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The debate - an opportunity for the formation of ecological culture in Biology and Health Education

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Abstract: *The present study is part of a didactic experiment, which aims at establishing the application and effectiveness of the school debate, as an interactive method of teaching in Biology and Health Education in XII grade in order to form an environmental culture among students. The application of school debate as a part of interactive methods corresponding to the objectives of environmental education and upbringing of a selected methodological unit of the 'Sustainable development - strategy for preserving life on Earth' is presented, and options for its application in a specific stage of the macro structure of the lesson are proposed. The results of a questionnaire, conducted with students to explore their opinions on the application of the debate as a teaching method, are presented. The analysis of the results shows that students are motivated to actively engage in the process of learning Biology and Health Education, accept the debate as an interactive form of learning because they believe that it increases their environmental awareness and develops key skills such as, critical thinking; skills to support sustainable development; teamwork; making decisions on various environmental topics; improves the ability to analyze and evaluate the relationship between man-society-nature.*

Keywords: key skills, environmental culture, interactive methods, sustainable development, school debate, formal education

Introduction

Globalization, the highly developed technological and digital society of the 21st century, climate change, the disturbance of the natural balance, have led to the emergence of a new reassessment of the relationship between man and society and nature. Addressing the effects of the global environmental crisis requires building a future generation that is responsible and literate about environmental issues. Here is the essential role of secondary school education, building of modern environmental culture is one of the main objectives of the new educational paradigm. It is based on the theory of constructivism, which emphasizes the role of the student as an ‘active learner’ and plays a key role in the mediation and student’s life at school [1]. According to the concept of constructivism, a learning environment must be built in which learners are engaged in activities and tasks that require thinking and motivation for active learning, and exploratory methods for problem-solving. This can be provided precisely through interactive learning.

According to the Strategic Framework for the Development of Education 2021-2030, the application of innovation is closely related to the culture of teaching with a view to increasing the effectiveness of the educational process and building a system of competencies [2]. One of these competencies as a system of knowledge, skills and attitudes is associated with the formation of ecological culture and a responsible attitude towards the environment and includes commitment to environmental problems and opportunities to solve them.

The emphasis of this article is the presentation of the possibilities of the debate as an interactive method for increasing and enriching the environmental culture of students.

Theoretical foundations of the research

Interactive learning (Engl. *Interaction*) is based on the interaction of students with the learning environment, which serves as an area in which experience is learned. The goal is to turn students from passive recipients of ready-made knowledge into active participants in learning, using their own knowledge to search for solutions in situations related to new knowledge. In interactive learning, what changes is the interaction between the teacher and the student: the activity of the teacher gives way to the activity of the students, his task is reduced to creating conditions for the development of their initiatives [3].

According to Ivanova, ‘interactive methods require partner relationships, a dialogical type of communication (based on pre-specified agreements and procedures) between the learners themselves,

between the learners and the trainer' [4].

Interactive methods mean constant feedback, constant student engagement, constant search for common solutions. They help to build a new educational reality based on collaborative inquiry, dialogue, discussion and decision-making [5].

Interactive methods are procedures, systematic ways containing the sequence of collaborative actions of researchers to achieve a particular goal in a certain scientific field. They are the appropriate ways to carry out the activity related to the solution of a given problem. In pedagogy, interactive methods are based on social constructivism, according to which learning is the result of social interaction in a specific context. Communication takes place between students in the work team, between students and the teacher, between students and an external expert [6].

One way that incorporates all these features of interactive learning and could meet the requirements for active student participation in the learning process is the use of a debate.

The Debate is an interactive method, a broader form of argument than deductive reasoning, which examines only whether a conclusion follows from premises, and factual argument, which examines what is or is not the case, or rhetoric, which is a technique of persuasion. Although logical consistency, factual accuracy, and emotional appeal to the audience are important elements of the art of persuasion, in debate one side often prevails over the other by presenting a better context of the issue, which is much more subtle and strategic [7].

