

FROM ENVIRONMENTAL EDUCATION TO SUSTAINABLE DEVELOPMENT - A NEW GLOBAL PARADIGM

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Abstract

In times of great technological changes and increased environmental problems schools should take more action and responsibility for students' education about sustainable development. Knowledge of the nature and environmental protection has existed for many years. During that time, environmental and political conditions have changed, as well as the expectations of those engaged in educational work.

The aim of this paper is to analyze the curriculum of the subject Biology for secondary education (four-year high school and three or four year vocational education) in order to determine the incorporation of education for sustainable development in the subject curriculum. During the analysis of the curriculum of the subject Biology all six program areas from the first to the fourth classes were scanned. The program of the subject Biology deals mostly with topics related to education and upbringing for the protection of the environment and the preservation of natural resources. The analysis of the curriculum's contents of the subject Biology unequivocally shows that the teaching content of this subject can contribute to the education of students in the field of sustainable development, although in the teaching objectives of Biology education for sustainable development is not mentioned in any curriculum and it is not explicitly mentioned as a term.

There is a lack of contemporary and practical examples that would help educators in the modernization and organization of teaching. For the implementation of more contents that treat the problem of sustainable development, specific scientific articles for analysis as well as presentation of targeted video materials as illustrations are more than necessary. With that, teachers would have an opportunity for a new way of implementing the program.

In comparison of the number of contents and the predicted number of hours according to the program, it is evident that there is insufficient time for the realization of laboratory exercises and practical application of the acquired knowledge.

In order to achieve the strategic goals of sustainable development, teachers must necessarily follow the current issues and be up to date with all scientific achievements in the field of sustainable development, so that they could give directions to the next generation about how they should act according that in the future.

Keywords: Environmental education, sustainable development, modern schools, child, school.

1 INTRODUCTION

Our knowledge of nature is full of gaps, vague and, perhaps, errors. The ecology of renewal, which was conceived in the 20th century and continued to develop in the new century, is still within the limits of traditional understanding of the relationship between society and nature.

Although you set the task of discovering the functioning of ecosystems and on the basis of designing ecological landscapes and systems, it did not give up the glorification of man as the main introducer of order in nature. It does not exceed the contradiction of natural and social development, but it utopically re-examines it as a new anthropocentrism. Although it tries to escape the reductionism of contemporary sciences – which begin from disassembling natural entities and renewing ecosystems – restoration ecology does not strive for life in harmony with nature, but for the life of preservation of nature. To a lesser or greater extent, this assessment also applies to the concept of sustainable development. Only to the extent of human need for development, "present and future generations", the concept of sustainable development stands for biodiversity in which the struggle for survival is excluded, turning the planet into clearly separate ecological areas among which there is no mutual penetration.

Ecological renewal cannot be achieved with the existing technique and technology of human society management. It does not decrease but increases, it does not eliminate, it produces, it does not stop, but it accelerates the contradictions between man and nature. The contradictions of natural and social

development should not be seen as a conflict, but as a corporate state. If contradictions would lead to a state of conflict, environmental restoration would require release from the factor or factors that disturb idyllic relations. Ecological renewal has a greater chance if contradictions are understood as a corporate state or functional conflict. "In that case", Goati says, "conflict is one of the possible means of achieving a goal.". The aim is for nature and society to function, and the choice of alternatives and means remains to be determined. Therefore, the goal is not an ecological restoration in itself, but a functioning of a corporation whose factors are diverse. On the side of man, the corporate relationship produces a constant need to adapt to the various manifestations of natural movements, while on the side of nature, corporatism implies a constant manifestation of objective laws. It is not an "ecological agreement", but a "one condition in which the human species can function without having to control it as a whole. If there is cosmic chaos, social concepts are irrelevant.

