
**ENVIRONMENTAL AND PROJECT-BASED ACTIVITIES
IN THE SCHOOL GEOGRAPHY CURRICULUM:
THEORETICAL AND METHODOLOGICAL
FOUNDATIONS AND DIGITAL TOOLS
FOR IMPLEMENTATION**

Nepsha Oleksandr, Hryshko Svitlana, Levada Olga
DOI <https://doi.org/10.30525/978-9934-26-714-7-42>

INTRODUCTION

The study of geography provides broad opportunities for implementing the competence-based approach outlined in the State Standard for Basic Secondary Education and the Concept of the New Ukrainian School. Geography contributes to the development of environmental, civic, digital, and research competences while fostering critical thinking, spatial analysis, and the ability to interpret cartographic, statistical, and geospatial information. An essential component of geography education is engaging students in investigating environmental processes and addressing contemporary environmental challenges.

Environmental project-based learning is an effective approach that integrates research, practical, creative, and information-based activities. It enables students to apply theoretical knowledge to real environmental issues, develop teamwork, information-search, analytical, and presentation skills, and strengthen interdisciplinary connections with biology, chemistry, computer science, and civic education.

The rapid digitalization of education has considerably expanded the possibilities for organizing environmental projects. Digital tools such as Google Earth, Google Maps, geographic information systems (GIS), satellite imagery, and online platforms improve the visualization of geographical phenomena, facilitate data collection and analysis, and promote students' digital literacy and independent learning¹.

¹ Hryshko S. V., Levada O. M., Nepsha O. V., Koval D. O. Digital tools in teaching geography: the possibilities of Google Maps and Google Earth. *Cross-disciplinary studies in science, innovation and social development*. Vol. 3. Monograph. Prague : Publishing house Education and Science s.r.o., 2026. P. 382–392.

The integration of project-based learning with digital technologies creates favorable conditions for developing environmental competence, research skills, critical thinking, and spatial reasoning. By investigating authentic environmental problems and analyzing reliable geographical data, students acquire practical experience in decision-making and develop responsible attitudes toward environmental protection.

This study substantiates the theoretical and methodological foundations for organizing environmental project-based learning in the school geography curriculum using modern digital technologies. The proposed approach contributes to the development of environmental competence, digital literacy, civic responsibility, and students' readiness to support sustainable development through practical educational activities.

1. Theoretical and methodological foundations for organising environmental project work within the school geography curriculum

The current stage of civilisation's development is characterised by an intensification of contradictions within the "nature-society" system, which necessitates a re-evaluation of approaches to fostering environmental awareness and responsible behaviour in individuals. Under these circumstances, the comprehensive development of environmental education as an integrated pedagogical system aimed at harmonising human interaction with the environment takes on particular relevance. School education is a priority area in this process, as it is during this period that worldview orientations, value systems and behavioural models are established, which determine an individual's future outlook on life².

The school geography curriculum holds significant potential for achieving the goals of environmental education³. Its distinctive feature lies in the integrative nature of its content, which combines the study of natural processes, socio-economic phenomena and the spatial forms of social organisation. Such a comprehensive approach creates the methodological foundations for forming a holistic understanding of the patterns governing the functioning of the Earth's geographical envelope and the nature of the interactions between natural and anthropogenic components. Geography as a school subject provides an interdisciplinary synthesis of knowledge, promoting an understanding of global and regional environmental issues in their systemic context.

² Толочко С. В., Бордюг Н. С. Особливості інтеграції цифрового контенту в освітній процес із формування екологічного світогляду учнівської молоді. *Інноваційна педагогіка*. 2026. Вип. 95. Т. 2. С. 62–66.

³ Мовчан В. В., Корнус О. Г., Корнус А. О. Екологічна освіта і виховання у шкільному курсі географії. *Наукові записки СумДПУ імені А. С. Макаренка. Географічні науки*. 2017. № 8. С. 191–195.

Environmental education within the study of geography involves a targeted pedagogical approach, the result of which is the development in pupils of an understanding of the unity and indivisibility of the planet's natural environment, an awareness of the need to optimise human society's interaction with the environment, as well as the acquisition of basic skills in geographical analysis and forecasting⁴. This involves not only the acquisition of factual knowledge, but also the development of spatial thinking, the ability to interpret environmental processes within the context of society's territorial organisation, and the ability to assess environmental risks and the consequences of economic activity. At the same time, an important outcome is the formation of a value-based attitude towards the environment in a broad worldview sense and a willingness to participate personally in nature conservation activities.

In scientific and pedagogical discourse, environmental education is viewed not merely as a process of imparting knowledge about the environment, but as a mechanism for fostering an active and positive attitude towards nature, grounded in environmental ethics and the principles of sustainable development]. Thus, its content goes beyond the purely informational and involves the development of creative and active attitudes towards the natural environment. Transforming environmental values into practical, scientifically grounded actions requires the development of responsibility, initiative, decision-making skills and the ability to anticipate the consequences of those decisions. Another important aspect is the development of a constructive, optimistic vision of the possibilities for solving environmental problems through active citizenship.

Project-based learning serves as an effective means of implementing these objectives in school practice; it is a specific form of pupils' educational and cognitive activity aimed at achieving a consciously defined, personally meaningful and socially motivated goal⁵.

According to S. Tolochko and N. Bordyug, "the development of environmental competence in senior secondary school pupils through project-based and research activities promotes a deep understanding of environmental problems, the acquisition of practical experience, and their involvement in various projects"⁶.

