

Historical development of environmental education in Bulgaria

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Publication Data

Paper received:
5 November 2010

Revised received:
12 July 2011

Accepted:
30 July 2011

Abstract

The article discusses the periods of environmental education (EE) development in connection with internal social and global international influences, mainly the effect of the First United Nations Conference on Human Environment in Stockholm 1972, the 1992 Earth Summit in Rio de Janeiro and the 2002 Earth Summit in Johannesburg. It pays attention to the impact of the social background and the role of science and pedagogical research on the different stages in the curricular and textbooks development. The school subjects' contents and educational technologies also evolved towards student-centered interactive education in school and out of school. A system of EE from nursery to postgraduate and lifelong education was developed in 1984 and a great part of it has been introduced in the different educational stages since then. After 1989 more than 132 NGOs and communities on ecology and environmental education were established and many others incorporated environmental education aspects in their activities. Still there are many unsolved problems in EE.

Key words

Environmental education, Curricular and textbooks, International collaboration, Bulgaria

Introduction

Environmental education (EE) has a long history in Bulgaria. It started far away in the past embedded mainly in Bulgarian folklore and literature. Later on it continued as practical education in the school gardens and forests through the environmental societies and movements. The definition of ecology and ecological approach to biology were first introduced in the courses of zoology at the University level (Kozarov, 1956) and in a textbook of zoology for the secondary school (Paspalev, 1962). The industrialization of Bulgaria caused the extermination of a few species from our biological diversity and some soil erosion due to construction was evident (Boev, 1970). A chapter on "Fundamentals of Ecology", including some notes about conservation of nature, was introduced for the first time in the biology textbook of the secondary school (Kostadinov, 1975) and since then EE has been increasing in scope, aims, contents, educational technologies, scientific research and monitoring. At the same time environment deterioration continued, many species were endangered and included in the Bulgarian Red Data Book. The present study aims to underline achievements and shortcomings in the development of EE mainly in secondary schools of Bulgaria encompassing all children and to look for new challenges and possibilities for its further enforcement and for

strengthening its effect on the quality of the environment itself as well as on the quality of education as a whole.

Materials and Methods

The study was carried out periodically for several years (2003, 2005 and 2008) and was mainly based on content and comparative analyses of school programs, textbooks, journals, scientific papers, books and dissertations, reports at conferences as well as personal experience and observation.

Results and Discussion

Periodicity in international development of EE and its resonance in Bulgaria: Internationally, history of EE can be divided into three periods on the basis of UN summits, which outlined global strategies for human-nature interactions and for corresponding changes in EE (Table 1). In the 60s of 20th century, due to rapid advances in industrial development, marked negative changes were detected in the environment, which spread over the whole planet. The global impact of humanity upon nature induced the beginning in the growth of global environmental awareness, which resulted in UN conferences and in corresponding curricula and textbook changes in order to prepare young people for the coming

Table - 1: Basic periods in global environmental policy and development of environmental education

1 st period before 1972	2 nd period 1972 – 1992	3 rd period after 1992 till present till date
Resources conservation and environmental awakening, IUCN (1948), The Club of Rome (1968), The Limits to Growth (1972) 1963: BSCS: Green, Yellow and Blue Versions; Nuffield Foundation Science Teaching Project: Nuffield Biology (1966, 1967)	UN Stockholm conference (1972); UNEP (1972); World Strategy for Conservation of Living Resources (1980); Our Common Future (1987); Contact (Newsletter of UNESCO); WWF; IUCN; International Environmental Educational Program (IEEP- 1975); Tbilisi conference (1977) and Moscow conference "Tbilisi + 10" (1987); First World Conference on EE, Canada (1982);	UN Earth Summit in Rio (1992); UN Summit in Johannesburg (2002); Declaration of the Club of Rome (1996); EU Biodiversity policy; EU nature legislation; World and EU strategy for sustainable development; Agenda 21. Second World Conference in EE (1992); UNECE strategy for ESD (2005) Stokes, E. Edge, A. and West, A. (2001); UNESCO: National strategies for SD and ESD, NGOs
International scientific committee on EE of Eastern Europe		

Table - 2: Basic periods in environmental education development in Bulgaria

1 st period before 1972	2 nd period 1972 – 1992	3 rd period 1992 – 2010
Nature reservations, forest creation, industrialization and urbanization, chemicals in agriculture.	Biosphere and other types of reservations; Technologies for purifying air emissions and waste waters; Nature conservation legislation;	Transition to trade economy; Closure of many factories; Land and factory privatization; Increased overexploitation of natural resources; Unemployment.
Folklore, poetry, literature; newspapers, magazines; Nature study society (1896); Union for nature protection (1927)	Research team on EE (NIER) (1972); International and national collaboration. A system of EE from nursery till post-graduation and throughout life (1984).	NIER closed. NGO's created; EE research at the Universities. Lots of new colleges and Universities. ESD. EE at the National palace of Children. New Journals
In-school and out of school activities; curricula and text book changes; practical and labour activities;	New curricula and textbooks in science education; Traditional and new out of class and out of school activities. EE in universities.	New curricular and textbooks. Ecological education in biology and EE in all school subjects. EE curricular and courses in universities