At the same time, there should be a clear distinction between the education for sustainable development and the ecological education. Firstly, the education for sustainable development and the ecological education are based on the completely different cultural paradigms. The purpose of the ecological education is the comprehensive study and consideration of the environmental problems along with the search for ways to resolve this undoubtedly extremely complicated but hardly unsolvable problems. The education for sustainable development is not aimed at correcting what has already been done by man, but rather at preventing environmental problems and disasters [1,2]. The education for sustainable development content is based on new approaches to the use of natural resources and the restoring issues. Moreover, the negative environmental impact is seen not only as a result of the misallocation of natural resources, but as a mismatch between existing environmental and consumption stereotypes to meet the needs of the future [3]. Apparently, only a new model of the ecological education commonly referred to as a noospheric education can ensure sustainable development of society.

2 SUSTAINABLE DEVELOPMENT

Sustainable development is the goal of a number of developing countries. International consensus such as Agenda 21, derived from the Earth Summit in Rio de Janeiro in 1992, highlighted the important role of education [4]. The Millennium Development Goals, set by the UN platform, have provided great progress in the educational system of each country, including the Republic of North Macedonia, which accepted those objectives as a pledge for sustainable development and ensuring the future of new generations. In the era of world globalization and urbanization, and also in the period of transition and reforms in all spheres in the Republic of North Macedonia, we are faced with many social, economic and environmental challenges, which are sublimated to the three main pillars of sustainable development. Education for Sustainable Development is the most important segment through which the principles of sustainable development are implemented, which are incorporated into some curricula, especially in biology programs.

According to Giddens [5], Sustainable Development is not only a final goal that can definitely be realized, but it is a guide and background that can direct us to the focus of attention in a certain direction, but it does not determine specific solutions. Sustainable development is a social process of research, learning and development. It is an alternating process, according to sociologist Anthony Giddens where the action of individuals constantly changes the conditions of action [6].

The leading idea in all such actions in the world, and even in Macedonia, is the term sustainability (with all its derived definitions, sustainable development, sustainable use of natural resources, maintaining biodiversity and cultural diversity etc.). This term prefers three fundamental values: balance, diversity, and coexistence. Sustainable development can be easily described as an inseparable blend of three important segments intertwined and complemented: ecological, economic, and social. These three segments of sustainable development are closely related, but in practice they can most often be contradictory, because conflict interests and goals are the key problems in terms of sustainable development. Activities taken in one area can cause side effects in another area. Therefore, we can conclude that sustainable development is not just an intensification of the positive effects, but much more a reduction of unexpected side effects.

Sustainable development is not just a prescribed definition, but a slow process that is dramatically complex. Sustainable development cannot be planned and realized gradually and rationally, nor through individual activities. Actually, changes in individual actions are needed for sustainable development, but it is a political task to find ways to change collective actions. Sustainable development is an ecological, social, and economic process that is incorporated into political processes of learning, research, and negotiations [7].

From here it arises that the way of living is imposed at such a pace, and it is quite clear that planet Earth cannot tolerate the increased pressure of consumption and the increase in the environmental footprint of its numerous inhabitants as a whole. It is impossible to separate the components of sustainable development among themselves, which results in sustainable development being an extremely complex concept with very comprehensive content.

3 EDUCATION FOR SUSTAINABLE DEVELOPMENT

The United Nations, in order to draw the attention of the world public, declared the period from 2005 to 2014 as the Decade of Education for Sustainable Development [8]. A leading role for the implementation of the goals and activities of the Decade of Education for Sustainable Development is primarily entrusted to UNESCO, as well as to other UN bodies [7].

It is expected that the countries, members of the UN, systematically evaluate the results of the activities in the field of education for sustainable development, in order to note some progress during the Decade for Sustainable Development. During all these years, numerous solutions have been offered for each country individually, through models and strategies, publications, and adequate materials.

What is Education for sustainable development? Education for sustainable development (ESD) gives learners of all ages the knowledge, skills, values, and agency to address interconnected global challenges including climate change, loss of biodiversity, unsustainable use of resources, and inequality. It empowers learners of all ages to make informed decisions and take individual and collective action to change society and care for the planet. ESD is a lifelong learning process and an integral part of quality education. It enhances the cognitive, socio-emotional and behavioral dimensions of learning and encompasses learning content and outcomes, pedagogy and the learning environment itself [9].