The application of the project-based approach involves engaging the intellectual, emotional, motivational-volitional, value-based, communicative

⁴ Левада О. М., Гришко С. В., Непша О. В. Роль шкільного курсу географії у формуванні екологічної культури учнів. *Наука і техніка сьогодні*. 2025. № 3 (44). С. 566–582.

⁵ Войтович О. П., Костолович М. І. Методика впровадження проєктів у шкільний курс географії. *Географічна освіта у шкільних та позашкільних закладах : проблеми, пошуки, перспективи* : збірник наукових праць. Рівне : Видавець О. Зень, 2020. С. 3–5.

⁶ Толочко С. В., Бордюг Н. С. Екологічна компетентність учнів у контексті подолання екологічних наслідків війни : монографія. Київ : Компрінт, 2024. 160 с.

and organisational components of the individual. Within the framework of such activities, exploratory, critical, predictive and axiological thinking are developed, as well as the ability to integrate knowledge across disciplines. Project tasks extend beyond the scope of individual academic disciplines, encompassing the natural sciences, humanities and technical fields in their interrelationship (Fig. 1). This facilitates an understanding of environmental issues as complex, cross-disciplinary and systemic, combining the natural and social aspects of development.

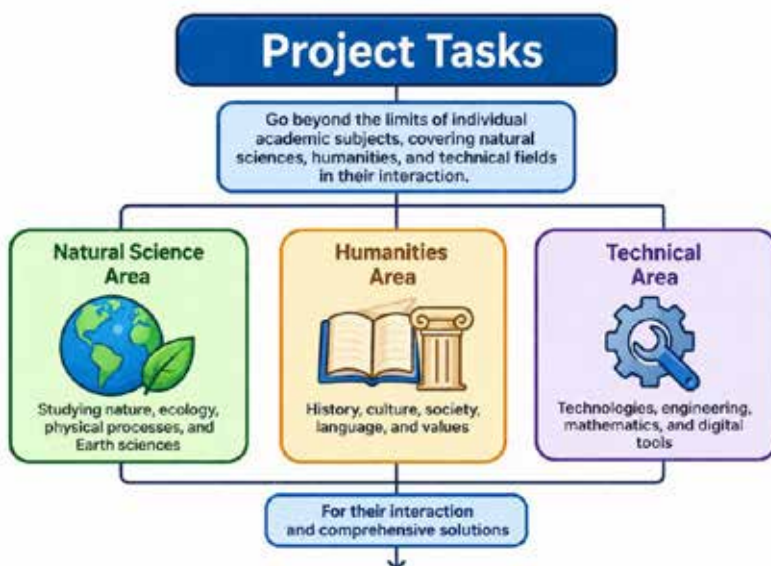


Fig. 1. The Interdisciplinary Nature of Project-Based Tasks

An important characteristic of the project-based approach is its situational nature. It encourages pupils to independently identify contradictions in real-life contexts, formulate problems and seek ways to solve them. Unlike abstract, model-based learning, project-based activities involve decision-making in specific, practically significant environmental situations, which enhances learners' awareness, sense of responsibility and social engagement⁷.

⁷ Титаренко В., Ковальчук В. Освітні технології розвитку екологічного мислення учнів у контексті сталого розвитку суспільства. *Науковий альманах мистецтва та освіти*. 2026. № 1. С. 65–67.

The aim of modelling educational environmental scenarios that replicate real-life circumstances is to create conditions for pupils to gain practical experience of action within a safe educational environment, one that allows for the possibility of making mistakes, recognising them and correcting them. This approach facilitates the development of behavioural strategies and value orientations without the risk of negative social or environmental consequences, which is of fundamental importance for the formation of an environmentally responsible individual.

The implementation of educational environmental scenarios contributes to the accumulation of multidimensional personal experience, in particular:

- experience of active agency, manifested in initiative, independence and the ability to apply general educational, communicative and socio-practical methods of action to solve specific real-life problems;
- experience of value-based self-determination, which encompasses the formation of one's own position, a reflective attitude towards alternative models of behaviour, and the making of moral choices;
- experience of motivational and volitional effort aimed at achieving a set goal whilst overcoming difficulties;
- experience of cooperation and tolerant interaction, which fosters the development of communicative skills and social responsibility;
- experience of organising activities – both individual and group-based – taking into account the principles of planning, the allocation of roles and the coordination of actions;
- experience of self-assessment and reflection on one's own behaviour (in particular, consumption patterns and lifestyle) in accordance with the legal and moral norms of society;
- experience in applying general scientific and communication skills within the framework of environmentally-oriented social practice, taking into account specific ethno-cultural conditions⁸.

Real-life environmental situations that appeal to pupils' immediate needs and interests serve a motivational function, stimulating cognitive activity. The cognitive interest thus formed is transformed into an intrinsic motivation for practical environmental action within one's capabilities – from recognising the problem and setting goals to carrying out specific actions in the environment, with mandatory reflection on each stage of the activity.

⁸ Djordjevic I., Jovanovic S., Markovic M., Andjelkovic S., Prnjat Z., Matović S., Valjarević A. Project-Based Learning in Geography and Its Impact on Developing Students' Values, Attitudes and Pro-Environmental Behavior. *Sustainability*. 2026. Vol. 18 (2). P. 725.

Educational environmental project work involves engaging pupils in a process of transformative activity, which should culminate in the practical implementation of the project⁹. In this context, one of the key criteria for assessing outcomes is the project's environmental and human health safety. This approach is consistent with the principles of sustainable development and encourages pupils to make responsible decisions.

The traditional focus of environmental project work is an environmental problem, which is interpreted as a conflict between society's growing needs and the limited resources and regenerative capacity of the natural environment. This contradiction is exacerbated by anthropogenic landscape transformation, urbanisation, and the reduced capacity of natural ecosystems to perform their environmental functions.

