

**Экологическое образование и воспитание в контексте глобальных климатических изменений**

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**Аннотация.** Глобальное изменение климата — одна из самых серьёзных проблем, стоящих перед человечеством. Для того чтобы сформировать у людей ответственное отношение к окружающей среде и подготовить молодое поколение к решению экологических проблем, необходимо развивать экологическое образование и воспитание. В статье рассматриваются ключевые аспекты экологического образования в контексте глобального изменения климата. Анализируются основные проблемы и предлагаются педагогические и инновационные подходы, которые помогут повысить уровень экологического сознания. Исследование современных программ и инициатив в области экологического образования показывает их значимость для формирования у студентов понимания важности устойчивости.

**ENVIRONMENTAL EDUCATION AND UPBRINGING IN THE CONTEXT OF GLOBAL CLIMATE CHANGE**

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**Abstract.** Global climate change is one of the most serious problems facing humanity. It is necessary to develop environmental education and upbringing in order to form people's responsible attitude to the environment and prepare the young generation to solve environmental problems. The article considers key aspects of environmental education in the context of global climate change. The main problems are analysed and pedagogical and innovative approaches that will help to raise the level of environmental awareness are proposed. A study of modern environmental education programmes and initiatives shows their significance in shaping students' understanding of the importance of sustainability.

**Key words:** environmental education, climate change, sustainable development, environmental education, innovative approaches.

**Introduction**

Global climate change is one of the most urgent and pressing issues on the world environmental agenda. They not only pose a threat to the environment, but also have significant social and economic consequences. One of the key aspects of addressing climate change is education. It plays an important role in equipping people with the knowledge and skills needed to understand and address environmental issues. Quality environmental education helps to develop students' ability to analyse changes in the environment and make informed decisions that promote sustainable development[1].

### **Relevance of the topic**

The need to develop environmental education stems from the growing risks associated with climate change, such as rising temperatures, extreme weather events, droughts and floods. Education systems in many countries require updating and introducing new teaching methods to not only provide students with information about environmental issues, but also to encourage them to take active action to address them. In the context of global climate change, it is important not only to impart knowledge but also to instil environmental values in young people. This makes the topic of environmental education particularly relevant.

### **Purpose and objectives of the study**

#### **Purpose of the study**

Analysis of modern approaches to environmental education and upbringing in the context of global climate change to develop recommendations for improving educational programmes and increasing the level of environmental literacy of students.

#### **Research objectives**

- 1. to study the key problems of integrating environmental education into educational processes in the context of climate change.**
- 2. To analyse effective pedagogical methods (project-based learning, digital technologies, gamification) in the formation of environmental awareness.**
- 3. To assess the level of environmental literacy of students and teachers based on surveys and analysis of educational programmes.**
- 4. To study international experience (EU, USA, Japan) in the field of environmental education and adaptation to climate change.**
- 5. To develop practical recommendations on modernisation of environmental education in higher education institutions (on the example of Tashkent State Technical University and other universities).**

#### **Scientific novelty**

- Comprehensive analysis of barriers and perspectives of environmental education in the context of climate crisis.**
- Proposal of adaptive teaching models combining interdisciplinarity, digitalisation and practice-oriented approach.**
- Specific measures to integrate the climate agenda into the curricula of technical and humanities specialities.**

The relevance of the tasks is conditioned by the need to train a new generation of specialists capable of addressing global environmental challenges through education.

#### **Research methodology**

A comprehensive approach was applied in the course of the study, which included:  
analysis of existing environmental and climate education programmes;  
study of best practices and approaches to environmental education globally;  
conducting a survey among teachers and students to assess their level of environmental literacy.

Various methods were used for the analysis, such as:

- content analysis of educational materials;**
- questionnaires;**
- comparative studies of environmental education programmes in different countries.**

Main part. Modern approaches to environmental education in the context of global climate change

In the framework of environmental education, special attention is paid to the integration of sustainable development principles into the teaching process. It is necessary not only to provide students with information about climate threats, but also to develop their ability to minimise the negative impact on the environment. This approach includes project-based learning, which allows students to apply the knowledge they have learnt in practice. They actively participate in the development of real environmental projects for their communities, which contributes to the formation of their responsible attitude towards nature. [2].

