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# Environmental Education in High School 9th – 12th Biology Course Curricula Started to be Implemented in 2007*

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**Abstract**

The aim of this study is to analyze 9th – 12th grade Biology Course Curricula started to be implemented in 2007 with regard to concepts and attainments addressing to environmental education. In this regard, 9th – 12th grade Biology Course Curricula were analyzed using content-analysis technique, one of the qualitative research methods. 9th -12th grade Biology Course Curricula started to be successively implemented since 2007 were downloaded from the web-site of Board of Education (BoE) and then content analyzed across the components of environmental literacy, that is the ultimate aim of environmental education, and how much emphasis are given to any components of environmental literacy was also investigated. Examining the components of environmental literacy, it is observed that the attainments in biology course curricula are related with cognitive, affective and psychomotor domains; but much more emphasis are given to the attainments associated with cognitive domain compared to other domains. At the end of the study, suggestions are provided to curriculum developers and biology teachers, who implement the curricula to realize the aims of environmental education.

**Key Words**

Biology Course Curriculum, Environmental Education, Environmental Literacy.

Towards the 21 century, people's life habits and careless use of resources cause to decrease of natural resources. Therefore, the importance of EE increases rapidly. When environmental education (EE) literature is examined, it is appear that there are two ultimate purposes of EE; i) to develop peoples environmental literacy (Disinger & Roth, 1992; Stapp et al., 1969) and ii) responsible behaviors toward environment (Hungerford & Peyton, 1977). The previous research indicated the contribution of school and curriculum to attain the aims of EE (Barraza & Cuaron, 2004; Blum, 1987)

## Environmental Education in Biology Curriculum in High School

The analysis of 1997 biology curriculum indicated that environmental related concepts and issues were observed in 9th and 11th grade (MEB, 1997), but not in 10th grade (Ekici, 2005). In addition, Human and Environment course had an important role to teach the environmental related topics (MEB, 1992).

One of the purposes in current high school biology course is to develop responsible behaviors to the environment, which is main aim of EE (Hungerford & Peyton, 1977) and to cultivate people who has environmental literacy (Disinger & Roth, 1992; Harvey, 1977). In the context of developing environmental literacy, Biology Course Curricula aim at cultivating students as a conscious consumer, having an awareness regarding environment and

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developing positive attitudes toward the environment (MEB, 2009). It is observed that the subjects in Biology curriculum is supported with the concepts in Geography curriculum (TTKB, 2011e)

**Environmental Literacy**

Studies conducted on EE (Hungerford, Peyton & Wilke, 1980; Disinger, 1983; Harvey, 1977; Iozzi, 1981, 1984; Marcinkowski & Mrazek, 1996; Hart, 1981; Osbaldiston, 2004) have indicated that the aim EE is to cultivate environmentally literate individuals. Harvey (1977) commented that an environmental literate people had basic knowledge, skills, perception, and emotions about the relationship between human and environment. Goldman, Yavetz and Pe'er (2006) emphasizes that an environmental literate people possess values, attitudes and skills which help his/her knowledge transform into behavior. As could be seen from these definitions, environmental literacy is consisted of four domains; knowledge, skills, affective disposition and behavior (Hsu, 1997). Most Currently, Simmons (1995) divided environmental literacy into seven components; e.g. Affect, Ecological knowledge, Socio-Political knowledge, Knowledge of environmental issues, Cognitive skills, Additional determinants of environmentally responsible behavior, and environmentally responsible behavior (Volk & McBeth, 1997; Weiser, 2001). This framework was utilized in several research studies (McBeth, 2006; Negev, Sagy, Tal, Salzberg, & Garb, 2006; Shin et al., 2005)

Babulski, Gannet, Myers, Peppel and Williams (1999) identified these dimensions in 36 categories. These sub-categories have been refined in more recent studies (Erdoğan, Marcinkowski & Ok, 2009; Erdoğan, Kostova & Marcinkowski, 2009) and thus, 41 sub-dimensions have been determined.

**Purpose of the Study**

The aim of this study is to analyze $9^{th}$ – $12^{th}$ grade Biology Course Curricula started to be implemented in 2007 with regard to concepts and attainments associated with environmental education. It is believed that the results of the study will provide in depth information for the revision works and to the practitioners of the curriculum.

**Method**

$9^{th}$ – $12^{th}$ grade Biology Course Curricula were analyzed using content analysis technique, one of the qualitative research methods. Content analysis technique gives researchers a direction about what is inside in the written or visual documents (Patton, 2002).