When implementing project-based activities within the school geography curriculum, it is advisable to organise the analysis of environmental issues along several methodological dimensions: by level of manifestation (global, regional, local); within the framework of a cultural-historical approach; drawing on pupils' personal experiences and their potential practical significance; and taking into account the positions of various stakeholders, which helps to develop the ability to step back from one's own point of view and analyse the problem from different perspectives¹⁰.

The outcomes of environmental projects must be socially and practically significant. In the case of theoretical issues, this involves formulating a specific, scientifically sound conclusion or proposal for resolving the issue; in the case of practical projects, it involves creating a product ready for implementation.

Such outcomes may include, in particular, maps illustrating the environmental status of an area, illustrated collections of descriptions of natural features, photo albums, posters, presentations, thematic mini-guides or other informational and analytical materials of practical value to the local community (Table 1).

The use of digital technologies in environmental geography projects is an important factor in improving the quality of education, developing students' research skills, and fostering environmental awareness. Digital tools enable the integration of theoretical knowledge with practical activities, provide access to up-to-date information, and promote the development of critical thinking, analytical skills, and information literacy.

⁹ Гришко С. В., Левада О. М., Прохорова Л. А., Непша О. В., Зав'ялова Т. В., Коваль Д. О. Еколого-проектна діяльність як засіб формування екологічної компетентності учнів у процесі вивчення географії з використанням цифрових технологій. *Наука і техніка сьогодні*. 2026. № 4 (58). С. 1200–1214.

¹⁰ Ковальова К. І., Нападовська Г. Ю. Метод проектів як засіб модернізації навчально-виховного процесу з географії. *Науковий вісник Херсонського державного університету. Серія: Географічні науки*. 2015. № 2. С. 113–118.

Table 1

**Typology of environmental educational projects
in the school geography curriculum**

Parameter	Category	Characteristics	Examples for the School Geography Course
Number of Participants	Individual	The project is completed by one student, fostering independence and personal responsibility	Climate zone map, essay on environmental problems of the local region
	Group	The project is completed by a team of students, requiring cooperation and role distribution	Investigation of water pollution, integrated report on natural resources
Type of Student Activity	Group	The project is completed by a team of students, requiring cooperation and role distribution	Investigation of water pollution, integrated report on natural resources
	Creative	The project content depends on students' interests and creativity	Illustrated glossary of geographical terms, presentation "Landscapes of Ukraine"
	Role-playing (Simulation)	Students perform different tasks within the same topic and combine their results into a common product	Booklet «Climate Zones of the World», conference lesson "Urban Ecology"
	Research	Includes all stages of scientific research	Report "The Impact of Urbanization on Natural Complexes", poster "National Parks of Ukraine"
	Informational	Collection, analysis, and systematization of information without conducting experiments	Booklet "Natural Resources of the Region", presentation on climate anomalies
	Practice-oriented	Has a clear structure and assigned roles; produces socially or practically valuable outcomes	Wall newspaper, posters, exhibition of environmental projects
Duration	Mini-project	Completed within a single lesson	Short map of forest distribution, mini-report on rivers of the region
	Short-term	Completed outside class within the study of a particular topic	Booklet on the natural resources of the district or region
	Long-term	Conducted over a school year or longer	Water quality monitoring, climate change research project
Coordination	Hidden Coordination	The teacher actively participates in the implementation of the project	Collecting data for the poster "Protected Areas of Ukraine"
	Open Coordination	The teacher coordinates, supervises, and provides guidance while students work independently	Students independently conduct research and receive teacher consultations when necessary
Project Function	Educational	Aimed at developing students' competencies over an extended period	Report on climate zones, weather observation diary
	Assessment	Intended to evaluate students' knowledge, skills, and learning outcomes	Assessment of project presentations, posters, exhibitions, and project reports

The organization of environmental projects should be based on a comprehensive approach that integrates natural, socio-economic, and spatial dimensions of research. Digital technologies significantly expand the possibilities for such analyses. For example, students can create interactive maps using Google Earth to monitor changes in forested areas or water pollution within their region, combining geographical information with environmental indicators¹¹.

The practical orientation of environmental projects is achieved through the application of knowledge to real-life situations. Digital technologies make these activities more accurate, interactive, and visually engaging. For instance, students can use mobile applications to record environmental observations, document cases of river pollution, analyze traffic intensity, or measure air quality indicators.

A value-oriented approach aims to develop responsible attitudes toward nature and readiness to participate in environmental protection activities. Digital environments create opportunities for students' civic engagement by enabling them to develop online petitions or conduct awareness campaigns through social media to promote the conservation of local natural resources. Such activities effectively combine educational objectives with social practice.

Another important feature is the situational nature of environmental projects, in which learning tasks simulate real-world interactions between humans and the environment. Using specialized simulation platforms such as EcoChains or SimCity Education, students can model the consequences of deforestation, urbanization, or climate change, analyze potential environmental risks, and predict the outcomes of various management decisions.

The implementation of environmental projects involves several successive stages. During the stage of problem identification and goal setting, it is advisable to use open-access data provided by local authorities or environmental agencies. For example, students may identify environmental «hotspots» within their community and integrate these data into ArcGIS Online, thereby defining a clear research objective.

During the planning and simulation stage, it is essential to create a safe learning environment that encourages experimentation and accepts mistakes as part of the learning process. Online environmental simulators allow students to model the effects of water or soil pollution without causing actual environmental damage, thereby promoting analytical thinking and problem-solving skills.

