

Towards Effective Instructions in Environmental Education: A Critical Review of Literature

Ahmet Baytak
Harran University
Urfa, Turkey
abaytak@harran.edu.tr
Harran University

Abstract

The tendency that there is a global warming issue and the environmental disaster through out the world became top news in media. While scientist and politicians are gathering to find solution for the environmental issues, educators are aware of that a sustainable future needs an effective education for today's children. However, how these children should be educated on environmental issues and what they should be required in this technology age is still a question. This paper, thus, provides an intensive review of the literature on environmental education and how different instructional strategies could be used effectively in educational programs.

Keywords: Environmental education, effective education, educational programs

Keywords: Environmental education, children's education, technology integration, educational technology, games.

Introduction

Recently, there has been a growing interest in environmental issues, and in particular, global climate change. This interest extends not only to researchers and educators in science but also nonprofit organizations (NGO), governments, concerned citizens and advocacy groups who aim to raise awareness on environmental issues. The international community has increasingly paid more attention to the importance of environmental education to environmental protection.

In the literature, the term environmental education (EE) began to be used in the 1960s as an effort “to produce citizens who are knowledgeable about the biophysical environment and its problems, aware of strategies that can be used to deal with those problems, and actively engaged in working toward their solution” (Stapp et al., 1969, cited in Fisman, 2005, p.39). A few years later, The United Nations Education Scientific and Cultural Organization (UNESCO) and United Nations Environment Program (UNEP) announced three major declarations that structured the objectives of environmental education courses.

The first declaration, the Stockholm Declaration, was created in 1972. Three years later, UNESCO and UNEP with representative from 60 countries, announced the Belgrade Charter in former Yugoslavia. According to this charter, the goal of EE is “to develop a world population that is aware of and concerned about the environment, its associated problems, so that the population will have the knowledge, skills, attitudes, motivation and commitment to work individually and collectively towards the solutions of current problems and prevention of new ones” (1996, p. 94). The Tbilisi declaration, in 1977, by the same international communities, focused on local environmental issues (Fisman, 2005). More recently, former UN Secretary General, Kofi Annan, stated the importance of current environmental problems and how humans are causing these problems. He also called nations and individuals to take action to end thoughtless or deliberate waste and destruction (Annan, 2004, cited in Haigh, 2006).

Academicians established a US-based international NGO, the Earth watch Institute, in 2003 “to work together to promote environmental education and the cause of sustainable development” (Haigh, 2006 p.330). With similar goals, there are different organizations such as TEMA in Turkey (2009) and the Worldwatch Institute in the US (2009), companies such as Shell in Malaysia (Said, Yahaya, Ahmadun, 2007) and several worldwide NGOs such as The National Audubon Society, Sierra Club, and GRACE (2009). Recently, Live Earth organization, which is founded by producer Kevin Wall, in partnership with former U.S. Vice President Al Gore, organized a worldwide concert on 07.07.07 called “round the world”. The aim of this event was to increase people’s awareness on environmental issues and global change.

In addition, special days and events focused on the environment are commemorated worldwide, and are often familiar to children in schools: Earth Day on April 22nd of each year and World Environment Day on June 5th of every year. These initiatives are designed to stimulate worldwide awareness of the environment and enhance political attention and action (UNEP, 2009). Tree Planting Day is also organized

in different countries such as China, Turkey, Australia, Iran, and Ireland in order to increase awareness of nature among young generations by planting trees.

Research on Environmental Education

Studies on environmental education from the 1960s and 1980s were mainly concerned with the identification, prediction, and the control of variables for environmental behavior (Palmer & Suggate, 2004). In the last decade, however, researchers have examined various perspectives related to the environment such as students' environmental knowledge (Morgil, et al. 2004), environmental awareness and concerns (Sherburn & Devlin 2004; Zimmer et al. 1994), behavior (Negev et al. 2008), and comprehension and participation (Said, Yahaya, Ahmadun, 2007).

