water, and temperature, radiation of the sun, nitrogen, carbon, oxygen cycle; the concept of ecosystem were given a lot. In the applied science course books, while the environmental subjects were encountered in the 4th-7th levels of course books, in the 8th level no related subjects were seen. In the 4th level applied science course books, under the title of “to know our environment”, the events happen in air, water, land areas were given attention in order to understand how they affect the living things. In the level of 5th, under the title of “living beings and relationships between the worlds”, the importances of the small organisms which affect the human



life were investigated in order to get the interaction between environments. In the level of 6th, under the title of “environment and plant”, the advantages of the plants and its importance to the human beings were investigated. In the level of 7th, in the unit of “being a conscious friend to environment”, the taking environmental precautions in the industry development, the importance concepts in some facilities in the field of agriculture, protecting the water sources, recycling of the consuming nutriments and energy sources and the effective usage of this sources are investigated. And also, ecosystem concept, the natural events which have greater effects on the degradation of ecosystem and natural balance, such as lightning, earthquake, flood, volcano explosions, and hurricane are explained in detail. In addition, the negative effects of excessive population growth, unplanned industrialization and ignorant use of natural sources on environment and nature are stressed. In the section entitled as being a conscious friend to environment, to prevent environment from degradation the precautions needed to be taken are also examined in detail. When the curricula is examined in detail, it is seen that while the relation between human and environment is handled superficially in the present textbooks, on the other hand, the importance of the environment on the human life, the factors causing environmental pollution, the precautions preventing this pollution are not mentioned sufficiently. And also, we did not come across any topics relating to the water, sources of water, water pollution and causing factors and water cycling for human life. Such a case is the most important lack encountered in the Turkish curricula. Beginning from the elementary level it leads the pupils not to be aware of environmental conscious. When they grow up they neglect the environmental problems furthermore they acquire habits to pollute it. Adding the environment-related topics into the curricula would help the students to be informed about the importance of environment and water cleanliness and the precautions taken to prevent to pollution. Most of the problems can be solved with the help of the studies when they are carried from the national level to international.

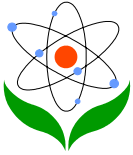
As seen from the results, some concepts related to environment were placed in the curriculum in order to make students more conscious. It is clear that they are not good enough to cover the expectations. There are certain environmental issues, such as ozone depletion and the greenhouse effect, which are not only complex but also abstract in nature (Boyes, Chamber and Stanisstreet, 1995). Moreover, research studies have found that the textbooks used in schools have inadequate or sometimes incorrect information (Soyibo, 1995). Because, the given information related to environment in the course books, generally not aim to make the people more



conscious but it explains the events theoretically. By giving the necessary information to the people about natural events (disasters), it decreases the negative impression of people towards environment and its affect. It is important to make people more conscious in order to understand what kind of precautions should be taken. Environmental science informs how to protect natural resources, gives them the tools they need to teach others, and serves to develop the next generation of land stewards (NAAEE, 2001). This consciousness can be achieved by including more environmental concepts or chapters into the science curricula.

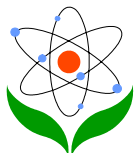
Conclusion

When the environment-related literature was investigated, especially it was understood that the gaining of the environmental conscious was on the front. Especially developed countries have conducted many of the studies related to the pollution of air and water, acid rains, chemical wastes, energy sources and global warming which were proved the hazardous to the environment and consequently to the human health in order to make the people conscious. But, these kinds of studies are not enough to inform the public, especially students and formal education is necessary for this information. So, school curriculum should be designed to make it easier. This kind of conscious could be achieved with well-designed curricula that include environment-based concepts because studies in the literature state that schools play an important role in the formation of children's positive attitudes towards to environment and the formal education system is the most convenient for incorporating EE programmes (Smyth, 1987; Spiropoulou, Roussos and Voutirakis, 2005). Especially, applying this kind of studies in the lack of environmental education and realizing the facilities done by the combined study of both ministry of environment and ministry of education, it is believed that the educational programs in Turkey must be improved again to arise the environmental conscious through subjects. In parallel to development in the educational systems and government policies, textbooks have been prepared and distributed by the government to the primary school students for the last two years. In the current textbooks, it is seen that chapters or units about environment and daily knowledge are widely placed. It is thought that these textbooks can partially prevent this lack of knowledge.