¹¹ Гришко С. В., Непша О. В. Теоретико-методичні засади використання інформаційних технологій в освітньому процесі та їх практичне застосування на уроках географії. *Актуальні питання у сучасній науці*. 2025. № 4 (34). С. 1015–1028.

The implementation and analysis stage actively engages students in data collection and processing. The use of sensors and digital measuring devices to assess air quality, water temperature, or noise levels, followed by data processing in Google Sheets or Microsoft Excel, develops students' competencies in data management, graphical representation, and statistical analysis.

The final stage involves reflection and presentation of research findings. Students may present their results through interactive presentations created in Canva, Genially, or Microsoft Power BI, as well as digital maps, photo albums, or educational booklets. Such formats contribute to the development of communication skills and the ability to effectively present research outcomes.

Environmental projects may differ in terms of their typology and implementation formats. They can be individual or group-based; creative, role-playing, research, informational, or practice-oriented; short-term or long-term; and implemented with either open or hidden teacher coordination. For example, a month-long group research project may involve collecting air quality data using mobile sensors and developing an analytical dashboard in Google Data Studio to visualize and interpret the results.

From a methodological perspective, it is advisable to employ authentic, real-life situations that correspond to students' interests and experiences. For instance, observing local flora and fauna through applications such as iNaturalist or eBird enables students to combine field investigations with the digital documentation of research findings. It is equally important to encourage students' independence and initiative, organize collaborative teamwork with clearly assigned roles, incorporate reflective activities, and ensure the technological safety of all learning processes.

The integration of interactive and multimedia resources, including interactive maps, video reports, virtual field trips, and virtual reality (VR) environments, enhances the visualization of geographical phenomena and increases students' motivation to learn. Furthermore, the implementation of an interdisciplinary approach enables geography to be effectively integrated with mathematics and computer science through the analysis of environmental statistics, the construction of charts and graphs, and the development of infographics.

Thus, school geography serves as an effective platform for implementing environmental project-based learning, providing students with opportunities to participate directly in practical and research-oriented activities related to the study of the natural environment and its interaction with society. The application of such approaches contributes not only to the acquisition of environmental knowledge but also to the development of students' value-based attitudes toward environmental protection, ecological awareness, and responsible behavior in everyday life. Environmental project-based learning enables students to acquire

practical experience in planning, analysis, collaboration, and decision-making, thereby enhancing their ability to evaluate the consequences of human activities for the environment and to participate actively in its conservation¹².

The integration of digital technologies into environmental geography projects not only improves the effectiveness of the educational process but also contributes to the development of environmental culture, digital literacy, and active citizenship among students.

Therefore, the integration of environmental project-based methods into geography education constitutes an essential component of contemporary environmental education aimed at fostering environmentally responsible, active, and conscious attitudes toward the natural environment among younger generations. This approach equips students with the competencies required to address current environmental challenges while promoting sustainable development principles and lifelong environmental responsibility.

2. Methodological Support for Environmental Project-Based Learning in the School Geography Curriculum Using Digital Technologies

Methodological Principles for Organizing Students' Environmental Project-Based Learning in Geography Education

1. General Principles for Organizing Environmental Projects:

1. Comprehensive approach – integrate natural science, socio-economic, and spatial aspects when studying environmental issues. For example: creating interactive maps in Google Earth to monitor changes in forest areas or water pollution in your region.

2. Practical orientation – provide students with opportunities to apply their knowledge in real environmental situations. For example: using mobile applications to record environmental observations, such as documenting river pollution, monitoring traffic intensity, or measuring air quality.

3. Value-oriented approach – foster students' responsible attitudes toward nature and their readiness to participate actively in environmental protection activities. For example: creating online petitions or interactive social media campaigns aimed at conserving local natural resources.

4. Situational nature of the project – use tasks that reproduce real-life situations and problems related to the interaction between humans and the environment. For example: modeling the consequences of deforestation or

¹² Hryshko S. V., Levada O. M., Nepsha O. V., Koval D. O. Theoretical and methodological foundations for organising students' environmental project activities in school geography courses using distance learning and learning management systems. *Cross-disciplinary studies in science, innovation and social development*. Vol. 7. Monograph. Prague : Publishing house Education and Science s.r.o., 2026. P. 85–95.

climate change using specialized simulators (e.g., EcoChains or SimCity Education).

2. Stages of Organizing Environmental Educational Projects:

1. Problem identification and project goal setting – select local, regional, or global environmental problems; formulate clear objectives that correspond to educational and practical goals. For example: identifying environmental “hotspots” in your city using open data provided by local authorities and integrating them into a map in ArcGIS Online.

2. Planning and situation modeling – create a safe educational environment for practical activities; allow opportunities for making mistakes and correcting actions. For example: using online environmental process simulators to model the consequences of human activities (e.g., water or soil pollution).

3. Implementation and analysis – engage students in problem-solving, observations, research, and environmental risk assessment. For example: using sensors and digital measuring devices to monitor air quality, water temperature, or noise levels, followed by data analysis in Google Sheets or Microsoft Excel.

4. Reflection and presentation of results – organize discussions, analyze completed work, and present the results in the form of thematic maps, photo albums, educational booklets, or interactive materials. For example: creating interactive presentations in Canva, Genially, or Microsoft Power BI to visualize the results of environmental research.

3. Typology and Forms of Projects:

- by the number of participants: individual, group;
- by the type of activity: creative, role-playing, research, informational, practice-oriented;
- by duration: mini-projects (within one lesson), short-term (extracurricular), long-term (throughout the academic year);
- by coordination: with open or hidden teacher participation;
- by methods of data collection: verbal, observational, statistical, experimental;
- by function: educational and assessment-oriented.