Table - 3: Development of environmental education in the Secondary school biology syllabi and programs

Programs					
1960	1973	1974	1984	1985	1991/7
Botany Zoology Human anatomy and physiology General biology	General biology: Fundamentals of ecology in 9 th grade	Biology from 5 th to 10 th grades. A chapter on ecosystems in 7 th grade; A chapter of ecology in 9 th grade	Biology from 6 th to 7 th grades. Conservation of plant and animal diversity in 6 th and 7 th grades	Biology from 8 th to 12 th grades. Chapters of ecology in 9 th and 12 th grades;	Natural science for 5 th grade: A chapter on Biosphere and Biomes; Biology for 11 th grade

Ecological approach to biological systems in all programs and textbooks

Revised school programs 2002/2003						
5 th grade	6 th grade	7 th grade	8 th grade	9 th grade	10 th and 11 th grades	12 th grade
Ecological approach	Nature and Humans	Organisms and environment	Unity of organisms and environment	Biosphere	Ecological approach	Biosphere

challenges. Bulgaria adequately responded to these trends mainly in two ways: participating actively in the preparation and confirmation of the UNESCO documents and in the further development and practical realization of the recommendations (Table 1).

Historical development of environmental education in Bulgaria was influenced by both, international events, and national social, economic and cultural characteristics (Table 2).

First period in EE history in Bulgaria: Environmental education, meant as love and care for nature, manifested itself in Bulgarian folklore, poetry and literature. In ancient times up to 1878, when Bulgaria was established as an independent state, nature was regarded as a guardian and as a source of living and welfare. This worship continued up to the urbanization and industrialization in the 1960's. Using anthropomorphism, folklore penetrated deep in the human soul and inspired moral consciousness. Priorities were given to moral categories as milestones of responsible attitude. Bulgarian

Table - 4: Environmental education requirements, included in the State educational standards

KOO	Standard requirements: Students should be able to:
Geography and economics	Evaluate natural diversity and beauty of our planet. Explain the global problems, connected with nature conservation and rational use of natural resources and the environment. Explain the processes of global warming of the climate and the depletion of the ozone layer. Discuss the problems, connected with management of water, soil and biotic resources and solid wastes. Value the concept of sustainable development as a global strategy. Know the principles of ecological monitoring and understand its necessity. Develop school projects on geographic and economic topics. Understand and use GIS.
Natural sciences and ecology	Use scientific approach when solving problems from different areas of life. Develop environmental culture and aspiration for nature conservation. Distinguish structural elements and processes at different biosphere levels of organization. Explain the state of the environment using natural ecological laws and human impact. Classify and compare ecosystems, populations and organisms. Anticipate the outcomes from changes in the environmental factors and human pressure on <i>environmental equilibrium</i> . Describe the application and biological impact of nuclear radiation. Understand the use of thermonuclear synthesis in production of nuclear energy and in nature conservation. Prove the necessity of recycling of materials and use of nature friendly technologies.

Table - 5: Environmental education aspects in primary and elementary school subjects

1 st – 4 th grades	5 th grade	6 th grade
Social and school environment – roles and responsibilities; nature of homeland, rules of behavior; healthy way of life; nature conservation festivals and traditions; nature and historical landmarks; seasonal phenomena.	Characteristics of nature components, natural resources, climate, natural zones on Earth, populations and settlements on Earth. Wise use of natural resources (geography).	Africa, Atlantic ocean, South and North America, the Arctic ocean: characteristics of nature components, resources of continents and oceans, population, economy, continental and regional environmental problems, natural disasters (geography).
Substances, bodies and organisms; natural resources: soil, ores, minerals, fuels; natural phenomena, life processes, adaptation, harmful substances, protection.	Pollution, purification of water and air, biodiversity protection, classification of living things, nutrition, respiration and excretion; hygiene of the body.	Heat pollution, conservation of the environment; reproduction, growth, development, movement and irritability; human-environment relationships (Man and nature).

poets and novelists (G. Rakovski, L. Karavelov, Ch. Botev, P. Slaveikov, I. Vazov, A. Konstantinov, E. Pelin, Y. Yovkov, and others) felt deep admiration for the beauty and diversity of Bulgarian nature and instilled it in children and adults.