Participation in a school debate allows participants to form and build on key skills for use in various aspects of everyday life. These skills include critical thinking, listening, making a research, information processing, creative thinking, communication, self-confidence, interpersonal skills and teamwork. Debate also involves making decisions, some of which simple and relatively unimportant and others more complex. Engaging in a debate helps participants develop a better understanding of the perspectives on both sides of complex decisions that have far-reaching impacts on society. The requirement to 'switch sides' allows debaters to explore an opposing point of view, which helps to build empathy and tolerance. As debates often relate to topics of local or national importance, participants deepen their knowledge of evidence and research, included in the debate preparation process. Debate helps participants develop persuasive skills and challenges them to improve their public speaking before a variety of audiences, while providing them with an intellectually challenging environment to test their ideas [8].

Debates increase engagement and sensitivity to global and sensitive environmental issues, while helping to develop students' research skills and environmental behavior change. The main skills that are being developed are for presenting evidence, including selecting and recognizing rational arguments, arranging arguments, refuting false statements [9].

Testing the school debate in Biology education is crucial for the formation of quality relationships both between the teacher and the learners, and between the learners themselves. They support the personal development of the participants on the basis of empathy, interaction, dialogue, collaborative problem solving through analysis, searching for alternatives and making decisions on a specific problem [10].

Research methodology

The purpose of the present study, as part of the didactic experiment, is to investigate the possibility of the Biology and Health Education in 12th grade curriculum to implement the educational debate as an interactive teaching method for the formation of ecological culture. *The object* of the study are 12th grade students. The *subject* of the study is their environmental culture (environmental knowledge and skills, values attitudes towards the environment) as a result of the application of the interactive debate method in Biology and Health Education.

The hypothesis of the study is that if debate as an interactive method is applied in the Biology and Health Education teaching process, environmental knowledge, skills and personal attitudes to environmental problems will be increased and enriched.

This study presents a single experimental design that includes 18 12th grade students.

The study was conducted at Elin Pelin Secondary school of Applied Sciences, Rouen village, region of Burgas in the 2022-2023 school year. The model was tested once, in one class, and the idea came from the last months of their studies, students are excited about the upcoming graduation exams. In order to diversify the biology lessons, they suggested that one of them be organized in an unconventional way, namely, to hold a debate on a given topic. This is an attempt to show that the change in teaching methods has motivated students to intentionally engage in environmental issues while integrating knowledge gained from different disciplines. We make these clarifications, with no claim to comprehensiveness of the presented results. More in-depth and large – scale research is needed for the use of the debate to form key competences in environmental education. This is the subject of future research by the author.

Organization of the school debate

The learning content of module 3 ‘Biosphere - structure and processes’ for profiled classes enables the application of the debate as a teaching method in different lesson units. For the needs of the study, the following debate topic was chosen: **‘Will the United Nations Sustainable Development Program transform the world?’** The topic was chosen on the basis of the Biology and Health Education curriculum, module 3, ‘Biosphere - structure’ - profiled training (standard - competence area ‘Sustainable development - strategy to preserve life on Earth’ and learning content topic – ‘Role of international cooperation for sustainable development of the planet’). The enrichment of the ecological culture through the implementation of the debate relates to the expected results laid down in the curriculum, namely: using knowledge to justify connections and relationships in nature, discussing the role of non-governmental organizations and arguing a different position for the protection of natural resources and sustainable development, evaluating the role of international cooperation, indicating activities and technologies at regional and national level for environmental protection [11].

The debate involves two teams of 5 students defending opposing positions on a specific topic. Teams are randomly assigned at least one month prior the scheduled debate. While preparing the debate, in addition to independent research for information, the teacher provides students with additional information on the topic (Application 2).

Students are given the task to do research and gather information on the following topics in advance:

- In what way is the air, water and soil polluted in your settlement?
- What are the consequences of climate change for Bulgaria?
- What is the activity of the following organizations: World Nature Organization (WNO), Nature Conservancy (TNC), Friends of the Earth International Network, Intergovernmental Panel on Climate Change (IPCC)?
- Which non-governmental (NGOs) organizations do you know in your locality that are involved in environmental protection and sustainable development? What are their activities?