For example: a month-long group research project in which students collect air quality data using mobile sensors and create a dashboard in Google Data Studio.

4. Methodological Recommendations:

1. Use authentic, real-life situations that appeal to students’ interests in order to foster intrinsic motivation for environmental activities. For example: observing flora and fauna using the iNaturalist or eBird applications.

2. Encourage students’ independence and initiative by promoting inquiry-based and critical thinking.

3. Organize collaboration and teamwork by assigning specific roles and responsibilities within group projects.

4. Include a reflective component in which students evaluate their own actions and their impact on the environment.

5. Ensure the technological safety of projects for students' health and the surrounding environment.

6. Incorporate a variety of interactive and multimedia resources (maps, videos, presentations) to improve visualization and increase student engagement. For example: interactive maps, video reports, virtual field trips, or virtual reality (VR) environments for studying ecosystems.

7. Integrate an interdisciplinary approach by combining knowledge from natural sciences, humanities, and technical disciplines. Combine geography with mathematics and computer science when analyzing environmental pollution statistics and creating infographics.

Practicum of Environmental Educational Projects Using Digital Technologies

Project 1. "Interesting Facts about the Oceans and Their Protection".

Project Objectives:

- to familiarize students with the main characteristics and interesting facts about the oceans;

- to enhance students' environmental awareness by demonstrating the impact of human activities on ocean ecosystems;

- to develop students' skills in information search, critical analysis, and selection of key data;

- to foster teamwork, presentation skills, and a creative approach to learning.

Stages of the Project:

1. Topic Selection and Group Formation.

Students, together with the teacher, selected the project topic «Interesting Facts about the Oceans and Their Protection».

Groups:

Group I – Young Explorers of the Pacific Ocean

Group II – Atlantic Ocean Research Group

Group III – Indian Ocean Scientists

Group IV – Arctic Ocean Explorers

Information Search and Collection: Students use Internet resources, electronic encyclopedias, and scientific articles to collect interesting and important information about the selected ocean.

2. Additional Activities.

Collecting information on environmental problems affecting the oceans, such as plastic pollution, climate change, coral reef degradation, and species extinction.

Analyzing and processing the collected data by identifying the main facts and unique characteristics of each ocean.

Identifying environmental threats and their consequences for marine flora and fauna.

Discussing possible actions to preserve ecological balance, such as reducing plastic consumption and supporting marine wildlife conservation programs.

3. Creation of Visual Materials.

Designing a poster using Canva, Microsoft PowerPoint, or hand-drawn illustrations.

Organizing the information into the following sections: “Interesting Facts”, “Environmental Problems” and “How We Can Help” (Fig. 2).

Using color schemes, ocean images, ecosystem diagrams, and infographics illustrating environmental threats.

4. Presentation of Results.

Presenting posters either in the classroom or via the Zoom platform.

Each group presents its work, explains the selected information, discusses environmental conclusions, and proposes possible solutions.

Conducting a discussion of the presentations, providing comments, and carrying out peer assessment.

Project Outcomes:

- students reinforced their knowledge of the geographical and natural characteristics of the oceans;
- students recognized the importance of ocean conservation and understood the impact of human activities on marine ecosystems;
- students developed skills in searching for, analyzing, and organizing information;
- students learned to work collaboratively, plan group activities, and present project results;
- students’ motivation for independent learning and creative engagement with educational content increased.

Reflection:

- students discuss what new knowledge they have gained about the oceans and their environmental problems;
- students analyze their own contribution to group work, evaluate how effectively they collaborated, identified key information, and distributed responsibilities;
- students reflect on the actions they can personally take to contribute to ocean conservation in their everyday lives;
- students express their opinions on how digital technologies facilitate environmental research and promote public awareness of ecological issues.



Fig. 2. Example of a Poster as a Guideline for Students

Project 2. “Environmentally Safe Production”.

Aims of the project:

- to familiarise pupils with the characteristics of production processes and their impact on the environment;
- to develop skills in analysing pollution chains and identifying alternative, environmentally safe solutions for businesses;
- to foster an understanding of the importance of environmental safety and a responsible approach to manufacturing activities.

Stages of the project:

1. Identifying the problem: discussing environmental issues arising from manufacturing processes; pupils select a specific enterprise or type of manufacturing activity to investigate.

2. Research and data collection: studying the enterprise’s technological processes and analysing sources of pollution; collecting data through observation, interviews with staff, official sources and statistics.

3. Analysis and discussion: identifying key stages of the production process that require improvement; discussing possible environmentally safe alternative solutions and technologies.

4. Developing solutions: formulating proposals to reduce the negative impact on the environment; identifying practical measures: using safe materials, optimising waste management, and recycling or reprocessing waste.

5. Practical implementation and modelling: pupils create information material, a poster or a presentation illustrating the proposed measures; possible modelling of changes to the production process to demonstrate the results.

6. Presentation of results: preparing a report, presentation or booklet using Canva or PowerPoint to present to the class or the school community; discussing the effectiveness of the proposed solutions and practical measures.

Summary and assessment:

- pupils receive feedback from the teacher on the quality of their analysis and the creativity of the proposed solutions;
- emphasis is placed on understanding the pollution cycle and the need for environmental safety in manufacturing;
- knowledge, analytical skills, the ability to propose practical solutions and the ability to present results are assessed.

Reflection: pupils discuss what went well, what difficulties arose and how environmental approaches in manufacturing can be improved.

Project 3. “Peaceful Coexistence on the Planet”.