In the period before the adoption of the Stockholm Declaration, the Action Plan and the Resolution in 1972, Bulgarian community was aware of the coming environmental changes from the information in the newspapers (Stupan – 1875, Macedonia – 1869), magazines (Nature, Hunter, Nature and Science, Forester's Thought, Nature Study and Geography, Young Tourist *etc.*) and from personal experiences (Penev, 1975). The *Bulgarian nature study society* (BNSS), established in 1896, for more than hundred years has been organizing scientists, teachers and amateurs in studying and protecting nature. The Ministry of education introduced field trips and excursions for studying nature in the school curricula (Velichkov, 1896, p. 339). Under teachers' provocation, K. Velichkov (1896, p. 465), the minister of education at that time, initiated circular letter to set up school gardens and school forests. Teachers' training courses at the vocational agricultural schools were organized, programs and teaching materials were prepared and regulations of prizes for the best school gardens to be awarded were adopted (Velichkov, 1896, p. 1149). That trend was maintained throughout the following years (Vazov, 1898). Biology textbooks for secondary and university education used ecological and evolutionary approaches (Altunkov, 1895). In 1927 the *Bulgarian union for*

nature protection was founded and jointly with the BNSS organized and lead the establishment of the first nature reservations (Parangalitsa and Silkosia) and other types of protected areas. Each family had to work for a week for communal prosperity – cleaning, planting trees, establishing gardens and parks, *etc.* (Petkov, 1925). In 1936, the first decree regulating the use and treatment of nature and natural resources was passed. All that shaped the requirements for corresponding educational changes. At war times these activities nearly stopped but after them they burst with new vigor.

After the second world war nature conservation became part of the labor education and training of children. Many eroded areas were planted with forests; water pipes renewed; parks and gardens created; wooden "houses" for birds constructed and placed in trees; feeding-troughs built. Simultaneously cognitive observations of animal behavior and plant development as outdoor activities widened and brought the necessity of collaboration of teachers with scientists. School gardens were transformed into school learning fields and school forest farms were started up. Schools were allotted pieces of land for those activities. Wildlife and nature "festivals" were regularly organized at which pupils demonstrated their learning and practical achievements, concerning nature. In 1955, the Central and the Regional Stations of young agrobiologists were founded and out of door and informal environmental education received its leadership and competent supervision. At the same time, vocational and production education prospered and all included care and

protection of nature. School societies for protection of birds and other animals, for plant species protection and cave life investigation were initiated (Vesselinov, 1961; Tachev, 1962).

The rapid industrialization and urbanization of the country and the tourists expansion in the 60s of 20th century and onwards alarmed scientists (Boev, 1970), teachers and ordinary people and evoked actions for rethinking education (Table 3), which started in 1960 and continued to the present days.

The biology syllabus of 1960 had the priority aim at developing love and care for nature and natural resources. Ecological approach was introduced and structure, functions and diversity of organisms were studied from the point of view of their adaptation to the environment. For each grade a separate textbook was prepared by different authors. There were no different versions of textbooks for a given grade. The aims of biological education stressed the abilities of human beings to conquer and manage nature and thus put people outside and above ecosystems. Modern poetry and literature at that time glorified the smoking chimneys of factories as signs of industrial development.

General biology in the 9th grade dealt with classification and evolution of the organic world and was called Darwinism. In the 10th grade, the biology course contained chapters on biochemistry, cytology, genetics, individual development and reproduction. Two books: "Silent spring" (Carson, 1962) and "Before nature dies" (Dorst, 1965), awakened Bulgarian scientists and teachers to organize nature protection activities.

Achievements during this period were: 1) Very high competences, responsibilities and dedication to science of science professors and lecturers at the universities (most of them had qualified abroad), who ensured a high qualification of teachers and thus a high scientific culture of the greater part of students; 2) Free access to education to all young people, who wanted to study and were able to pass the entrance exams; 3) State-paid education; 4) Very well organized practical education in the open and in the laboratories; 5) Entrance exams of high standards at the universities.

Disadvantages were connected with: 1) Not very adequate equipment for experiments and research; 2) Banning of genetic studies; 3) No alternative versions of textbooks; 4) No EE in chemistry and physics curricular and textbooks; 5) Lack of EE in universities, except for Biology faculties in Sofia and Plovdiv Universities.

Second period in EE history in Bulgaria: The UN's conference on the Human Environment in Stockholm, 1972 marked a turning point in the development of international environmental policy. The declaration, containing 26 principles concerning the environment and development, the Action Plan with 109 recommendations, and the resolution, became a major guiding strategy for nature management and for environmental education development.