Students should prepare answers to the questions: What is the main thing you want to prove?; Who are the affected parties, what are their positions, what solutions do they propose?; What are the consequences of the changes?

Students are informed in advance about the rules of the debate and are warned to follow them strictly when preparing their case studies.

Rules during a debate:

- Respect your interlocutors:
- Listen to yourself
- Observe the linguistic norms of the Bulgarian literary language
- Present logically connected arguments
- Prepare in advance on the topic

Conducting the debate

The debate is conducted according to the rules of the Karl Popper Debate Program, adapted to the conditions and learning objectives in 12th grade [12].

All team members participate individually in the oral presentation of their case, but the team determines the order of speakers. Individual presentations should be broadly similar in terms of time, difficulty of presentation, responses, etc. The teacher acts as a moderator and ensures that the rules of the debate and the timing of the individual presentations from both teams are followed.

The purpose of the debate is for the participants to take theoretical and empirical knowledge, related to environmental education, the Concept of Sustainable Development, climate change, global warming and apply it to a real-world case study (one that has already been addressed at an international level).

The school debate is held according to the following regulations:

Team I: affirmative (3 people): Speaker U1, Speaker U2, Speaker U3. Develops a thesis, proves statements with arguments.

Team II: negative (3 people): Speaker O1, Speaker O2, Speaker O3. Prepares an antithesis, proves statements with arguments.

Debates begin with the first speaker from the affirmative team

Speaker U1: Introduces himself and the team. Presents definitions on the given topic. Formulates the team's thesis on the topic. The team's strongest arguments are highlighted, attached with examples. A brief conclusion is given.

First negative cross-examination: It's question and answer time. The graduate speaker of the affirmative team answers questions of a participant of the negative team. The affirmative speaker might make a mistake in their answers, and it is the duty of the negative team to take advantage of these gaps in the speech that immediately follows.

Speaker O1: Introduces himself and the team. Agrees with the given definitions. If not - supplements or gives new definitions. Presents the negative thesis. Refutes the arguments of Speaker U1. Presents arguments for the second team's thesis. A brief conclusion.

First affirmative cross-examination: the procedural rules for 'First negative cross-examination' also apply here.

Speaker U2: Rebuts arguments of Speaker O1. Defends the presented arguments of the team and presents new arguments attached with examples. A brief conclusion.

Second negative cross-examination: The procedural rules described above under 'First negative cross-examination' also apply here.

Speaker O2: Refutes the arguments of Speaker U2. Defends the presented arguments of his team and presents new arguments attached with examples. A brief conclusion.

Second affirmative cross-examination: the procedural rules described above under 'First negative cross-examination' also apply here.

Speaker U3: briefly summarizes what has happened so far in the debate. Refutes the strongest argument of the denying team. Builds on their team's argument, supported with examples. Summarizes and concludes.

Speaker O3: Rebuts the affirmative team's strongest argument. Compares the meaning and implications of both sides' arguments. Builds on their team's arguments, supporting with new examples. Summarizes and concludes.

Speaker O1 or O2: Indicates the points of opposition during the debate. Shows why the denying team has been proven right.

Speaker U1 or U2: Summarizes the debate. Points out the main issues that have been the focus and shows why the affirming team has been proven right.

Each speech lasts 5 or 6 minutes, cross-examination is 3 minutes.

The rest of the class is the audience, which at the end of the debate expresses its opinion in the form

of individual statements in support or in rebuttal of one side or the other. An opportunity can be provided for everyone to share their personal opinion on the topic. The debate is won either by the affirmative team, if, based on the arguments presented, it has convincingly defended its position, or by the negative team, if, based on its arguments, it refutes the affirmative thesis, or has managed to cast doubt on its truth [13]. The judges award victory to the team that was clearer and more convincing in presenting and defending its arguments. Each team is evaluated according to certain criteria listed in Table 1, with three levels defined for each of them – good, average, and poor [14]. We use evaluation criteria similar to those applied by Vallejo & Zorrilla, but in our case reduced to 3, with certain indicators included in one criterion [15].