Aims of the project:

- to foster an awareness among schoolchildren of the global interdependence of people and natural systems;

- to develop skills for assessing the impact of various social and economic factors on the environment;
- to raise environmental awareness and encourage peaceful and sustainable practices in everyday life.

Stages of the project:

1. Introduction to the concept of peaceful coexistence between people and nature.
2. Exploring global environmental issues through examples of international initiatives.
3. Identifying practical local solutions to reduce humanity's negative impact on the environment.
4. Developing their own proposals for improving the state of the environment.
5. Presenting the results in the form of posters, short presentations or interactive presentations using Canva or PowerPoint.

Outcomes:

- pupils demonstrate an understanding of global environmental processes and their own role in managing them;
- skills in analysing, finding solutions and presenting environmental initiatives are developed.

Reflection: pupils discuss what new insights they have gained into the interdependence of people and nature, what practical actions they can take in their own lives to improve the state of the environment, and assess their own contribution to the group work.

Project 4. “National Health and Social Development”.

Project objectives:

- to demonstrate the interconnection between the environment, public health and social development;
- to foster the development of skills in researching and analysing environmental and social indicators;
- to instil in school pupils an active civic stance in support of an environmentally sustainable lifestyle.

Stages of work:

1. Analysis of public health issues and the impact of the environment on public health.
2. Gathering information on the state of the environment and social indicators in the region.
3. Discussion of possible ways to improve public health and the environmental situation.
4. Development of practical recommendations for the local community.
5. Presentation of findings via posters, leaflets or online presentations using Canva or PowerPoint.

Outcomes:

- pupils recognise the interconnection between the state of the environment and human health;
- analytical skills are developed, along with the ability to propose practical solutions to improve the environment and social development.

Reflection: pupils assess which environmental factors have the greatest impact on human health, how their analysis has helped identify ways to improve the local environmental situation, and discuss what actions they are prepared to take in their daily lives.

Project 5. “Appeal to the United Nations”.

Project Objectives:

- to familiarize students with international environmental initiatives and the role of the United Nations in their implementation;
- to develop students’ skills in preparing appeals, reports, and proposals addressing environmental issues;
- to foster critical and systems thinking in the context of global environmental challenges.

Project Stages:

1. Study the structure and functions of the United Nations in the field of environmental protection.
2. Analyze global environmental issues that require international attention.
3. Develop an appeal or formulate proposals for addressing a specific environmental problem.
4. Prepare a written document, presentation, or multimedia project using Canva or Microsoft PowerPoint.
5. Present the project outcomes to the class, the school community, or in an online format.

Project Outcomes:

- students gain practical experience in participating in international initiatives;
- students develop skills in systems analysis, evidence-based presentation, and a responsible approach to addressing global environmental challenges.

Reflection: Students reflect on the extent to which global environmental issues affect local communities, consider what actions they can take to support international environmental initiatives, and evaluate the new knowledge and skills they have acquired throughout the project.

Project 6. “The Rate and Consequences of Large-Scale Anthropogenic Transformation of the Coastal Landscape of the United Arab Emirates (A Case Study of Dubai)”.

Project Task: Using Google Maps, Google Earth, and satellite imagery (Fig. 3), investigate how Dubai has created a new geography of its coastline and analyze the causes and consequences of this transformation.

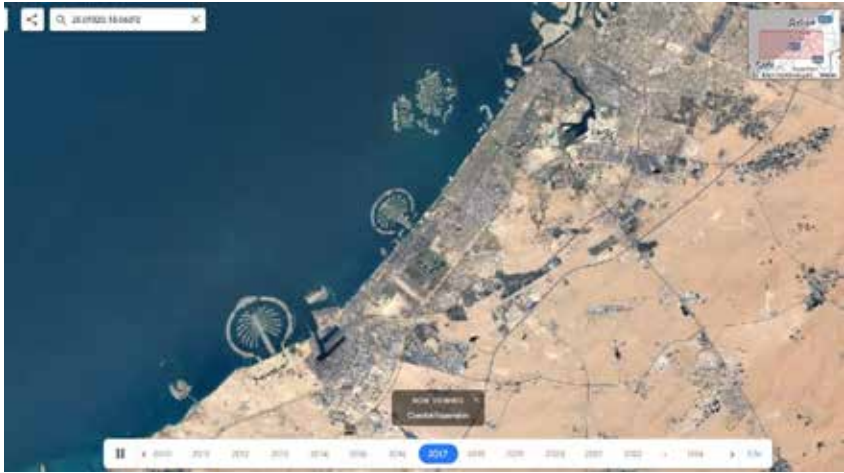


Fig. 3. Visualization of the Study Area – Dubai, United Arab Emirates¹³

Project Stages:

Stage 1. Visualization and Quantitative Assessment

1. Locate the coastline of Dubai in Google Maps (approximate coordinates: 25.09319, 55.06372). Identify and name the major artificial archipelagos visible in the satellite image (e.g., Palm Jumeirah and The World Islands).
2. Use the “Measure Distance” tool in Google Maps or Google Earth to:
 - estimate the length of the artificially constructed trunk of Palm Jumeirah;
 - determine how far the outermost islands of The World archipelago are located from the original coastline.
3. Using Google Earth Timelapse, compare satellite images of Dubai from 2001 and the current year. Determine how long it took to construct Palm Jumeirah.

Stage 2. Socio-Economic Aspect of the Study.