According to the 1973 school program, a new textbook for the 9th grade was prepared and introduced (Kostadinov, 1975) that dealt with evolution, origin of Earth and life on it, historical development of all phyla and classes of organisms and fundamentals of ecology. The last chapter included abiotic and biotic factors, ecosystems, biocoenoses, biogeographical regions, the biosphere and man. The aim of biology education changed and human beings were regarded as components of the ecosystems. The journals, "Biology and Chemistry" (1957 – 1991), "Nature and Knowledge" (1950 – 2007), "Protection of Nature" (1974 – 1992), spread scientific and didactic knowledge and experience among scholars, teachers and scientists. Articles discussed the structures and functions of ecosystems, anthropogenic impact on them and measures for avoiding or reducing it.

A Chair of Landscape knowledge and environment protection at the Faculty of Geography and Geology (1973) and a Chair of ecology and nature conservation at the Faculty of Biology (1974) were established at Sofia University. Geography, geology and biology students received a solid environmental education (NIER, 1981a,b).

At the National Institute of Educational Research (NIER) in Sofia a team of scientists was organized in 1972 to investigate, develop and guide the implementation of environmental education. The team worked on a national as well as international level in collaboration with research teams of Eastern countries and with the Commission of education and communication of IUCN. The international work started with preparation of a glossary of 123 special terms in seven different languages (Russian, Hungarian, German, Czech, Polish, Bulgarian and Serbo-Croatian), so that scientists from the collaborating countries could understand one another. The proper interpretation of terms in EE and the images they created for other people in order to share them for effective communication was worked out. The Bulgarian version was published first in our country (NIER, 1978), but the complete dictionary in all the seven languages was published in Hungary the next year. The leader of the scientific team was academician I. D. Zverev (1979). Later on this idea was accepted and further elaborated in a new Glossary of environmental education terms (1983), containing 318 terms, by another scientific team.

The school biology syllabus was revised in 1974 and a new educational reform started that used the experience and achievements of BSCS (1963, 1964) and Nuffield Foundations (1966, 1967). The study of living things was named biology in all secondary school classes from 5th till 10th grades. Plants and animals were studied in 5th, 6th and 7th grades (two periods of 45 min per 35 weeks in a school year). Twenty school periods at the second half of the 7th grade were allotted to the study of ecosystems (Table 3). For the first time lessons on ecology were introduced in elementary school. The ecological approach to biology teaching was applied in all classes. The biology textbook in the 9th grade

Table - 6: Environmental education aspects in middle and high school subjects

Biology and health education	Chemistry and nature conservation	Physics, Geography and economics
Biodiversity, Classification and protection of species, Five kingdoms (Monera, Protista, Plants, Fungi and Animals – invertebrates), extinct and threatened species from each taxon. Organism and environment: Food interrelations, habitat, adaptation, human influence on the environment, human and environment hygiene (7 th grade).	Air, water and soil pollution, rational use of natural resources, physiological effect of different substances and materials, useful and harmful chemical processes, thermal effect, solutions of environmental problems, security in the chemical laboratory (7 th grade)	Effect of electrical current on the human body, sources of noise pollution, biological effect of ionizing radiation, security rules, radioactive rays, nuclear reactor. Asia, Indian ocean, Australia, Pacific ocean, Oceania, Antarctic ocean: resources, climate, waters, biomes, organisms, population, settlements, eco-problems, disasters (7 th grade)
Biodiversity, Animal kingdom – vertebrates. Human body: Structure, physiology, health and diseases. Hygiene of each body system and first aid. Organism and environment: Ecosystem, biodiversity, food chains and food webs, cycle of matter. Humans as part of nature (8 th grade).	Organic and inorganic substances, water purification, first aid, sources of acid rains and their effects, environmental problems, pollution from gaseous emissions, heavy metals, fuels, fertilizers, recycling, decomposition, friendly technologies (8 th grade)	Thermal pollution and means of reducing it, safe transport, internal combustion engines and pollution. Europe, Balkan peninsula, Bulgaria: Natural diversity, resources and rational use, relief, climatic zones, waters, population, trade economy, eco-problems and reservations (8 th grade).
Biosphere: Levels of biological organization, ecological factors, adaptations, populations, intra and inter specific interactions, ecological niche, behavior, communities, ecosystems, biomes, biogeochemical cycles of matter and flow of energy, ecological pyramids, succession, and equilibrium, impact of human activity on nature. Biodiversity (9 th grade).	Biological effect of ion and, radioactive elements, cycles of nitrogen and carbon; pollution, treatment of harmful substances; Drugs and their lethal concentrations, first aid in the chemical laboratory (9 th grade)	Noise pollution; production, transmission and use of energy, ultrasound application in medicine. Earth ecospheres, resources, global eco-problems, risks and disasters, world population and settlements, urbanization, world economy, polarization and organizations, regional eco-problems, GIS, demographic problems, sustainable development (9 th).
Multicellular organisms: Levels of organization, individual development, heredity and variation, genotype, phenotype, environment, mutations, hereditary diseases. Biological evolution, struggle for existence, natural selection, speciation, microevolution, macroevolution, anthropogenesis (10 th grade).	Thermo-effect of chemical processes; physiological effect of heavy metals; fuels. Nature protection: Global environmental problems, methods of purification, waste technologies, recycling, purification of gaseous, fluid and solid waste (10 th grade).	Ionizing radiation, nuclear power stations, infrared, ultraviolet and X-Rays, thermonuclear synthesis, radioactivity. Geography of Bulgaria: Natural diversity and resources; population structure, density, migration, social and demographic problems, economy and eco-problems, sustainability (10 th grade).
Cellular organization, genetic engineering, cloning, cellular cultures, biotechnology, mutagenic factors, homeostasis (11 th grade).	Fundamentals of qualitative and quantitative chemical analysis; Chemical monitoring of the environment (11 th grade)	Thermal pollution, waste emissions, entropy, rational use of energy. World economy. Demography and GIS, migration, urbanization, globalization and concepts in geopolitics, transnational corporations.
Evolution: Micro- and macroevolution, gene pool, Biosphere: Organism and environment, populations, communities, ecosystems, biomes, cycles of matter and energy flow, homeostasis, succession, productivity of ecosystems, biomes, noosphere. Rational use of natural resources; national and international regulations. Pollution and biological monitoring, global environmental problems, sustainable development (12 th grade)	Application of substances, fuels, pharmaceutical, toxic and lethal doses of substances, harmful effect of drugs, rational use of natural resources, recycling, composting, waste and harmless technologies, principles of purification of wastes, chemistry and nutrition, medicines, polymers. Problems of nature conservation; Analysis of the state of the environment (12 th grade).	Radioactive emissions, nuclear power stations, energy and pollution. Demographic problems and demographic processes; regional development and demographic policy; trade economy and competition; foreign investment policy; regional economy. Economic polarization, world economic organizations, transnational corporations. New world order and conflicts. Bulgaria in the contemporary world. Sustainable development (12 th)