Table 1. Criteria for evaluating the debate

Criteria	Good	Average	Poor
Content /includes arguments, consistency of presentation, quality of evidence/	The arguments are fully relevant to the thesis; there is a logical connection between them; accurate and substantiated; the evidence presented is from reliable sources; fully supports the arguments	Some of the arguments are relevant to the thesis; some are inaccurate and unsubstantiated; the evidence presented partially supports the arguments; there are gaps regarding the reliability of the sources used	The submission as a whole uses irrelevant, incomplete and unsubstantiated arguments; the evidence does not fully support the arguments; the evidence is from unreliable sources
Form /includes speaking style, language, body behavior, emotions/	Use of rich vocabulary; tone is respectful, calm; makes visual contact with audience, manages to captivate audience; body language conveys confidence	Presence of vocabulary gaps; tone is disrespectful at certain times; makes eye contact with audience at certain times; body language is sometimes	Poor language vocabulary; tone is entirely aggressive; lack of audience contacts; tone is mostly disrespectful

		aggressive and challenging	
Strategy /presentation of purpose, presentation of speaker, content of speech, timing/	Has a clear introduction, main body and conclusion; follows the speakers' statements; uses information from cross- examination questions; makes full use of the time allocated for statements and does not exceed it	Presence of gaps in the presentation of the purpose of the thesis; fails to fully follow the speakers' responses; in some cases, exceeds the time allotted for statements	Largely lack of a clear introduction, main body and conclusion; lack of logical connection between the parts, largely exceeds the time allotted for statements

After the end of the debate, the teacher and the judges discuss with the participants in both teams the logical mistakes that have been made, gaps in the presentation of the evidence and the justified use of arguments, the presentation of the speeches.

Results and Discussion

A questionnaire (Appendix 1) with 12 multiple choice questions with a selectable answer was developed to report the results. The survey examines students' opinion on the impact of the school debate on enriching their environmental awareness. In general, the students are satisfied with the debate, they have increased their skills to search and find reliable sources of information, they have changed their attitude towards environmental problems; their critical attitude towards the negative consequences of environmental pollution has increased.

To the question ‘Is this the first time you have actively participated in a debate?’ only 22.2% answered positively, indicating a topic they were debating ‘For or against cloning’. The remaining 77.8% participated for the first time and found it a challenging experience. When asked: Has holding a debate increased their interest in environmental issues, 89% answered positively, 5.5% answered partially and again 5.5% did not show interest (Fig. 1 and Fig. 2).

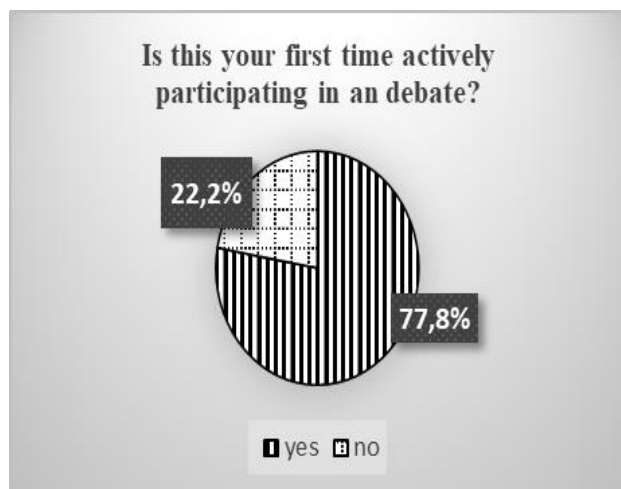


Figure 1. Results for Question 1 of the survey



Figure 2. Results for Question 2 of the survey

In forming the teams, the random principle was preferred as the fairest, due to the fact that it would contribute to improving relationships between students who have contradictions on given topics. When asked how they accept this, 61.1% answer that it is a good opportunity to adopt different points of view, 22.2% do not think this option is a good one, 16.7% think it is a good opportunity to some extent (Fig. 3).