**Analyzed Sources**

Obtained from Board of Education (TTKB 2011a, 2011b, 2011c, 2011d), the current $9^{th}$, $10^{th}$, $11^{th}$ and $12^{th}$ grade Biology Course Curricula started to be implemented in 2007 were content analyzed with regard to concepts and attainments related to EE.

**The Conceptual Framework**

The components and sub-components of EL already used in previous research studies (Erdoğan, Kostova et al., 2009; Erdoğan, Marcinkowski et al., 2009; Erdoğan, Coşkun, & Uşak, 2011) were utilized as framework for analyzing the Biology Course Curricula.

**Analysis**

The content analyses of 9-12 grade Biology Course Curricula carried out in four steps. The conceptual framework of EL developed by Simmons (1995) in 7 components was reconsidered depending upon the studies of Volk and McBeth (1997), and Erdoğan, Kostova et al., (2009) and combined into 4 categories to create the basic framework of the study. In the second step, subjects, concepts and attainments about the environment removed from curricula and written in a separate sheet. In the third step, attainments in the curricula were analyzed with regards to components of EL. Also, these attainments were matched with 41 sub-components. In the forth step, before tabulating the learning outcomes, first analysis was cross-checked by another researcher to establish coherence between the experts.

**Results**

**EE in the $9^{th}$ Grade Biology Course Curriculum**

There are 3 units and total 31 attainments in the $9^{th}$ grade Biology Course Curriculum. There are 8 attainments in the $1^{st}$ unit, 16 attainments in the $2^{nd}$ unit and 7 attainments in the $3^{rd}$ unit. The concepts and attainments related to the environment are generally presented in the $2^{nd}$ and $3^{rd}$ units. While the concepts related to biologic diversity take place in the $2^{nd}$ unit, ecologic footprints, recycling and current environmental issues take place in the $3^{rd}$ unit. Students are expected to acquire the knowledge about global and local environmental issues, cause and ef-

fects of these issues also gain some knowledge and competency on solving those problems. Besides the active participation of students to the problem solving process is another goal of this unit.

**EE in the 10th Grade Biology Course Curriculum**

There are 3 units and total 34 attainments in the 10th grade Biology Course Curriculum. There are 14 attainments in the 1st unit, 12 attainments in the 2nd unit and 8 attainments in the 3rd unit. Only 3rd unit have some attainments related to the environment. The concepts in the 3rd units mostly related with ecosystem, biotic and abiotic factors, food pyramid, energy flow, substance cycle and sustainability. Students are expected to learn and interpret the interaction of the elements of ecosystem by these learning outcomes. Additionally students are expected to appreciate the importance of natural cycles and value them.

**EE in the 11th Grade Biology Course Curriculum**

There are 3 units and total 57 attainments in the 11th grade Biology Course Curriculum. There are 27 attainments in the 1st unit, 20 attainments in the 2nd unit and 10 learning outcomes in the 3rd unit. All units have subjects and concepts related to the environment. The concepts in the first unit are related with basic structure of plants, photosynthesis, plant growth and environment and chemical fertilizers. The concepts in the second unit are related to gene-environment relation. The concepts in the third unit conceptions are related to community ecology, population ecology and biome subjects. Besides students are expected to know the results of extreme population increase and gain knowledge for the causes of danger of species in terms of environmental issues.

**EE in the 12th Grade Biology Course Curriculum**

There are 3 units and total 60 attainments in the 12th grade Biology Course Curriculum. There are 47 attainments in the 1st unit, 5 attainments in the 2nd unit and 8 attainments in the 3rd unit. All units have subjects and concepts related to the environment. The concepts in the first unit are related with environment-behavior. The concepts in the second unit are related with natural selection and its results. The concepts in the third unit are related with biologic diversity and its protection, sustainability of goods and food resources, rehabilitation of environment and sense of environment. Beside, this unit has some affective and psychomotor-related learning outcomes.

**In Class and Out of Class Activities**

There are so many activities suggested to acquire the attainments in 9th – 12th grade Biology Course Curricula about the environment and the teachers -practitioners of curriculum- are expected to use these activities in their lessons. The aims of these activities are for students to gain knowledge and awareness about the environment to protect the natural environment. These activities are suggestions for teachers to use in class to achieve the instructional goals.

## Discussion

As revealed in the present study, subjects, concepts and attainments associated with environmental education are included much more in 2007 Biology Course Curricula when compared with the previous Biology Course Curricula (Aydoğdu, 2010). Environmental related topics taking place mostly in 1st and 3rd grade biology course curricula in 1997 (Gezer, Köse, Durkan, & Uşak, 2003) are scattered to all grades in 2007 Biology Course Curricula by considering the interdisciplinary nature of EE (Palmer, 1998).