In the already mentioned Agenda 21, in Chapter 36, three program areas are described on which future actions are focused: reorientation of sustainable development education, raising public awareness, and promotion of training [4]. In paragraph 36.16, it is stated "Countries and educational institutions should integrate environmental and developmental issues into existing training curricula and promote the exchange of their methodologies and evaluations". Paragraph 36.18 states: "Countries should strengthen or establish practical training programmes for graduates from vocational schools, high schools, and universities, in all countries, to enable them to meet labour market requirements and to achieve sustainable livelihoods. Training and retraining programmes should be established to meet structural adjustments which have an impact on employment and skill qualifications."

4 GLOBAL GOALS FOR SUSTAINABLE DEVELOPMENT UNTIL 2030

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests [10].

The Sustainable Development Goals, also called Global Goals, are an upgrade to the Millennium Development Goals (MDGs) – the eight anti-poverty goals the world has pledged to achieve by 2015. The Millennium Goals, which were adopted in 2000, include a number of issues, including the fight against poverty, hunger, disease, gender inequality, water supply and sanitation conditions. In achieving the millennium development goals, significant success has been achieved, indicating the importance of having a unifying program based on goals and results. Despite success, poverty is not completely eradicated. The 2030 Global Sustainable Development Goals go far beyond the Millennium Goals and address the root causes of poverty and the universal need for development for the benefit of all people.

The new 2030 programme will define a new cooperation within the international community in terms of global efforts to create a different future for people and the planet through sustainable development. While the Millennium Development Goals were focused on developing countries, the 2030 Programme is the first global agreement in history to establish a universal, comprehensive action programme that would affect all countries, including their national policies. Within the 17 new Sustainable Development Goals and 169 targets, there are three dimensions of sustainable development (environmental, social, and economic dimension) in areas such as poverty, inequality, security in food provision, health,

education, sustainable consumption and production, growth, employment, infrastructure, sustainable management of natural resources, climate change, as well as gender equality, peaceful and inclusive society, access to justice and responsible institutions.

Geopolitical changes in the last 15 years have led to the realization that the universal objectives that integrated solutions are now more suitable. The new programme is of a much wider scale, and it applies to all countries. One of the biggest innovations in the 2030 programme was the recognition of the fact that action in the field of sustainable development requires simultaneous progress in three areas, where economic, social, and environmental issues must be resolved together in an integrated way.

For successful realization, all resources are expected to be included, both local, national, and international, as well as public and private. All countries will have to make an honest contribution, taking into account the level of development, national context, and capacity of each state. National responsibility and accountability before citizens will be crucial to the success of realization of the Sustainable Development Goals by 2030.

These conceptual global goals and objectives can be easily grounded in the creation of the goals, outcomes, and content of the secondary education curricula. In the following text examples of how to establish a correlation between secondary education curricula and global sustainable development goals in the learning and teaching process will be offered.

5 NATIONAL POLICY FOR SUSTAINABLE DEVELOPMENT

In 2010 the Republic of North Macedonia adopted the National Strategy for Sustainable Development in the Republic of Macedonia (2009-2030) [9] which is based on the principles of sustainable development accepted globally and defined at the UN Conference on Environment and Development (Rio de Janeiro, 1992) in order for Agenda 21 to be in operation. In the national strategy, among other things, one paragraph highlights the importance of the need for significant improvement and strategic direction of the education sector, but in the seven strategic commitments of the document there is no specific proposal for the manner of realization of education for sustainable development [11]. According to this, it can be concluded that the National Strategy for Sustainable Development needs a deeper and more analytical thought in terms of greater dimensioning the importance of education for sustainable development in educational institutions. In this context, the expeditious implementation of education and education for the environment falls among the most important tasks of each state, i.e., local self-government, a segment that is omitted in the National Strategy for Sustainable Development. It is extremely important to note that we still do not have a National Strategy for Sustainable Development that should:

- Recognize that education for sustainable development lasts a lifetime;
- Create a sense of responsibility for the conditions in nature starting from local to global levels;
- Ensure recognition of environmental problems as their own problems and encourage steps to take appropriate measures;
- Provide everyone with accurate, complete and timely information;
- Encourage the principles of sustainable development;
- Encourage the partnership of all relevant stakeholders and use all available resources.