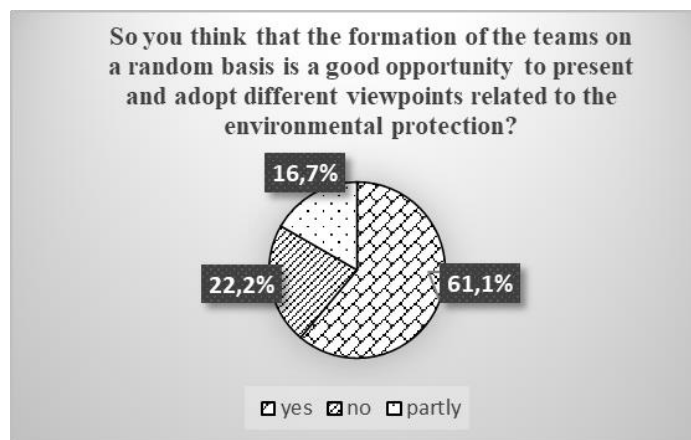


Figure 3. Results for Question 3 of the survey

To questions 4 and 7, all students have answered that they have acquired new knowledge related to improving and protecting the environment and have formed an environmentally friendly way of life (Fig. 4

and Fig. 8).



Figure 4. Results for Question 4 of the survey



Figure 5. Results for Question 5 of the survey

To questions 5, 6 and 9, 94.4% of students answered that they increased their skills to analyze and evaluate their ecological footprint, increased their environmental literacy and the ability to search and find information from reliable sources (Fig. 5, Fig. 6, and Fig. 7).