EE is not suggested as a separate course in secondary education but it is integrated to Biology course. This is similar with biology course curriculum implemented in some European countries; e.g. Austria, Belgium (Flemish Society), Belgium (French Society), German (North Rhine), German (Thuringia), Denmark, Spain and Finland. (Stokes, Edge and West, 2001)

When the subjects, concepts and attainments about the environment is analyzed on the basis of units and classes, it can be said that they are planned and sequenced in a hierarchy from easy to more complicated (TTKB, 2011a, 2011b, 2011c, 2011d). Most of the attainments related to the environment are observed to be associated with cognitive domain and mostly with 'Ecology Knowledge' and 'The Knowledge of Environmental Problems and Issues'. These findings show parallelism with the findings of the study done by Erdogan, Kostova, et al. (2009) on the analysis of recent Science and Technology Course Curricula in terms of environmental literacy. However, this limitation is tried to be dealt with the suggested activities and the horizontal connection with attainments in Geography Course Curricula. The attainments in the learning domain of 'Environment and Society' in Geography course is designed for the aims such as perception of the interaction between people and natural environment,

developing consciousness of responsibility and savings, developing practices for avoiding natural disasters and environmental problems, perception of functions and connections of regional and global scaled environmental, cultural, political and economical organizations.

In the research of Gülüm (2010), it was found that Geography Courses would be helpful to achieve some new points in terms of "Environment Problems and Information" and "Socio-Economic-Politic Knowledge". Furthermore, it is suggested that biology teachers should also use some different activities both in the classroom and out of the classroom to improve some learning acquisitions in the teaching program.

Most of the attainments in 2007 high school biology course curricula are related with cognitive domain. In the researches of environment education, it has been observed that there is a relationship between "environmental" knowledge and responsible environmental behaviors (Cottrell & Graefe, 1997; Hines, Hungerford, & Tomera, 1986/87; Hornik, Cherian, Madansky, & Narayane, 1995; Sia, Hungerford, & Tomera, 1985/86). But, it doesn't mean that if students know the concept of environment, they will protect the environment. That is, sometimes, even if they know the concept of environment, they don't do anything to protect the environment. So, only knowing the concept of environment is not enough to protect environment (Maleki & Karimzadeh, 2011). It should be known how this knowledge could be used in real life and transferred into the environmental protection. When the needs of students and educational system are thought, awareness of environmental issues should be improved using not only traditional methods but also modern, interactive and/or interdisciplinary techniques. In this regards, the courses including practical sessions and field trips will contribute to development of responsibility towards the environment by acquiring the ways of living (Yerkes & Haras, 1997), environmental awareness (Howe & Disinger, 1988), environmental knowledge and behavior (Erdoğan, Erentay, Barss, & Nechita, 2008).

The course of "Environment and Human" in previous educational program was an important course for attaining the aims of EE. But, a study conducted with secondary school teachers by Uzun and Sağlam (2007) revealed that this course was given as an elective and not opened in many secondary schools. In addition, the study indicated that they did not provide any opportunities for practicing (e.g. field trips, hands-on activities) and practical knowledge were not given sufficiently. In this context, the results of the analysis have shown the contribution of current Biology Course Curricula to fill the gap in the field. Cetin and Nisancı (2010) conducted a research for investigating the effect of Biology Course Curriculum on 9$^{th}$ graders' environmental awareness. Their study indicated that the activities suggested in the current Biology Course Curriculum contributed to development of environmental awareness much more than activities used in the traditional classes.

**Suggestions**

Several suggestions for further research and educational practice can be drawn from this study:

1. High School Geography Course Curricula could also be content analyzed in terms of the components of environmental literacy to assess how much this course contributes to the acquisition of environmental literacy. For example, Demirbaş (2011) reported based on his content analysis that especially 11$^{th}$ and 12$^{th}$ grade Geography Course Curricula includes attainments associated with sustainable development.

2. School and curriculum are sources for developing skills, knowledge, affects and behavior related to the environment (Erdoğan & Ok, 2011). In addition, media (Alaimo & Doran, 1980; Ostman & Parker, 1987), documentaries, parent, internet (Huang & Yore, 2003) and books (Arbuthnot, 1974; Mobley, Vagias, & DeWard, 2010) are others sources to contribute to the development of environmental literacy. Thus, teachers could make use of such sources for their instruction.

3. Implemented curriculum may sometimes be different from actual curriculum. Thus, experimental study could be undertaken to observe the biology instruction on students' environmental literacy.

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