In order to achieve the set development goals and tasks, important changes are needed in the social, economic, and cultural aspect, as well as the establishment of spiritual, intellectual, and creative renewal of individuals in the hot spot of interests.

In addition to that is Einstein's thought: "We cannot solve a problem that we ourselves have created, with the same way of thinking as we initiated it before". Therefore, to achieve the goals and fulfil the tasks in the protection of the environment within the principles of sustainable development, the basic prerequisite is personal change in each of us.

6 METHODOLOGY

This paper presents an analysis aiming to determine the incorporation of education for sustainable development into the curriculum for the subject Biology, which is taught in high school and secondary vocational education.

From the secondary professional four-year education, all 14 educational professions were analyzed, whereby the representation of education for sustainable development was determined in all educational profiles in relation to the curricula of other subjects studied in the secondary vocational four-year education. During analysis, it was determined that there is an overlap in the curricula in the educational professions in the three-year secondary vocational education, (but to a lesser extent), with the curricula of the four-year secondary vocational education, so the recommendations and outcomes in the analysis refer to the same curricula/educational professions in both types of education.

7 RESULTS

From the analysis of the Biology curriculum in high school education that is studied as a mandatory subject, all three program areas from the first to the third year of secondary high school education, were scanned. In secondary vocational schools, the subject Biology is taught as a compulsory subject only in the first year, while in the remaining years (second, third and fourth year) it is taught as an elective subject.

The teaching subject Biology in high school education is studied as a compulsory general education subject in the first year with two hours a week or 72 hours a year. The selection and grouping of topics and contents in this curriculum is based on strategic determinations, in continuity of three years of compulsory study to achieve the development of awareness and responsibility for the environment and one's own health.

Regarding the contents that the students studied according to the biology program in primary education, the contents in these curricula represent a linear-spiral structure, which implies deepening and expanding of the contents with the help of the built-in standards of knowledge and abilities. The goals that students should achieve with this curriculum are in line with their age and the possibilities of psychophysical development and with the goals of high school education.

Out of the five teaching topics studied in the first year, three topics (or 60%) cover environmental issues. These are Topic no. 3 – Ecology, Topic no. 4 – Evolution of the animal world, and Topic no. 5 – Emotional and physical health that directly or indirectly depends on the conditions of the environment in which a person lives. By studying environmental topics in secondary high school education, correlations are established between the prior knowledge of biology and other natural sciences (physics, chemistry) from primary education, with the biology program from the first year and the previous topic [12].

In the second and third year, the teaching subject biology as a compulsory general education subject is also studied for two hours a week or 72 hours a year. Since ecology is a branch of biology, its foundations are laid on the biological laws that govern nature. Sustainable development as a new global paradigm is directly related to these two scientific areas that will enable us to find urgent solutions for the global environmental problems that affect planet Earth. The contents processed within the biology subject unequivocally show that it is a key factor for the education of students in the field of sustainable development. Compared to other subjects, the program in biology deals mostly with topics related to education and upbringing for environmental protection and conservation of natural resources. In the curriculum objectives of biology for high school education, education for sustainable development is not mentioned in any curriculum and is not explicitly mentioned as a term. Among the stated general goals of biology teaching for high school education for all years, only goals that directly or indirectly contribute to functional education for sustainable development can be recognized.

In secondary vocational schools, biology is also taught as a compulsory subject in the first year with a 3+2 course load that corresponds to 50 hours of student activity, of which 20 hours are for homework and 30 hours are for independent study.