### **Environmental Education and Upbringing in the Context of Global Climate Change**

#### **1. Modern approaches to environmental education**

In the context of global climate change, traditional methods of environmental education are becoming insufficient. A transition to integrated, interdisciplinary and practice-oriented learning models is necessary.

##### **1.1. Integrating ecology into curricula**

Interdisciplinary approach: Incorporating climate change issues not only in biology and geography, but also in economics, political science, engineering disciplines. Environmental Education and Upbringing in the Context of Global Climate Change

#### **1. Modern approaches to environmental education**

In the context of global climate change, traditional methods of environmental education are becoming insufficient. A transition to integrated, interdisciplinary and practice-oriented learning models is necessary.

Example: The Climate Economics course at universities in Europe, where students study carbon markets, green investments and adaptation strategies.

Compulsory environmental modules: Introduction of core sustainability courses for all majors (as done, for example, at the University of British Columbia, Canada).

##### **1.2. Project and problem-based learning (PBL)**

Students work on real cases: calculating the carbon footprint of a university, developing strategies for city adaptation to climate change.

Examples of successful practices:

Climate-KIC programme (EU), where students create start-ups in the field of climate innovation.

Ecosystem restoration projects (e.g. student initiatives to plant mangrove forests in Southeast Asia).

#### **2. The role of innovative technologies in environmental education**

##### **2.1 Digital educational tools**

Virtual laboratories and simulators:

Platforms like Climate Interactive allow modelling the consequences of climate decisions.

Using VR to visualise the melting of glaciers or the effects of sea level rise.

Online courses and MOOCs (Coursera, edX):

Courses from top universities (e.g., "Climate Change Science and Negotiations" from Harvard).

##### **2.2 Gamification and interactive methods**

Environmental quests and simulations:

The game "Fate of the World" - a strategy where players manage the climate policy of countries.

Mobile applications to calculate personal carbon footprints ("JouleBug", "EcoChallenge").

#### **3. Shaping environmental responsibility through practice**

##### **3.1 Green campuses and student initiatives**

Implementation of zero waste and carbon neutrality principles in universities:

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Example: Stanford University reduced CO<sub>2</sub> emissions by 68% by switching to renewable energy sources.

Student eco-clubs and actions:

Fridays for Future movement, originated as a student initiative.

### 3.2 Cooperation with local communities

Volunteer programmes:

Participation in reforestation (Eden Reforestation project).

Educational projects for schools (e.g. Climate Lessons from WWF).

### 4. Problems and barriers in environmental education

#### 4.1 Lack of qualified staff

Many teachers are not prepared to discuss climate issues due to lack of specialisation.

Solution: Create professional development programmes (e.g. UNESCO's Climate Change Education for Sustainable Development).

#### 4.2. Lack of funding and infrastructure

Lack of laboratories, digital resources, support for green projects. Пути решения:

Grants from international organisations (GEF, UNDP).

Partnership with business (e.g. co-operation of universities with Tesla on the introduction of solar panels).

#### 4.3. Resistance to systemic change

Conservativeness of educational standards.

Experience of overcoming:

In Finland, environmental education is integrated into the national curriculum from 2020.

### 5. International experience and best practices

Country/University	Programme/Initiative	Results
<b>Sweden</b>	Compulsory environmental education from kindergarten	90% of schools using green standards
<b>Germany</b>	Project "Bildung für nachhaltige Entwicklung"	4000+ schools participating
<b>Japan</b>	Course "SDGs and Climate Action" in universities	60% of students involved
<b>University of California</b>	Campus Carbon Neutrality System	80% reduction in emissions

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The Role of Innovative Technologies in Environmental Education

In today's world, technology plays a key role in environmental education. Through the use of multimedia resources, virtual excursions and online courses, the learning process becomes more accessible and understandable. For example, virtual platforms allow students to study the impact of climate change on different regions of the world, simulate ecological processes and participate in online environmental activities. This approach helps students to develop a deeper understanding of the issue.