1. Investigate why the United Arab Emirates invested billions of dollars in land reclamation instead of expanding the city further into the desert. What objectives were achieved through this project (e.g., tourism development, real estate expansion, or the establishment of a global financial hub)?
2. Analyze how the construction of these artificial islands affected one of the most important geographical indicators – the length of the UAE coastline. To what extent did the artificial islands increase the country’s total coastline?

¹³ Watch Dubai evolve from desert to cosmopolitan in 32 years. URL: https://www.khaleejtimes.com/uae/watch-dubai-evolve-from-desert-to-cosmopolitan-in-32-years?utm_source=chatgpt.com.

3. Determine which natural resources were used to construct these islands (e.g., the type of material and the origin of the sand) and identify the methods used to transport these materials.

Stage 3. Environmental Aspect of the Study.

1. Investigate how sand reclamation and the alteration of the coastline have affected the ecology of the Arabian Gulf. Which environmental components have been most significantly influenced by changes in marine currents (e.g., coral reef degradation or water stagnation)?

2. Considering that the artificial islands are low-lying coastal structures, formulate a hypothesis explaining how a global sea-level rise of even 1–2 meters could threaten these large-scale investment projects in the future.

3. Find information on how Palm Jumeirah is protected against coastal erosion and severe storms (e.g., through the construction of breakwaters).

Research Outcome: Prepare an analytical map or a concise report containing screenshots from Google Maps and conclusions explaining how Dubai's economic ambitions have transformed its geography while creating new environmental and engineering challenges.

Project Outcomes:

- students gained practical experience in using digital mapping services (Google Maps and Google Earth) to investigate anthropogenic changes in coastal landscapes;

- students understood how large-scale engineering and economic projects can transform urban geography by creating artificial archipelagos and extending the coastline;

- students analyzed the socio-economic motivations behind the construction of artificial islands, including the development of tourism, real estate, and the financial sector;

- students evaluated the environmental consequences of coastal transformation, particularly its effects on marine currents, coral reefs, and the risks associated with global sea-level rise;

- students developed the ability to formulate analytical conclusions and prepare visual reports using maps, satellite imagery, and screenshots.

Reflection:

- students discuss what surprised them most about the pace of anthropogenic transformation of the coastal landscape and the scale of these changes;

- students evaluate how economic ambitions influence the natural environment and explain why environmental risks should be considered when planning large-scale development projects;

- students reflect on which lessons from this case study can be applied to local environmental issues and identify preventive measures that could reduce the negative impacts of similar engineering interventions;

– students analyze their own actions by considering how they can contribute to sustainable development and environmental protection in their daily lives and educational environment.

CONCLUSIONS

As a result of the theoretical analysis of the problem of organizing environmental project-based learning in the school geography curriculum, it was established that school geography possesses considerable integrative potential for implementing the objectives of environmental education, as it combines natural, socio-economic, and spatial dimensions of environmental studies. Geography provides a systematic understanding of the relationships within the «nature–society» system, promotes the development of spatial thinking, and fosters students' ability to analyze environmental processes, assess environmental risks, and predict the consequences of human economic activities.

It has been substantiated that project-based learning is an effective pedagogical tool for developing students' environmental competence. Its main advantage lies in integrating the cognitive, value-based, motivational, and practical components of the educational process. The project-based approach ensures the integrity of learning, from problem identification to the analysis of results and reflection, while encouraging students to solve authentic environmental problems.

It has been established that the situational nature of environmental project-based learning creates favorable conditions for students to acquire practical experience in decision-making within a safe educational environment. Modeling real-life environmental situations contributes to the development of students' agency, value-based self-determination, motivational and volitional qualities, communication skills, and self-assessment abilities.

It has been determined that environmental issues constitute the central conceptual core of environmental project-based learning. Their analysis should take into account different levels of manifestation (global, regional, and local), the cultural and historical context, the perspectives of various stakeholders, and students' personal experiences. Such an approach promotes the development of systems thinking, critical thinking, and multi-perspective analysis.

The typology of environmental educational projects has been generalized according to the number of participants, the type of activity, project duration, the nature of teacher coordination, and their functional purpose. This classification makes it possible to adapt instructional formats to educational objectives, students' age characteristics, and the content of the geography curriculum.

Particular emphasis has been placed on the role of digital technologies as an important factor in the modernization of environmental project-based learning. Their application expands opportunities for data collection, analysis, and visualization, enhances the clarity and accessibility of research findings, and contributes to the development of digital literacy and interdisciplinary integration. The use of digital tools effectively combines theoretical instruction with practical activities, thereby meeting the requirements of contemporary education and the principles of sustainable development.

Thus, the theoretical and methodological foundations for organizing environmental project-based learning in the school geography curriculum are based on the principles of interdisciplinarity, competency-based education, situational learning, and the practical relevance of the educational process.

SUMMARY

This chapter examines the theoretical and methodological foundations of organizing environmental project-based learning in the school geography curriculum under the conditions of educational digitalization. The role of project-based learning as an effective means of developing students' environmental competence, research skills, and digital literacy is substantiated. The principles, stages of implementation, typology, and methodological features of environmental educational projects using modern digital technologies are identified. A set of practical environmental project tasks based on the use of Google Earth, Google Maps, ArcGIS Online, Canva, and other digital tools is proposed to support the study of natural and socio-economic processes. The findings demonstrate that the integration of digital resources enhances the visualization of learning, promotes critical thinking, spatial analysis, geospatial data processing skills, and interdisciplinary integration. It is established that environmental project-based learning facilitates the practical application of geographical knowledge, fosters environmental awareness, encourages responsible attitudes toward the environment, and prepares students to address contemporary environmental challenges. The results of the study can be applied by geography teachers and general secondary education institutions to improve geography teaching methodologies through the effective use of digital technologies.