(Angelov, 1981) discussed intra- and interspecies interactions, biocoenoses and ecosystems, cycles of matter and flow of energy, succession, biosphere and human impact on it and ended with nature conservation. The first ecology book for teachers, written by Angelov (1981) was of great help for pedagogical practice, very soon was out of print and followed by a second revised edition in 1988.

The teachers' guides for biology education, accompanying the textbook, addressed intellectual, emotional and psychomotor spheres of personality and directed learning to the acquisition of knowledge, skills and attitudes (to the environment, to science and to intellectual and physical work). Eleven unifying themes were formulated; three of them directly concerned the environment: "Unity and diversity of the living world", "Interdependence of organisms

Table - 7: Contents of reports on conferences (UB, 2003, 2005, 2007; UC, 2006; SU, BF, 2009)

Conferences Classification of reports:	Union of biologists						UC 2006		SU: BF 2009	
	1 st - 2003		2 nd 2005		3 rd 2007		N	%	N	%
	N	%	N	%	N	%				
Environmental education	19	44.2	21	36.2	17	31	7	14.6	7	6.2
Health education	7	16.3	20	34.5	12	21.8			2	1.8
Education	16	37.2	13	22.4	23	41.8	41	85.4	10	8.85
Ecology	1	2.3	2	3.45	3	5.4			37	32.7
Molecular and Cell Biology									34	30.1
Biotechnology									10	8.85
Others			2	3.45					13	11.5
Total	43	100	58	100	55	100	48	100	113	100

and environment” and “Interdependence of all components of the Biosphere”. This reform marked the first attempt to differentiate education into compulsory and facultative; two kinds of textbooks were prepared – for the obligatory courses and for the optional ones. The topic of homeostasis was introduced for the first time and a broader space was provided for EE. In 1981, a new educational reform started from the first grade of the primary school, including care for the environment and simple environmental notions. Programs were published and new textbooks prepared. Environmental problems were implicitly and explicitly introduced and gradually developed from 5th to 12th grades.

New textbooks for the 9th grade were prepared by two independent teams of authors using one and the same syllabus (Angelov, 1989; Ganev, 1989). It was very interesting and at the same time very difficult for teachers and students. So far they were used to one single textbook, very often memorized the information and used to think and speak in the words and styles of the authors. The necessity to compare, look for differences and similarities and analyze definitions stimulated logical thinking. Authors also benefited from sharing visions and experience and from having feedback from teachers at the discussion and evaluation sessions after the trial of the textbooks. In the new textbooks, besides the chapters on ecology and evolution, two new chapters were included: “Adaptation and behavior” and “Conservation and renewal of nature”. The educational technology was enriched with laboratory exercises, seminars, field trips, group work, discussions, school conferences and presentations of papers (referati) by the students, now called projects. The number of lectures, called lessons, was diminished and the participation of students – increased.