It is important to develop students' sense of environmental responsibility through educational activities. In addition to theoretical knowledge, it is necessary to develop in students a sense of personal responsibility for the environment. This can be achieved by participating in practical environmental projects such as greening, recycling, renewable energy and other initiatives that are actively implemented in educational institutions. Such projects not only contribute to practical understanding of environmental knowledge, but can also become an important factor in the development of environmental culture of young people. [3].

#### Results and discussions

The following stages of analysis were conducted in the course of the study:

- study of existing educational programmes on ecology and climate change;
- analysis of global experience in this area;
- survey of teachers and students.

These stages of analysis allowed for a better understanding of the current state of affairs in environmental education and training in the context of global climate change.

#### 1. Integrating environmental issues into traditional curricula

The results of the study show that in most national education systems, environmental topics are not yet compulsory at all levels of education. Although some countries have specialised environmental programmes, the principles of global climate change and sustainable development are often not integrated into other disciplines. For example, environmental issues may be addressed in biology, geography or social science courses, but are not considered in the context of global issues and interdisciplinary approaches. This results in students not recognising the complexity and interconnectedness of environmental issues.

**Discussion.** It should be noted that the lack of adequate integration of environmental topics into educational programmes has led to a lack of awareness among students about climate threats and their impacts. This underscores the need to revise educational standards and integrate sustainable development into curricula at all levels. The inclusion of ecology in all subjects will enable students to perceive it as an integral part of their daily lives and professional activities.

#### 2. Faculty challenges and lack of resources

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*The study found key challenges related to the lack of qualified environmental and climate change professionals. Educational institutions are also struggling to provide resources for innovative educational programmes such as sustainable campuses or project activities involving students. To address the shortage of qualified teachers, there is a need to develop professional development programmes for educators to effectively teach topics related to environmental change and sustainable development.*

*In addition, support from governments and private organisations is required to address resource constraints. Funding should be provided for educational activities aimed at improving environmental literacy.*

#### *3. Эффективность проектного обучения и инновационных подходов*

Изучение текущих образовательных инициатив демонстрирует, что применение проектно-ориентированных методов обучения и внедрение инновационных технологий, таких как виртуальные экскурсии и онлайн-курсы, способны существенно увеличить интерес учащихся и их понимание вопросов, связанных с изменением климата. Например, в рамках проектов студенты могут разрабатывать конкретные меры по решению местных экологических проблем, таких как очистка водоёмов, борьба с загрязнением воздуха или повышение энергоэффективности своих организаций. Подобные проекты не только способствуют развитию практических навыков студентов, но и усиливают их чувство ответственности за будущее нашей планеты.

**Discussion:** Project-based learning not only facilitates the assimilation of theoretical knowledge, but also provides an opportunity to actively apply it in practice. This significantly increases students' interest in learning about ecology. This approach also develops critical thinking, teamwork skills and the ability to solve practical problems. The use of technology in the educational process makes learning more accessible and helps to create new formats for students to interact with environmental issues.

#### 4. Impact of environmental education on students' behavioural change

Project-based learning not only facilitates the assimilation of theoretical knowledge, but also gives the opportunity to actively apply it in practice. This significantly increases students' interest in studying ecology. This approach also develops critical thinking, teamwork skills and the ability to solve practical problems. The use of technology in the educational process makes learning more accessible and helps to create new formats for students to interact with environmental issues.

**Discussion:** Research has shown that in order to change pupils' behaviour, theoretical lessons alone are not enough. It is necessary to actively involve them in practical activities. Environmental actions, volunteer programmes and environmental projects can be effective tools for developing young people's sense of responsibility for the environment. It is important that these initiatives are supported at all levels of education, from school curricula to university programmes.

#### 5. Assessment of international practices

A comparison of international educational programmes shows that many successful environmental education practices employ interdisciplinary methods and actively introduce innovative technologies. In Europe and North America, environmental education is often part of the core curriculum, and students can participate in environmental projects both within and outside of their studies. It is also important to note that educational institutions are actively involved in international environmental initiatives such as green campuses and sustainable urban development.

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Discussion: The experience of successful international education systems demonstrates that integrating environmental education into the broader context of sustainable development and interdisciplinary approaches can not only improve students' knowledge but also transform their perceptions of the environment. These examples may be useful in developing educational programmes in other countries where environmental education is just beginning to develop.