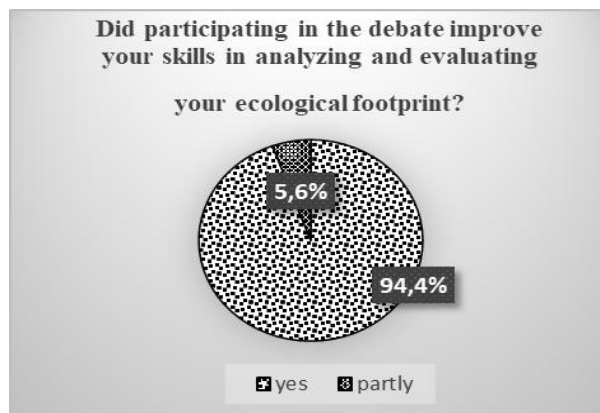


Figure 6. Results for Question 6 of the survey

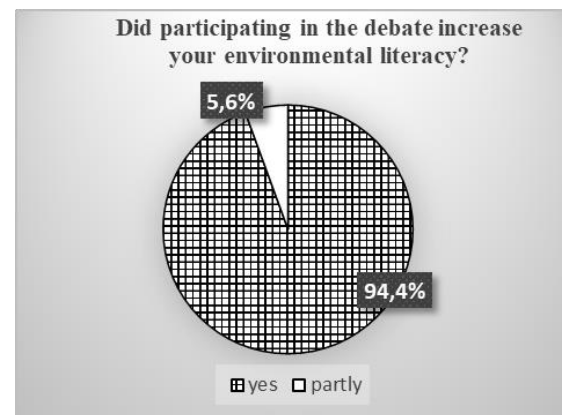


Figure 7. Results for Question 9 of the survey

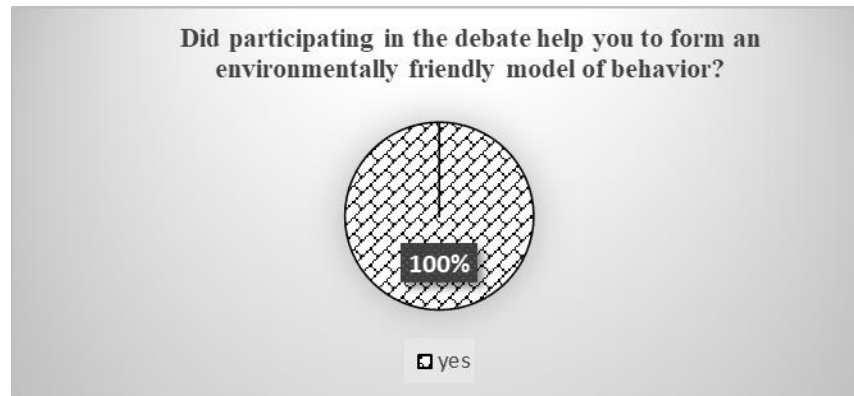


Figure 8. Results for Question 7 of the survey

To questions 10 and 12, 89% of the students responded that the school debate provides an opportunity to make motivated decisions, evaluate one's own behavior and form environmental literacy (Fig. 9 and Fig. 10).

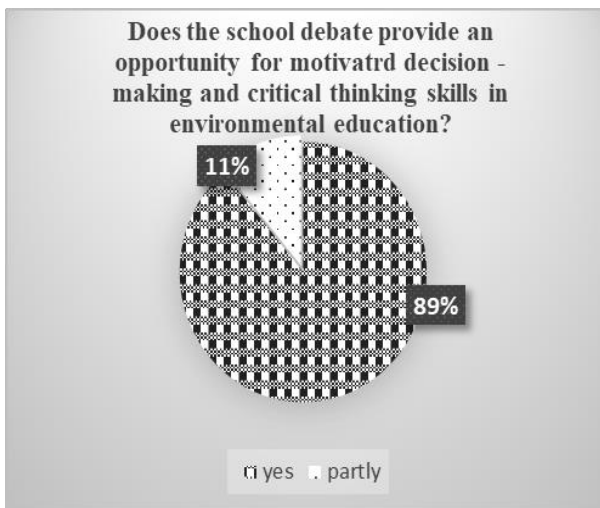


Figure 9. Results for Question 10 of the survey

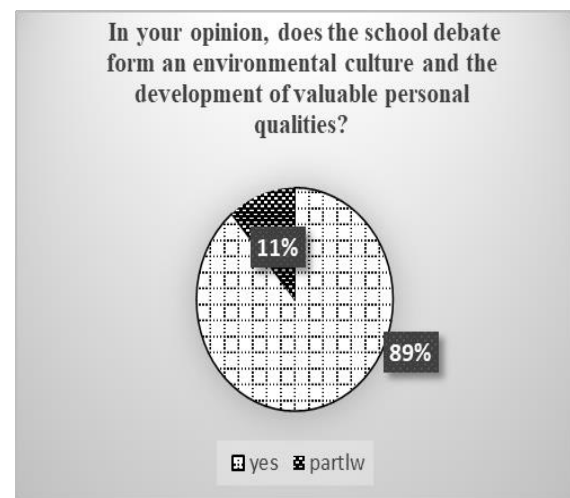


Figure 10. Results for Question 12 of the survey

To the question concerning the formation of a critical attitude towards the problems and their consequences to the environment, 83.3% answered that they have become more critical, 11.1% answered in certain situations, and 5.6% answered no (Fig. 11).

Participating in a debate requires sufficient knowledge to convincingly present the defended thesis. When asked whether students had sufficient knowledge to defend the thesis, 72.2% said they had the knowledge to formulate logically connected and convincing arguments, 22.2% had certain gaps in their knowledge, and 5.6% said they did not have the necessary knowledge (Fig. 12).