Table 1: *Summary of reviews for the studies about environmental education*

<i>Sample Study</i>	<i>Country-Age Level</i>	<i>N</i>	<i>Methods and Purposes</i>
Nicolaou, et al. (2009)	Greece, 11-12 years old	12	Qualitative study to explore the development of decision making skills and environmental skills
Shobeiri, Omidvar, & Prahallada, (2007)	India-Iran, secondary school	991	Comparison of students environmental awareness in two different countries
Barraza and Walford (2002)	Mexico-UK, 7-9 years old	246	Comparison to find possible reasons of influencing the environmental knowledge and perceptions
Jinliang et al, (2004)	China, primary and high school students	1179	Quantitative study to analyzes the status and characteristics of environmental awareness
Korhonen & Lappalainen, (2004)	Madagascar 8- to 21-year-old	212	Quantitative study to examines environmental awareness
Negev et al. (2008)	Israel, Middle and High school students	3101	Quantitative study to evaluate students' environmental literacy
Said, Yahaya, & Ahmadun, (2007)	Malaysia, secondary school students	306	Quantitative study about environmental education and behavior changes
Duan & Fortner (2005)	China, university students	108	Quantitative study to examine students perceptions about internal and external factors of environmental issues
Palmer & Suggate (2004),	UK, adults and children	322	Longitudinal study to investigate the acquisition and development of environmental knowledge, awareness and concern
Tuohino, (2003)	Finland, adults	586	Quantitative study to measure participants attitudes towards environmental sustainability
Haigh, (2006)	UK, adults	450	Case study of an NGO
Dresner & Gill (1994)	USA, 10-13 years old	28	Quantitative study about camping and environmental education

Evans & Gill, (1996)	UK, Middle and High School	173	Quantitative study about attitudes and environmental awareness
Morgil et al. (2004)	Turkey, University Students	88	Quantitative study to measure the effects of computer-assisted education on environmental knowledge and awareness
Uzunboylyu, Cavus & Ercag, (2009)	North Cyprus, University students	41	Quantitative study to investigate use of mobile technologies and environmental awareness
Day, (2004)	USA, Elementary school students	23	Quantitative study to examine how artwork increase students awareness about environment
Heo (2004)	Korea, Elementary school students	NA	Quantitative study to investigate story telling and environmental education in web-based learning environments
Pacheco, Motloch, & Vann, (2006)	USA, 6 th grade	NA	Case study to explore games and environmental education

N: Sample size NA: Not applicable

1. External Factors in Environmental Education

As Nicolaou, et al. (2009) stated, environmental problems are complex and ill structured, and these problems involve consideration of values, tradeoffs, social interests, and culture. For instance, Shobeiri, Omidvar, and Prahallada, (2007) found cultural differences between Indian and Iranian students' perceptions of identifying environmental problems in their countries.

Barraza and Walford (2002) found that students have different perceptions about environmental issues in each country. For example, students in Mexico ranked population growth whereas students in England ranked nuclear waste as the most dangerous environmental issues. In another study conducted in China, students listed the quality of water and pollution as the main environmental problem (Jinliang et al, 2004). Similarly, lack of water was identified in a study in Madagascar (Korhonen & Lappalainen, 2004), and air pollution in studies in Israel (Negev et al. 2008) and in Malaysia (Said, Yahaya, Ahmadun, 2007).

Similarly, when examining Chinese students' awareness of global problems and local problems, Duan and Fortner (2005 p.30) claim "It is reasonable that people would determine that an issue is real if they can see or smell it. The most significant issues are the certain ones that can be directly sensed." They suggest further "educators should choose effective sources and formats to make more complicated environmental issues tangible and understandable" (p.30). However, none of these studies focused on a diverse classroom environment.

Barraza and Walford (2002, p.178) stated, "Children's environmental knowledge varies according to the school ethos, the teacher, and their access to information through books, media such as television, computer games, and other social activities. Thus, when children are exposed to situations that involve environmental dilemmas, their reactions vary according to four major factors: (1) culture; (2) experience; (3) affiliation for a particular animal; and (4) school ethos". Shobeiri, Omidvar, and Prahallada (2007) stated

that type of school management, private or public, also has an impact on environmental awareness of students.

II. Cognitive Structure of Environmental Education

Some studies also focused on how people's environmental knowledge and awareness is structured. According to Palmer and Suggate (2004), "environmental problems are socially constructed in terms of their conceptualized effects on individuals, groups, other living things and systems, [and accordingly,] research based on constructivist principles provides not only a coherent framework in which to theorize about learning, but also a context for understanding socially constructed issues and knowledge" (p. 208).

Students' perceptions about environmental issues, however, seem mainly influenced by media coverage (Barraza & Walford, 2002; Jinliang et al. 2004). For example, survey results from Jinliang et al (2004) showed that students learned their environmental knowledge from TV (34.259 percent), followed by the press (27.350 percent), teachers (13.746 percent), and only 4.630 percent from the parents.