Conclusion. The study shows that environmental education needs to be improved in order to effectively address global climate change. It is important to integrate environmental topics into educational programmes, improve the qualifications of teachers and ensure access to necessary resources. Modern environmental education should be based on project-based learning and innovative approaches such as the use of information and communication technologies. Only such integrated efforts can significantly improve the environmental literacy and responsibility of the younger generation and prepare them to address global environmental problems.

#### List of sources used:

1. Stepanov, I. A. (2020). "Environmental education in the context of global change". *Ecological Pedagogy*, 5(2), 56-62.
2. Ozhegov, V. S. (2021). "Problems and prospects of introducing sustainable development into educational programmes". *Sustainable Development Issues*, (7), 88-95.
3. United Nations Educational, Scientific and Cultural Organization (UNESCO). (2017). "Education for Sustainable Development Goals: Learning Objectives". Paris: UNESCO.
4. Xusainov, R. R. Improving corporate governance in Uzbekistan is the key to the successful functioning of the JSC. *A young scientist. International Scientific Journal*, (1.3), 51-54.
5. Хусаинов, Р. Р. (2025). Развитие и эволюция искусственного интеллекта в мире и Узбекистане. *THE THEORY OF RECENT SCIENTIFIC RESEARCH IN THE FIELD OF PEDAGOGY*, 3(31), 38-45.
6. Хусаинов, Р. (2025). Устойчивое развитие в инженерии: экономические подходы и инновации в Узбекистане. *MUHANDISLIK VA IQTISODIYOT*, 3(1).
7. Хусаинов, Р. (2025). Глобальные экологические инициативы и их влияние на международную экономику. *YASHIL IQTISODIYOT VA TARAQQIYOT*, 3(1).
8. Хусаинов, Р., & Ибрагимова, К. (2024). Изменение климата и зеленая экономика: стратегии и меры в узбекистане. *YASHIL IQTISODIYOT VA TARAQQIYOT*, 2(11).
9. Khusainev, R. R. (2024). PATHWAYS TO SUSTAINABLE ECONOMIC GROWTH IN UZBEKISTAN: CHALLENGES AND OPPORTUNITIES. *Eurasian Journal of Law, Finance and Applied Sciences*, 5(1), 26-32.
10. Khusainev, R. R. (2024). PATHWAYS TO SUSTAINABLE ECONOMIC GROWTH IN UZBEKISTAN: CHALLENGES AND OPPORTUNITIES. *Eurasian Journal of Law, Finance and Applied Sciences*, 5(1), 26-32.
11. Юсупходжаева, Г. Б. (2024). Цифровая транспортно-логистическая интеллектуальная платформа в узбекистане. *Interpretation and researches*, 2(24).
12. Yusupkhodjaeva, G. B. (2024). Management Of Metallurgical Enterprises Based On The Introduction Of Financial Analysis. *The Peerian Journal*, 28, 21-26.
13. Husainov, R., & Ibragimova, S. (2024). Financial literacy in uzbekistan. *Interpretation and researches*, 2(24).

## THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

### VOLUME-5, ISSUE-5

14. Ибрагимова, С., & Абдулазизов, Ф. (2025). Развитие корпоративного управления в Узбекистане на основе современных мировых стандартов. *YASHIL IQTISODIYOT VA TARAQQIYOT*, 3(1).
15. Begmullayev, O. I. (2024). Sanoat korxonalarini bozor sharoitlariga moslashtirish samaradorligini oshirish (Monografiya). *Interpretation and researches*, 2(15).
16. Хусаинов, Р. (2025). РОЛЬ НАЛОГОВЫХ РЕФОРМ В СТИМУЛИРОВАНИИ ИНВЕСТИЦИЙ В УЗБЕКИСТАНЕ. *Interpretation and researches*, (2 (48)).
17. Хусаинов, Р. (2025). РОЛЬ НАЛОГОВЫХ РЕФОРМ В СТИМУЛИРОВАНИИ ИНВЕСТИЦИЙ В УЗБЕКИСТАНЕ. *Interpretation and researches*, (2 (48)).