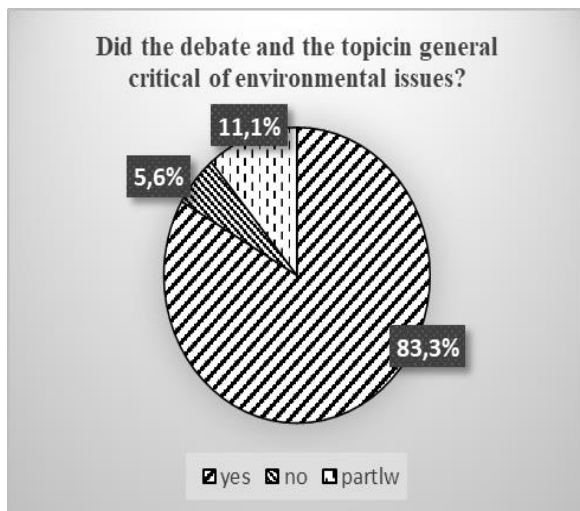


Figure 11. Results for Question 11 of the survey

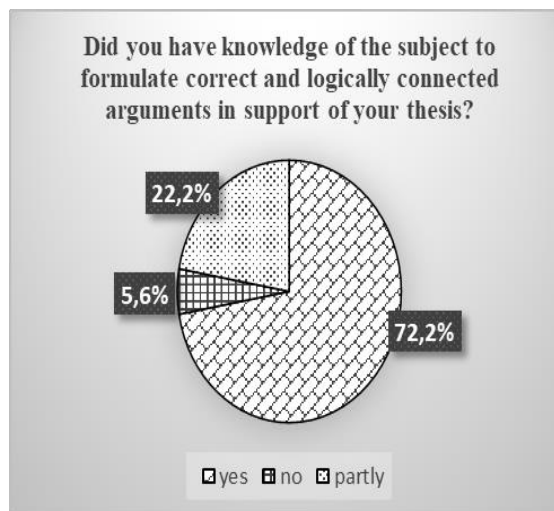


Figure 12. Results for Question 8 of the survey

Conclusion

Without claiming to be exhaustive, the author believes that the results obtained from the conducted pedagogical experiment confirm the working hypothesis: if the debate is applied as an interactive method, environmental knowledge, skills and personal attitudes to environmental problems will be increased and enriched. Debate on an environmental topic is of interest to students, forms skills to analyze, evaluate and critically relate to global environmental issues. The awareness of the fact that we ourselves determine the environment in which the future generation will develop, is indicative of the upcoming changes in behavior, attitude and care for our surroundings. At the same time, the debate as a teaching method is a way to acquire, consolidate and apply knowledge from various areas of environmental educational content. The application of debate in the teaching of educational content improves thinking processes, helps improve relationships among

students, increases the ability to analyze the cause-and-effect relationships between individual environmental problems and seeks ways to resolve them. All this enriches the students' environmental culture, which is the main goal of environmental education.

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Annex 1. A survey to study the students' opinion on the implementation of the debate as an interactive method for the formation of environmental culture

Question	Yes	No	Partly
1. Is this your first time actively participating in a debate? If you have participated before, indicate when and on what topic?			
2. Did debating increase your interest in environmental issues?			
3. So, you think that the formation of the teams on a random basis is a good opportunity to present and adopt different viewpoints related to the environmental protection?			
4. Did participating in the debate help you gain new knowledge related to improving and protecting the state of our environment?			
5. Did preparing for the debate improve your skills in searching for, finding and processing information from credible sources?			
6. Did participating in the debate improve your skills in analyzing and evaluating your ecological footprint?			

7. Did participating in the debate improve your skills in analyzing and evaluating your ecological footprint?			
8. Did participating in the debate improve your skills in analyzing and evaluating your ecological footprint?			
9. Did participating in the debate increase your environmental literacy?			
10. Does the school debate provide an opportunity for motivated decision-making and critical thinking skills in environmental education?			
11. Did the debate and the topic in general critical of environmental issues?			
12. In your opinion, does the school debate form an environmental culture and the development of valuable personal qualities?			