Even though most prior studies explored students' environmental knowledge and awareness, there are still concerns about transferring knowledge into action. For instance, in one study, it was found that people were aware of environmental aspects but was not prepared to transfer their environmental beliefs into consumer behavior (Tuohino, 2003). A similar finding was also reported in the Barraza and Walford study (2002) in Mexico and England where students perceived environmental issues and had a high level of knowledge of environmental issues, but, they were not able to transfer this knowledge into action. Thus, in order to deal with such problems, Nicolaou, et al. (2009 p.49) suggest that "students should be able to reason cause and effects, advantages and disadvantages, and alternative outcomes to the decision making process."

Since today's children will be responsible for the remaining natural resources, children's environmental knowledge, environmental awareness, and attitudes toward environment is important (Korhonen & Lappalainen, 2004). To address that problem, UNESCO has urged educators, institutions, and governments to design environmental education curricula for students that provide learning modules that bring skills, knowledge, reflections, ethics, and values together in a balanced way (Haigh, 2006).

Since the 7-9 age group is at a state where the child's mind undergoes a developmental change, some researchers specifically examined these students' environmental awareness (Barraza, Walford, 2002). According to Palmer and Suggate (2004), "the analysis of understanding shows that children as young as 4 years of age are capable of making simple accurate statements about the effects of major environmental change on habitats and living things. Occasionally by the age of 8 and certainly by the age of 10, pupils are capable of appreciating and explaining the complexity of some of the relationships that exist among plants, animals and their habitats, and to provide accurate reasoned explanations of some of the effects of significant changes to global environments" (p. 205).

III. Instructional Strategies for Environmental Education

In order for students to have sustainability, educators start teaching Environmental Education courses either as part of science class, or a separate course. Environmental education as conservation was established in the second half of the 20th century. For example, formal environmental education started in England in the 1950s and in Mexico in the 1980s (Barraza & Walford, 2002). In the US, conservation education started in 1953 and current environmental education started with U.S. Congress Environmental Education Act in 1970 (McCrea, 2006).

In environmental education classes, there have been different programs and activities organized to increase awareness and knowledge of students about environmental issues. Some of them are traditional class lectures, media coverage, camping (Dresner & Gill 1994), or involving students in “the use of facilities, such as botanic or zoological gardens, or museums, as educational resources” and “involvement of the local community in the management of resources” (Evans & Gill, 1996, p. 245). Computer-based instruction is also used for environmental education (Morgil et al. 2004).

Even though environmental issues have an effect on several subject areas, it is rarely integrated with subject areas other than science in formal schooling. Some areas of integration in the research are as follows; math (Jianguo, 2004; Foorest, Schnabel & Williams, 2006), geography, science, moral education, and life skills (Said, Yahaya, Ahmadun, 2007), web-based storytelling (Heo 2004), mobile technologies (Uzunboylu, Cavus & Ercag, 2009), and art (Day, 2004) in order to increase students’ environmental awareness. Day (2004), for instance, designed a study where students created artwork to increase their environmental awareness. The results showed that the artwork reached students on an emotional level, affected critical thinking, and assisted memory retention.

Another traditional instructional strategy for learning about environmental education is outdoor education where students visit certain area to lively experience the environmental perspective of the area. With outdoor experience students have opportunity to explore the relationship within the environment and the impact of human being on the environment (Priest & Gass, 2005).

According to Bhandari & Abe outdoor activities have most impact on transferring environmental education from theory to practice (2000). These activities help students acquire knowledge, attitudes and skills in school as well as out of school. Moreover, there are some other similar activities that give students opportunities to explore and apply environmental education in real-life cases. Some of these are eco-clubs, green clubs, nature clubs, and summer camps. Based on the researchers study scope of countries in Asia, Indonesia Nepal and Fiji are countries that implemented outdoor education as part of their environmental education programs (Bhandari & Abe, 2000).

Outdoor education could be effective instruction in for environment education but it generally requires technical and physical skills for participation in and professional instruction of adventure activities (Thomas, 2005). In addition, schools in metropolitan areas could not have that many options for outdoor education.

UNESCO that for the adults learning about environmental issues and increase their awareness about these issues also purposed it, experimental learning strategy could

be implemented (Bélanger, 1997). Other than specific environmental education courses, most science teachers with project-based teaching approach, gives students task to test certain environmental issues to see results (Boss & Krauss, 2007). Besides the lab experiments that teachers do in class by following the textbooks there are websites (e.g. terrificscience.org) that have several examples of different experiments that students can try at home and at school.

Pedagogically similar to learning with experiment, experiential learning approach provide education strategies where the students able to develop their skills and understanding through an active involvement in their learning. Maloof, as a teacher in the field, pointed how the experiential approach could be effective learning strategy for environmental education where students could take real world cases as their homework to act upon them (2006). Even though these approaches are found effective for learning about environmental issues, it becomes a physical barrier to extend learning more about environmental issues. There also could be schools that not have enough lab equipments or adequate solution for some possible lab hazards.