The annual meetings of the *International team of experts* in EE of Eastern European countries and the biannual meetings of this team with IUCN European experts in EE accompanied with scientific symposia, were extremely beneficial for the exchange of ideas and experience and for outlining the prospects for further development and collaboration. The problems investigated and worked out were as follows: aims and objectives, principles, unifying ideas, ecological and environmental conceptual systems and their implementation in school curricula and in all school subjects. Concrete guidelines were prepared for the implementation of different aspects

of ecology, environmental problems and nature conservation in *literature, Bulgarian language, mathematics, biology, physics, chemistry, geography, history, social studies and technical subjects as well as in all kinds of schools* (NIER, 1975). Theoretical recommendations were accompanied by development of educational technologies and practical teaching at the experimental schools of the research team (NIER, 1977). Open experimental lessons were visited by the research team, discussed with the teachers and improved. Guidelines, giving theoretical and practical assistance to teachers were prepared, accompanied by collections of model lessons, tried in the teaching practice (NIER, 1985).

Difficulties arising from the interpretations of nature conservation concepts, were addressed by the research team and their clarification, classification and introduction in the school subjects elaborated. The team developed a program, a teachers' guide and a workbook for an integrated course “Man and his surrounding environment”, which underwent practical trial and then was introduced in schools (NIER, 1979). This course, enlarged and correspondingly elaborated was adopted in universities, preparing teachers and named “Man and Nature”.

Specialized courses on ecology and nature conservation either in master's degree or in post graduate studies were introduced in 22 High Institutes and Universities (NIER, 1981a,b)

A team of scientists, including professors and educators from different disciplines, developed a unified system of environmental education, culture and upbringing (value education) from nursery throughout life (Kutov *et al.*, 1984). Programs for teachers preparation at the universities and for their in-service training and qualification were also developed and used by university lecturers (NIER, 1981a,b and 1983). A dictionary of ecology and nature conservation of 1800 terms was prepared for teachers and students and 19 scientists from different science disciplines took part in its development (Kutov *et al.*, 1984). That was a kind of environmental education for the authors as many discussions, preceded by thorough analysis of lots of dictionaries, textbooks and scientific papers, had to take place before the terms were accepted by all of them.

The first Didactics of biology (Bozarov *et al.*, 1984) was published and a chapter on EE included. This comprehensive

book summarized theoretical knowledge and practical achievements and provided professional help for teachers. Some teachers attended post graduate courses in EE at Sofia University "St Kliment Ohridski" and at the University of Plovdiv "Paissii Hilendarski"; others undertook didactic investigations and defended doctor's dissertations.

A model of EE for a general secondary school was constructed, which underwent a practical experimentation in many schools of the country (Kostova, 1985; 1988) and finally was revised, improved and subjected to further use and development (Kostova, 2003).

Effective environmental teaching strategies with the help of media and, especially of the pedagogical journals, reached all schools and all teachers. That was stimulated by the two International scientific symposia, held in Bulgaria (NIER, 1981b) and (NIER, 1988 and 1989), attended each by as many as more than 400 participants from the country and from abroad. They were accompanied by exhibitions of students and teachers' achievements, open lessons and out of school activities. Information about them was published in UNESCO's Newsletter Connect (1981, 1988). The full reports of authors, presented at the first symposium were published in six separate collections: 1) plenary session, 2) for university education, 3) for school subject teaching, 4) for out-of-school activities, 5) for nursery children upbringing and 6) for youth organization and class teachers' lessons. The materials from the second symposium were abbreviated and published in one collection (NIER, 1989; Kostova, 1989).

Environmental clubs, nature trails, "Green patrols" for studying and protecting living environment, and "Blue patrols" for studying and protecting water, were initiated, supported and guided in their work. That was very beneficial both for education and for improvement of environmental quality. A Learning Ecological Station was set up in the town of Assenovgrad, serving as an ecological school with "classrooms" in the open and helping students to "read" from the book of nature. Students acted in it as guides to the visitors from the public and spread environmental knowledge among their co-citizens. Nature trails were set up and used in environmental education of many schools of the country. Ecological stations for research and practice were set up for university students as well (MESC, 1984).