Out of six modular teaching units, in the last three topics with environmental content are studied. These are: 4. Classification of Organisms, 5. Organisms and their Environment, and 6. Human Impact on the Ecosystem.

From the analysis of the teaching contents, it was also concluded that the concept of sustainable development is not mentioned anywhere.

What is education for sustainable development? In most examples, this term is equated with environmental education. In fact, education for sustainable development is education for life, or for everyday behavior and actions. It implies the acquisition of knowledge, but it is generally known that knowledge without values and attitudes is not enough. It is necessary for a person to acquire procedural knowledge and willingness to engage and act in accordance with their own beliefs and principles. Therefore, education for sustainable development should not be just another topic in the curriculum,

remaining at the level of theory, but it should be aimed at acquiring competences through action. In the process of the rapidly changing world, a well-known goal is to enable students to participate in social processes of sustainable development. It is of essential importance to give them the opportunity to develop their competencies, which would be reflected in improved mutual cooperation.

In the already mentioned Agenda 21, in chapter 36, three program areas are described on which future actions are focused: reorientation of education for sustainable development, raising public awareness, and promotion of trainings. Paragraph 36.16 states “Countries and educational institutions should integrate environmental and developmental issues into existing training curricula and promote the exchange of their methodologies and evaluations”. Paragraph 36.18 states “Countries should strengthen or establish practical training programs for graduates from vocational schools, high schools and universities, in all countries, to enable them to meet labor market requirements and to achieve sustainable livelihoods. Training and retraining programs should be established to meet structural adjustments which have an impact on employment and skill qualifications” [13].

In that context, the expedient implementation of upbringing and education about the environment is among the most important tasks of every state, that is, local self-government, a segment that is omitted in the National Strategy for Sustainable Development.

It is extremely important to note that we still do not have a National Strategy for Education for Sustainable Development that should:

- Recognize that education for sustainable development is lifelong;
- Create a sense of responsibility for the conditions in nature starting from local to global levels;
- Ensure recognition of environmental problems as their own problems and encourage steps to take appropriate measures;
- Ensure accurate, complete and timely information for all;
- Promote the principles of sustainable development;
- Encourage the partnership of all relevant stakeholders and use all available resources.

In order to achieve the set development goals and tasks, important changes are needed in the social, economic and cultural aspect, as well as the establishment of spiritual, intellectual and creative renewal of individuals in the focus of interest.

The contents that are processed in the framework of the subject Biology unequivocally show that it is a key factor for the education of students in the field of sustainable development. Compared to other subjects, the biology program deals mostly with topics related to education and upbringing for the protection of the environment and the preservation of natural resources. In the teaching objectives of biology for high school education, education for sustainable development is not mentioned in any curriculum and it is not explicitly mentioned as a term. In secondary high school education - Biology as a teaching subject is represented with a total of 216 hours during the I, II and III years and 99 hours in the IV year for those students who chose the natural-mathematical area B - (PMB), in which biology is an optional subject. Among the stated general goals of teaching biology for high school education for all years, goals that directly or indirectly contribute to functional education for sustainable development can be recognized.

Table 1. Objectives of subject Biology related to sustainable development

<i>Direct goals</i>	<i>Indirect goals</i>
Developing basic scientific literacy, love of nature and awareness of own place in it	Developing a positive attitude towards the study of biology
Acquiring basic knowledge about the basic construction, diversity and significance of plant and animal life	Developing objective and logical reasoning, encouraging curiosity, independence, and critical thinking
Developing knowledge and skills in the field of ecology and a sense of responsibility for the preservation and improvement of life environment	Developing the ability to apply the acquired knowledge from various biological disciplines in everyday life
Training for independent experiments and research of biological phenomena	Acquiring skills and forming habits for using different sources of knowledge from the studied biological area

8 DISCUSSION

Although the Decade of Education for Sustainable Development has ended (UNESCO 2005), in teaching practice, teaching activities for living in a sustainable way are still insufficiently represented. It is necessary to redefine the goals and expand the contents in accordance with a modern concept of teaching. This is especially so because in the goals and biology program for high school education, education for sustainable development is not mentioned in any year, nor is it explicitly mentioned as a term.