Researchers have acknowledged that children's and adolescents' opinions and knowledge concerning the environment have been under-researched (Korhonen & Lappalainen, 2004). In addition, some scholars believe that environmental education should not be restricted to formal education class time since environmental education is a lifelong process (Haigh, 2006). Accordingly, Evans and Gill (1996) suggested having cross-curriculum teaching for environmental education.

Given the growing interest in including more environmental content in education, efforts to increase students' knowledge and awareness of environmental issues are valuable. However, "young people will not act immediately because there is an inevitable time lag before the children or students, who are being educated, are in planning or decision-making roles" (Evans & Gill, 1996, p.245). Likewise, some scholars have criticized the learning strategies employed in environmental education classrooms. Heo (2004), for instance, argued that most classrooms focus solely on learning facts and principles of environment. Others note that studies are focusing solely on local problems (Evans and Gill 1996). Students, therefore, fail to consider environmental issues from a global perspective.

Game play also has been explored as a formal and informal learning environment about environmental issues. For instances, 6th graders were asked to play the game *Second Chance* to increase their environmental awareness (Pacheco, Motloch, & Vann, 2006). In another study, 6th grade students designed games about global warming (Pinkard, 2007). However, this study only focused on girls' engagement in programming. It was found in this study that designers should have clear definition of their responsibility during collaboration.

Conclusion

In sum, most of the previous studies have focused on educational strategies and tactics to improve students' environmental knowledge and increase their environmental awareness. However, there is a lack of studies that explore children's behaviors in the

environment. The previous researches have not measured in a long-term process whether the children's achieved environmental knowledge and awareness affects their behaviors and attitudes toward the environment. It has to be accepted that there are various ways to teach about environmental issues and instructional strategies such as outdoor education learning or learning with experiments could be also enjoyable for children. However, as mentioned previously, the down side of these approaches and children desires for the new styles of education requires for educators to provide alternative instructional strategies for an effective environmental education. Especially with the growing interest of children's in technology and games could be a powerful instructional strategy to teach these children about environmental education and to increase their awareness about environmental issues.

References

- Barraza, L. & Walford, R. A. (2002). Environmental Education: A comparison between English and Mexican school children. *Environmental Education Research*, 8, 171–186.
- Bhandari, B. B. & Abe, O., (2000). Environmental Education in the Asia-Pacific Region: Some Problems and Prospects. *International Review for Environmental Strategies* 1(1), pp. 57 – 77
- Boss, S. & Krauss, J. (2007). *Reinventing Project-Based Learning: Your Field Guide to Real-World Projects in the Digital Age*. ISTE
- Bélanger, P., (1997). Adult environmental education: awareness and environmental action. Fifth International Conference on Adult Education (CONFINTEA V), Hamburg, 1997
- Day, J. (2004). *Connections: Combining environmental education and artwork in the primary grades for sustainability*. Unpublished master thesis, University of Phoenix
- Dresner, M. & Gill, M. (1994). Environmental education at summer nature camp. *Journal of Environmental Education*, 25(3), 35-41.
- Duan, H. & Fortner, R., W. (2005). Chinese college students' perceptions about global versus local environmental issues. *The Journal of Environmental Education*, 36(4), 23-32.
- Earth Watch (2009). Retrieved April 15, 2009 from EarthWatch website: www.earthwatch.org
- Evans, S.M. & Gill, M.E. (1996). School children as educators: The indirect influence of environmental education in schools on parents' attitudes towards the environment. *Journal of Biological Education*, 30(4), 243-248.
- Filho, W. L., Murphy, Z., & O'Loan, K. (1996). *A sourcebook for environmental education: A practical review based on the Belgrade Charter*. Bradford/Carnforth, UK: ERTCEE/Parthenon Press.
- Fisman, L. (2005). The Effects of local learning on environmental awareness in children: An empirical investigation. *The Journal of Environmental Education*. 36(3), 39-50.
- Forrest, K., Schnabel, D., & Williams, M. (2006). Earth day. *Teaching Children Mathematics*, 12(8), 408-409.
- GRACE (2009). Retrieved April 10, 2009 from global resource action center for the environment website: <http://www.gracelinks.org/>
- Haigh, M. J. (2006). Promoting environmental education for sustainable development: The Value of links between higher education and non-governmental organizations (NGOs). *Journal of Geography in Higher Education*, 30(2), 327–349.