A very fruitful collaboration was established between scientists, didactic researchers and teachers, which was supported and promoted by different kinds of media. There was understanding and good constructive will between institutions with the great support by the Ministry of Education. Annual National Ecology Olympiad was set up and greatly stimulated teachers and students learning. Theory and practice were united with beneficial effect for both of them. The National Library was subscribed for more than thirty international journals on ecology, nature conservation and EE, most of which from western countries. Many teachers and university scientists and students were able to use Russian, English, German

and French languages, studied the experience of other countries and developed their own creative teaching techniques. Teachers dedicated efforts and time on EE, improved their professional competences and qualifications. In-school and out of school activities, formal and non-formal education were coordinated by the Ministry of Education, National Institute of Educational Research and the Central Station of Young Technicians and Agrobiologists (Kostovs and Kutrovska, 1988; MESC, 1984).

Achievements in EE: (1) EE existed as a national policy, and a system of EE from nursery up, including university and post graduate studies was introduced; (2) EE was based on interdisciplinary approach and educational reform was guided by scientists from universities and from Bulgarian academy of sciences with co-operation of teachers, parents and students, ensuring maximum help and freedom for creativity; (3) Scientists collaborated nationally and internationally; (4) Integrated courses and wide range of teaching styles, many of them new, were introduced; (5) Studies were differentiated into compulsory and optional; (6) Different forms of teacher training and qualification were firmly developed; (7) EE became part of University education.

Some shortcomings and difficulties were the following: (1) There were some scientists and ordinary people who thought EE redundant and in lack of time, omitted it from the programs; (2) Teachers had to be continuously trained and qualified as some left the profession and new unprepared came; (3) Lack of different versions of textbooks for each grade, with the exception of biology in the 9th grade, hindered the exchange of ideas and experience.

Third period in EE history in Bulgaria: The UN summits opened new vistas for EE, giving priority to sustainable development and biodiversity protection. This period coincided with great changes affecting the economic and social life of Bulgaria and new vistas were sought for education as well. Research in EE was left to the responsibility of Universities. A National palace of children was established in Sofia as a coordinator of out of school activities of the Regional centers for learning, technical and scientific creativity. regional centers for work with children and municipal children complexes were also opened. Clubs "Ecology, biology and environmental conservation" were being organized in these institutions, where children spend their out of school time learning and playing.

New educational reform started, new publishers evolved, new programs were prepared and a thorough work for reorganizing and rethinking education began. For all grades, from 1st-11th, new textbooks were published in three or more versions for each grade, answering the requirements of one and the same program, freely interpreted by the authors. There were some differences between the versions of the textbooks. Teachers were left to choose the version to study with the children that suited them best. Aims were expressed in abilities that could be demonstrated and observed, measured and assessed. Environmental education was centered in the 10th grade in order to be based on genetics. The topics of

“Plants and their environment” and “Animals and their environment” were preserved in 6th and 7th grades. In 5th grade, new textbook, named “Nature study” was introduced centered on earth geospheres (atmosphere, hydrosphere, lithosphere and biosphere) and on biomes (MESc, 1997). Teacher’s guides, workbooks and test-books for self-assessment, accompanying each textbook, were prepared and published. Nature conservation aspects were included in the textbooks of biology, chemistry, physics and geography. Suitable topics were developed for social science and technological education textbooks.

Much time was devoted to the construction of State Educational Requirements, which laid the foundations for development of curricular, programs and textbooks. The state requirements and the teaching materials were prepared in two levels – for a compulsory level and for a high level. Ecological and nature conservation concepts at present are well represented in the Bulgarian school standards in the Cultural educational areas (KOO in Bulgarian): “Natural sciences and ecology” and “Geography and economics” from 3rd to 12th grades of the secondary education (State Newspaper, 2000). The State standards (Table 4) required inclusion of environmental and nature conservation aspects in school curricula and textbooks in the light of sustainable development.

The school programs and textbooks answered adequately the state standards and included topics dealing with ecology and human-environment relationships, starting from the first grade with the subject *Homeland* and continuing with *The world around* in the second grade and *Man and nature, Man and society* in 3rd – 6th grades (Table 5).

In each grade the environmental education is laid on enlarged social and natural science foundations, which help students to understand better the adverse consequences from human neglect of the environment. Gradually the concept of sustainable development encompasses all the aspects of EE giving them new perspectives (Table 6). Environmental and health education are closely connected and centered on nature and human life protection, including students’ life as well. For each grade and for each subject three versions of textbooks from different authors were published together with workbooks and teachers’ guides.

Analysis of reports, delivered at recent conferences, shows a slight decrease in EE reports of biology teachers, due to the invasion of information communication technologies (ICT) and computer assisted learning (CAL), a good start in the reports of chemistry teachers and increase in research of ecologists (Table 7). Participation of teachers and students in ecological research is bound to improve the effectiveness of EE, which requires a close collaboration between universities and secondary school.