In this process, especially environmental related courses must be included in the educational programs such as ‘Environmental Education’. Because, teachers who teach these subjects feel themselves limited between applied sciences and biology courses and also they feel irresponsible to teach such a subject because they are not trained to teach it. And therefore, teachers are failing to develop environmental literacy because they are not incorporating environmental concepts ecological principles into the subjects they are teaching (Spiropoulou, Roussos and Voutirakis, 2005). It could be useful to gather environmental subjects in the biology and applied science books in order to teach them in detail and to give conscious. It is better to teach them as a separate course and it helps the problems disappear. In this content of this course, beside the unit ‘Living things’, the global warming, acid rains, holes in ozone, the greenhouse-effect and some kind of environmental pollution affecting the human and environment negatively should be taught theoretically including the necessary precautions. In this current situation, in order to execute these courses, firstly applied science, biology and chemistry teachers should be informed about environmental subjects through in-service training. Because, one of the most important difficulties encountered for an effective environmental education is lack of the expert teachers in environmental education. The teachers play an important role in teaching environmental-based concepts (Khalid, 2003). But, as stated by Ko and Lee (2003), if there is an urge to do something for the environment, the teachers will try to teach environmental education despite the barriers. In addition, curriculum designed for environmental education should be clear and enough for teachers to realize desired environmental education and enough time should be given in class to teach it. We also advise to establish a separate department training environmental teachers in universities. We believe that it is useful to include environmental courses in primary and secondary school curricula.

There is no doubt that Turkey is not the only country in the developing world insufficient environmental education is in action. Lack of environmental knowledge in curricula is obvious in many countries. The results of globalization have been closely noticed in every passing day. For this reason, all people around the world have been affected by all the activities related to environment, either positive or negative. For example, some scientists claim that the newly hurricanes ‘Katrina’ and “Rita” are caused by global warming. It is also clear that scientists lack a detailed explanation of how global warming would cause the hurricane trends seen so far. However, it is known that environmental pollution and degradation of the natural balance cause

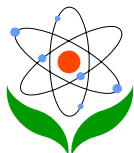


many undesired natural events. So it is crucial to enlighten people about the environmental problems and to bring up with environmental conscious through environmental education. It is important to make the pupils conscious in such an educational environment. But besides the educational institutions, non-governmental organizations should also fulfill their obligations about this subject all over the world. “Green Peace Organization” is the well-known organization around the world, which is very sensitive to the environmental problems in the world. In Turkey, as a candidate to EU, the members of this organization have also done sensitive works to environment. TEMA is also another crucial organization doing good works for the environment in Turkey. As the efforts in Turkey, many studies are carried out all over the world about the environmental education and conscious. Instead of performing such studies separately in all countries, they should take common precautions altogether. Such an approach would help them to solve arising problems easily.

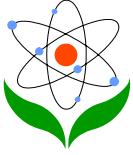
In summary, it is urgent to give the necessary training both to the students in school and the people in society. It is stated that if the students do not have the proper knowledge and understanding of causes and effects of these environmental issues, it will be very hard for them to make correct decisions in the future to reduce and control these problems (Khalid, 2003). Thus, environmental education for whole society and citizen is crucial for human life and world life. And also, as stated by Tuncer and colleagues (2005), it is not forgotten that translate theoretical knowledge into environmental attitudes will help very much in constructing an environmental education strategy. Because, to know is not enough, to apply is also necessary. Everybody must not forget that we have one world.

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