Bibliography

1. Hryshko S. V., Levada O. M., Nepsha O. V., Koval D. O. Digital tools in teaching geography: the possibilities of Google Maps and Google Earth. *Cross-disciplinary studies in science, innovation and social development*. Vol. 3. Monograph. Prague: Publishing house Education and Science s.r.o., 2026. P. 382–392. <https://doi.org/10.65237/3-2026-25>.

2. Толочко С. В., Бордюг Н. С. Особливості інтеграції цифрового контенту в освітній процес із формування екологічного світогляду учнівської молоді. *Інноваційна педагогіка*. 2026. Вип. 95. Т. 2. С. 62–66. <https://doi.org/10.32782/ip/93.2.11>.

3. Мовчан В. В., Корнус О. Г., Корнус А. О. Екологічна освіта і виховання у шкільному курсі географії. *Наукові записки СумДПУ імені А. С. Макаренка. Географічні науки*. 2017. № 8. С. 191–195.

4. Левада О. М., Гришко С. В., Непша О. В. Роль шкільного курсу географії у формуванні екологічної культури учнів. *Наука і техніка сьогодні. Серія «Педагогіка», Серія «Право», Серія «Економіка», Серія «Фізико-математичні науки», Серія «Техніка»: журнал*. 2025. № 3 (44). С. 566–582. [https://doi.org/10.52058/2786-6025-2025-3\(44\)-566-582](https://doi.org/10.52058/2786-6025-2025-3(44)-566-582).

5. Войтович О. П., Костолович М. І. Методика впровадження проєктів у шкільний курс географії. *Географічна освіта у шкільних та позашкільних закладах: проблеми, пошуки, перспективи* : збірник наукових праць. Рівне : Видавець О. Зень, 2020. С. 3–5.

6. Толочко С. В., Бордюг Н. С. Екологічна компетентність учнів у контексті подолання екологічних наслідків війни : монографія. Київ : Компрінт, 2024. 160 с.

7. Титаренко В., Ковальчук В. Освітні технології розвитку екологічного мислення учнів у контексті сталого розвитку суспільства. *Науковий альманах мистецтва та освіти*. 2026. № 1. С. 65–67. <https://doi.org/10.31652/3041-1017-SAAE-2025.1.19>.

8. Djordjevic I., Jovanovic S., Markovic M., Andjelkovic S., Prnjat Z., Matović S., Valjarević A. Project-Based Learning in Geography and Its Impact on Developing Students' Values, Attitudes and Pro-Environmental Behavior. *Sustainability*. 2026. Vol. 18 (2). P. 725. <https://doi.org/10.3390/su18020725>.

9. Гришко С. В., Левада О. М., Прохорова Л. А., Непша О. В., Зав'ялова Т. В., Коваль Д. О. Еколого-проєктна діяльність як засіб формування екологічної компетентності учнів у процесі вивчення географії з використанням цифрових технологій. *Наука і техніка сьогодні. Серія «Педагогіка», Серія «Право», Серія «Економіка», Серія «Фізико-математичні науки», Серія «Техніка»: журнал*. 2026. № 4 (58). С. 1200–1214. [https://doi.org/10.52058/2786-6025-2026-4\(58\)-1200-1214](https://doi.org/10.52058/2786-6025-2026-4(58)-1200-1214).

10. Ковальова К. І., Нападовська Г. Ю. Метод проєктів як засіб модернізації навчально-виховного процесу з географії. *Науковий вісник Херсонського державного університету. Серія : Географічні науки*. 2015. № 2. С. 113–118.

11. Гришко С. В., Непша О. В. Теоретико-методичні засади використання інформаційних технологій в освітньому процесі та

їх практичне застосування на уроках географії. *Актуальні питання у сучасній науці. Серія «Педагогіка», Серія «Право», Серія Економіка», Серія «Державне управління», Серія «Техніка», Серія «Історія та археологія»»: журнал.* 2025. № 4 (34). С. 1015–1028. [https://doi.org/10.52058/2786-6300-2025-4\(34\)-1015-1028](https://doi.org/10.52058/2786-6300-2025-4(34)-1015-1028).

12. Hryshko S. V., Levada O. M., Nepsha O. V., Koval D. O. Theoretical and methodological foundations for organising students' environmental project activities in school geography courses using distance learning and learning management systems. *Cross-disciplinary studies in science, innovation and social development*. Vol. 7. Monograph. Prague : Publishing house Education and Science s.r.o., 2026. P. 85–95. <https://doi.org/10.65237/7-2026-3>.

13. Watch Dubai evolve from desert to cosmopolitan in 32 years. URL: https://www.khaleejtimes.com/uae/watch-dubai-evolve-from-desert-to-cosmopolitan-in-32-years?utm_source=chatgpt.com (дата звернення: 11.07.2026).

Information about the authors:

Nepsha Oleksandr,

Senior Lecturer at the Department of Geography and Tourism
Bogdan Khmelnytsky Melitopol State Pedagogical University
59, Naukovoho mistechka Street, Zaporizhia, Ukraine

Hryshko Svitlana,

Candidate of Geographical Sciences, Associate Professor,
Head of the Department of Geography and Tourism
Bogdan Khmelnytsky Melitopol State Pedagogical University
59, Naukovoho mistechka Street, Zaporizhia, Ukraine

Levada Olga,

Candidate of Geographical Sciences,
Associate Professor at the Department of Geography and Tourism
Bogdan Khmelnytsky Melitopol State Pedagogical University
59, Naukovoho mistechka Street, Zaporizhia, Ukraine