Ecological and environmental education and training at the university level has gained firm achievements¹. Faculties of specialized ecology were established at some universities: Faculty

of plant protection and agro-ecology as well as agro-ecological centre (Agrarian University), Faculty of ecology and landscape architecture (Forest-Technical University), Center of ecology (Chemistry-Technical Metallurgic University). Chairs of specialized ecology at the University of Sofia “St. Kliment Ohridski” were also opened and now function effectively: Chair “Ecology and Environmental protection” (Faculty of Biology); Chair “Landscape studies and environmental conservation” (Geologo-Geographical faculty), Specialty “Eco-chemistry” (Faculty of Chemistry). Other universities introduced special forms of EE as well: Chair “Chemistry and ecology” and Specialty “Technique & Technologies for environmental conservation” (Technical university, Gabrovo); Chair “Ecology & Environmental conservation” (Technical University, Burgas); Chair “Engineering ecology” (University of Nutrition technologies); Chair “Ecology & environmental conservation” (Technical University, Varna); Chair “Earth Sciences and environment” (New Bulgarian University, Sofia); Specialty “Ecology and Environmental conservation” (Faculty of Biology); Specialty “Environmental Conservation” (Faculty of Chemistry) at the University of Plovdiv “Paisii Hilendarski”; Specialty “Ecology and Environmental conservation” (Universities in Rousse, Schumen and Stara Zagora); Courses in environmental conservation, regional development and territorial planning (Southwest University in Blagoevgrad). Many research projects are also undertaken from all universities and they allow scientists to travel abroad, to welcome colleagues from other countries and to research environmental problems on a wider level. Boundaries are now open for international collaboration, exchange of staff and of students (Kostova, Atasoy, 2008, 2009; Erdogan et al., 2009).

Many Non-Governmental Organizations (NGOs) and Nature protecting societies undertook the realization of projects aiming at EE of students and teachers as well as at improving the quality of the environment (NGO, 2005). Some of these projects received financial support from other countries: USA, Netherlands, Germany, Great Britain, European Union and others. Reference guide, programs & model lessons for primary schools and for teaching of biology, geography, chemistry, literature and history for secondary schools in national parks were prepared, experimentally tried and published with the aid of GEF project for biodiversity in Bulgaria (MESc, 2000). These trends are being continued, widened and improved, involving more and more teachers and students.

Advantages of this period: (1) State educational standards, including EE standards, were created, three versions of new textbooks for each grade published, learning and teaching materials and new interactive educational techniques developed; (2) Greater social engagement of schools is now visible, priority of sustainable development and international assistance of educational reform is being certified. (3) Access to information via internet, CAL, ICT competences are expanding; (4) EE courses and specializations at the colleges and universities were established, life long education and wide professional contacts are being reassured (Dimova, 2003; Peycheva, 2007; NGO, 2005).

Disadvantages: (1) Some good achievements from the previous periods were forgotten and some environmental values as well; (2) Economic and financial problems are increasing and resources diminishing, but ecological economics is neglected; (3) Out-of-class and out-of-school activities are being neglected and illiteracy is beginning to grow, etc. Fortunately, the new challenges stimulate the community to look for new possibilities and solutions in EE.

EE in Bulgaria has developed as a result of interaction of national and international needs and theoretical and practical activities answering them. Our country copied developmental model and experience from industrialized countries and faced the same environmental problems. EE is being continuously developed, involving gradually all school children, university students and teachers. Based on scientific research, it spread in all school subjects and school activities.

Secondary education state standards, school curricula, programs, textbook and teaching facilities included ecology, nature conservation and sustainable development aspects. Long lasting collaboration of scientists, teachers and students was established throughout the years and had its beneficial effect on EE. Rethinking and improvement of education through educational reforms exerted innovations in contents and teaching methods and stimulated the development of EE and ESD.

Together with the change of political and economic structure, some good and productive practices were abandoned (out-of-school activities, school teaching fields, nature trails, school forests), but new and more up-to-date ones have been developed. Democratization and decentralization provided new challenges and stimulated new endeavors in EE.

Informational technologies and multimedia invaded schools, universities and homes, attracted due attention and provided new teaching and learning resources. They renewed the interest in the environment but to some extent put a barrier between students and nature.

The Integration of Bulgaria with the European Union provided the possibilities for the development of new capacities in EE and new challenges. In times of economic crisis we should be prepared to participate in problem-solving, using the best from the traditional, innovative, effective and adaptive approaches, knowledge and techniques in EE and in ESD.

Acknowledgment

The authors are grateful to Prof. Raicho Dimkov, Sofia University "St. Kliment Ohridski" for reading the manuscript and offering some improvements, as well as to Lilia Dulgerova for correcting the English language. We also thank Prof. Recep Efe for all the correspondence and guidelines for the improvement of the manuscript.

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