Annex 2. Information on the topic that students use in preparing for the debate

1. Concept of sustainable development - the concept of sustainable development was born in the 80s of the 20th century, and in the 90s it was already adopted and introduced as a line of behavior for humanity. In 1983 The UN Secretariat formed a commission chaired by Mrs. Gro Harlem Brundtlan, then Minister of the Environment of Norway. The commission was tasked with analyzing what had been achieved internationally since the Stockholm meeting and making proposals for future environmental action. The Commission prepared and presented to the UN General Assembly in 1987 a report called **Our Common Future, which** introduced the term **sustainable development** as a concept in international practice, which subsequently gained wide citizenship.

The view of the authors was that only by guaranteeing such development, the approach to the use of natural resources, investments, reorientation of technologies and the direction of the competent national and international institutions to the implementation of a policy consistent with the existing and future opportunities for satisfying human resources, can be changed.

2. In September 2015, world leaders adopted the United Nations 2030 Agenda for Sustainable Development, which sets out a set of sustainable development goals to end poverty, protect the planet,

ensures human rights are protected and prosperity for all. In particular, the following key policy areas were adopted in which transformations against sustainable development in the EU are needed:

- A fair transition to a low-carbon, resource-efficient and circular economy;
- Transition to a socially inclusive society and economy- decent working conditions and human rights;
- Transition to sustainable food production and consumption;
- Investing in innovation and the long-term infrastructure modernization and promoting sustainable enterprises;
- Contribution of trade to global sustainable development.

3. The sustainable development of the XXI century is built on three main components -nature, society and new technologies. In a context of economic crisis and accelerating climate change, questions about future development and overcoming the problems arise. For many years, and notably at the Gothenburg Council in 2001, EU leaders have recognized that the environment is not an isolated issue confined to national borders. Decisions made in the transport and agriculture sectors to expand international trade and development have had a beneficial or adverse impact on it. In order to improve the quality of life for future generations, all EU policies and activities must take the environment into account. This is called sustainable development. The role of the EU is to support and coordinate the efforts of member states and to check that governments keep the commitments they have made.

4. Poverty and environmental destruction are often linked. It is often the poorest nations on the planet who suffer the most from large-scale natural disasters. In this regard, many large-scale international programs and centers aimed at protecting and restoring the environment from various damages caused by human activity, have been set up and are functioning at the United Nations.

- **United Nations Environment Program:** UN program focused on the environment and sustainable use of natural resources.
- **UN Environment Network:** the global portal for official environmental information by topic and region.
- **World Nature Organization (WNO) or World Environment Organization:** an international intergovernmental organization, which has emerged from multilateral environmental negotiations and is in

the process of formation. Its functions are to implement actions and support environmental and climate protection at the global international level.

- **The Nature Conservancy (TNC):** an international organization, funded by public and private sources, whose work focuses on biodiversity and environmental conservation. It was founded in 1951 and has offices in 35 countries. TNC is credited with successfully contributing to the protection of approximately 50 million hectares of land and marine areas on the planet through innovative conservation approaches.

- **Friends of the Earth International or Friends of the Earth International Network:** an international network of environmental protection organizations from 74 countries. It was founded in 1969 by activists against the development of nuclear weapons, whose main leaders were Robert Anderson, Donald Aitken, David Brower and others. The organization is affiliated with the European Environmental Bureau. The main objective proposed by the Friends of the Earth network is to spread the dangers of using nuclear weapons. The organization has an office in Amsterdam where it offers support for promotional campaigns.

- **Intergovernmental Panel on Climate Change (IPCC), Intergovernmental Panel on Climate Change:** an international organization founded in 1988 by the World Meteorological Organization (WMO) and UNEP, both belonging to the organizational structure of the United Nations. Its function is to provide scientific, economic and social information on climate change generated by human activities and projections of its consequences, in addition to indicating opportunities for mitigation and adaptation to this phenomenon threatening humanity.

The role of NGOs in natural resource conservation is of great importance for sustainable development. The transition to sustainable development requires the efforts of both national governments and the entire public in the form of non-governmental organizations and democratic society.