Most of the contents that are directly related to sustainable development (and mostly to the part that refers to pollution and environmental protection), are represented in the biology curriculum for the first year - within the topic "Ecology".

In the curriculum in the topic "Ecology" it is necessary to expand the contents related to sustainable development by incorporating topics in which:

- The significance of the wealth and possibilities of the World Sea will be analysed as one of the basic sources for meeting the needs of humanity with food and energy resources (mineral substances, oil and gas from the ocean depths, biodiesel from algae, etc.);
- The importance of seas and oceans will be mentioned as producers of more than 1/2 of the atmospheric oxygen, as the largest and cheapest traffic corridors, and their impact on the climate.
- A comprehensive overview of the pollution of water eco systems with different types of waste and its consequences will be given; the possibilities of self-purification of the seas and oceans; pollution of lake and river eco-systems that have little power for self-regulation and are easily susceptible to degradation; protection measures (Eco remediation) for revitalization and establishment of original ecological relations and development of new technologies (e.g., use of oil and plastic degrading bacteria in solving the waste water problem, etc.).

It is necessary to incorporate topics and content in which:

- The exceptional significance of the forest eco-systems for the preservation of balance, biodiversity, for the economic development and planned exploitation of them will be analysed.
- The problem of global climate changes should be studied through the analysis of their negative impact on eco systems. (climate change as a permanent crisis with unpredictable consequences on the amount of food, water, natural disasters, human health, reduction of biodiversity, economic growth, etc.)
- Students' knowledge about air pollution will be deepened - air quality (maximum allowed concentrations of different types of pollutants), noise as a pollutant in urban areas, which is in direct correlation with people's quality of life.
- It would be useful to treat topics about the differences, advantages, and disadvantages of using different alternative types of energy (solar, geothermal energy, wind and water energy, biomass) as renewable energy resources.
- The problem of access and promotion of safe food and sustainable agricultural production will be treated (organically produced food, which uses minimally low concentrations of artificial fertilizers and pesticides, with the ultimate goal of human health safety and soil protection, especially in rural areas, gmos, seed banks, etc.).
- Students should be educated about the planned and rational use of clean drinking water, which today due to enormous pollution, is no longer seen as an unlimited natural resource (use, technical, communal water, purification systems).
- The problem of waste management, its safe storage, selection and the possibilities of reuse, recycling, using energy from waste, i.e., waste as a resource, will be studied. The 4r principle - (reduction, reuse, recycling, recovery)
- The effects of the contaminated environment on human health will be studied.

In comparison of the number of contents and the predicted number of hours according to the programme, it is evident that there is insufficient time for the realization of laboratory exercises and practical application of the acquired knowledge (organized visits to museums, institutions, hydrometeorological institute, botanical gardens...). And it is precisely the practical application of the basic values of sustainable development that can make a significant step forward from the classical approach to learning - to learning by active action. An example of good practice in connecting curricular

content with extracurricular activities for sustainable development and care for the environment is the involvement of students in the restoration of forest eco systems by initiating actions for greening, concrete contribution in waste selection and recycling of biowaste (composting). With that, the students perceive their own potential in the direction of developing a sustainable society and enriching the school program with extracurricular activities, and teachers have an extraordinary opportunity to expand their educational influence for sustainable development.

9 CONCLUSIONS

In order to achieve the strategic goals of sustainable development, teachers must necessarily follow the current issues and be up to date with all scientific achievements in the field of sustainable development, so that they could give directions for the future.

Teachers should create opportunities for students to develop creativity, innovation, and the ability to think about an alternative way of life. They should also constantly encourage students to reconsider their daily habits in terms of living in accordance with the standards of sustainable development. Acting in this way, teachers have an opportunity to redirect the educational system towards the realization of the strategy and goals of sustainable development.

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