- Heo, H. (2004). Inquiry on storytelling for the web-based environmental learning environment. *Association for Educational Communications and Technology*, 19-23
- Korhonen, K., & Lappalainen, A. (2004). Examining the environmental awareness of children and adolescents in the Ranomafana region, Madagascar. *Environmental Education Research*, 10(2), 195-216.
- Jianguo, M. (2004). Teaching environmental awareness in mathematics. *Chinese Education and Society*, 37(4), 53–56.
- Jinliang, W., Yunyan H., Ya, L., Xiang, H., Xiafei, W., & Yaunmei W. (2004). An analysis of environmental awareness and environmental education for primary school and high school students in Kunming. *Chinese Education and Society*, 37(4), 24–31.
- Liveearth, (2009). One world. One climate. Be the change. Last accessed on April 16, 2009 liveearth.org
- McCrea, E. J. (2006). The roots of environmental education: How the past supports the future. *Environmental Education and Training Partnership (EETAP)*. Retrieved April 16, 2009 from http://www.eric.ed.gov/ERICDocs/data/ericdocs2sql/content_storage_01/0000019b/80/1b/c6/41.pd f
- Maloof, J., (2006). Experience this! The experiential approach to teaching environmental issues. *Applied Environmental Education and Communication*, 5:193–197
- Morgil, I., Arda, S., Secken, N., Yavuz, S., & Oskay, O. O. (2004). The influence of computer assisted instruction on environmental knowledge and environmental awareness. *Chemistry Education: Research and Practice*, 5(2), 99-110.
- Negev, M., Sagy, G., Garb., Salzberg, A., & Tal. A. (2008). Evaluating the environmental literacy of Israeli elementary and high school students. *The Journal of Environmental Education*, 39(2), 3-20.
- Nicolaou, C., Korfiatis, K., Evagorou, M., & Constantinou, C. (2009). The development of decision-making skills and environmental concerns through computer-based, scaffolded learning activities. *Environmental Education Research*, 15(1), 39-54.
- Pacheco, P., Motloch, J., & Vann, J. (2006). Second chance game: local (university-community) partnerships for global awareness and responsibility. *Journal of Cleaner Production*, 14, 848-854.
- Palmer, J. A. & Suggate, J. (2004). The development of children’s understanding of distant places and environmental issues: report of a UK longitudinal study of the development of ideas between the ages of 4 and 10 years. *Research Papers in Education*, 19(2), 205-237.
- Pinkard, N. (2007). Girl power, encouraging sixth grade girls to give video games a try. Retrieved April 2, 2009 from http://spotlight.macfound.org/main/entry/pinkard_girl_power_encouraging_girls_games/
- Priest, S. & Gass, M. (2005). *Effective leadership in adventure programming, 2 nd ed* . Human Kinetics: Champaign, IL.
- Said, A., M., Yahaya, N., & Ahmadun, F. (2007). Environmental comprehension and participation of Malaysian secondary school students. *Environmental Education Research*, 13(1), 17–31.
- Sherburn, M. & Devlin, A. S. (2004). Academic major, environmental concern and arboretum use. *The Journal of Environmental Education*, 35(2), 23-48.
- Shobeiri, S. M., Omidvar, B., & Prahallada, N. N. (2007). A comparative study of environmental awareness among secondary school students in Iran and India. *International Journal of Environmental Reservation*, 1(1), 28-34.
- TEMA (2009). Türkiye Erozyonla Mücadele Ağaalandırma ve Dogal Varlıkları Koruma Vakfı. Retrieved April 10, 2009, from <http://tema.org.tr/>
- Thomas, G (2005). Traditional adventure activities in outdoor environmental education. *Australian Journal of Outdoor Education*, 9(1), 31-39

- Tuohino, A. (2003). Environmental awareness and environmentally friendly behavior—case Sulkava Rowing Event. *Environment Papers Series*,6(2), 1-11.
- UNESCO (1976). *The Belgrade Charter*. New York: United Nations.
- UNEP (2009). World Environment Day 2009. United Nations Environment Program. <http://www.unep.org/wed/2009/english/>
- Uzunboylu, H., Cavus N., & Ercag E. (2009). Using mobile learning to increase environmental awareness. *Computers & Education*, 52, 381–389.
- World Watch Institute (2009). Accessed <http://www.worldwatch.org>
- Zimmer, M. R., Stanfford, J. F., & Stanfford, R., M. (1994) Green issues: Dimensions of environmental concern. *Journal of Business Research*, 30, 63–74.