

6 Ning Y., Zhou Y., Wijaya T. T., Chen J. Teacher education interventions on teacher TPACK: A meta-analysis study. *Sustainability*, 2022, vol. 14, no. 18, art.11791. <https://doi.org/10.3390/su141811791>.

7 Masterson J.E., Carr C. J., Petty E., Stevenson H., Yaromich A. Learning to teach in the 2020s: four teacher candidates' experiences amid challenging times. *Teaching and Teacher Education*, 2024, vol. 151, art.104733. <https://doi.org/10.1016/j.tate.2024.104733>.

8 Cuahdar C. Investigation of pre-service teachers' levels of readiness to technology integration in education. *Contemporary Educational Technology*, 2018, vol. 9, no. 1, pp. 61-75. <https://doi.org/10.30935/cedtech/6211>.

9 Janssen N., Lazonder A. W. Supporting pre-service teachers in designing technology-infused lesson plans. *Journal of computer assisted learning*, 2016, vol. 32, no. 5, pp. 456-467. <https://doi.org/10.1111/jcal.12146>.

10 Lee Y., Lee J. Enhancing pre-service teachers' self-efficacy beliefs for technology integration through lesson planning practice. *Computers & education*, 2014, vol. 73, pp. 121-128. <https://doi.org/10.1016/j.compedu.2014.01.001>.

11 Kontkanen S., Dillon P., Valtonen T., Renkola S., Vesisenaho M., & Väisänen P. Pre-service teachers' experiences of ICT in daily life and in educational contexts and their proto-technological pedagogical knowledge. *Education and Information technologies*, 2016, vol. 21, no. 4, pp. 919-943. <https://doi.org/10.1007/s10639-014-9361-5>.

12 Chai C.S., Koh J.H.L., Tsai C.C. A review of technological pedagogical content knowledge. *Journal of Educational Technology & Society*, 2013, vol. 16, no. 2, pp. 31-51. Available at: https://www.researchgate.net/publication/290044779_A_Review_of_Technological_Pedagogical_Content_Knowledge (accessed 17 December 2025).

Received: 03 May 2026. **Accepted:** 05 June 2026. **Published:** 30 September 2026.

Information about the authors:

Zhanatbekova Nazym Zhanatbekkyzy – Candidate of Pedagogical Sciences, Associate Professor, I. Zhansugurov Zhetysu University, Republic of Kazakhstan, 040009, Taldykorgan, 187A Zhansugurov Str., tel.: +77756026876, e-mail: n.zhanatbekova@mail.ru.

Abdulaeva Aigerim Bekmukhanbetkyzy* – PhD, Lecturer, Department of physics and mathematics, I. Zhansugurov Zhetysu University, Republic of Kazakhstan, 040009, Taldykorgan, 187A Zhansugurov Str., tel.: +77717468653, e-mail: abdulaeva_aigerim@mail.ru.

Жанатбекова Назым Жанатбекқызы – п.ғ.к., қауымдастырылған профессор (доцент), І. Жансүгіров атындағы Жетісу университеті, Қазақстан Республикасы, 040009, Талдықорған қ., І. Жансүгіров көш., 187А, тел.: +77756026876, e-mail: n.zhanatbekova@mail.ru.

Абдулаева Әйгерім Бекмұханбетқызы* – PhD, физика-математика кафедрасының оқытушы-дәріскері, І. Жансүгіров атындағы Жетісу университеті, Қазақстан Республикасы, 040009, Талдықорған қ., І. Жансүгіров көш., 187А, тел.: +77717468653, e-mail: abdulaeva_aigerim@mail.ru.

Жанатбекова Назым Жанатбекқызы – к.п.н., ассоциированный профессор (доцент), Жетысуский университет имени И. Жансугурова, Республика Казахстан, 040009, г. Талдықорған, ул. Жансугурова, 187А, тел.: +77756026876, e-mail: n.zhanatbekova@mail.ru.

Абдулаева Айгерим Бекмұханбетқызы* – PhD, преподаватель-лектор кафедры физики-математики, Жетысуский университет имени И. Жансугурова, Республика Казахстан, 040009, г. Талдықорған, ул. Жансугурова, 187А, тел.: +77717468653, e-mail: abdulaeva_aigerim@mail.ru.

IRSTI 14.35.07

UDC 378.1

<https://doi.org/10.52269/SEPT2632076>

EXPLORING ENVIRONMENTAL EDUCATION AMONG UNIVERSITY STUDENTS IN KAZAKHSTAN AND TAJIKISTAN: FINDINGS FROM A PILOT STUDY

Zhubakova S.S.* – PhD, Associate Professor, Department of pedagogy, L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan.

Abdullozoda Z. – Master's degree, Department of Pedagogy, L.N. Gumilyov Eurasian National University, Astana, Republic of Kazakhstan.

The article examines university students' perceptions and experiences of environmental education in Kazakhstan and Tajikistan based on a pilot study. The relevance of the study is driven by global environmental

challenges and the need to develop environmental culture among young people in the context of current sustainable development goals. It aimed to examine students' understanding of environmental education, self-reported environmental practices, perceptions of its integration into university learning, and views on its development. An exploratory cross-sectional online survey was conducted among 37 students from two universities in Kazakhstan and Tajikistan. Data were collected using a structured questionnaire and analyzed through descriptive statistics and qualitative content analysis of open-ended responses. The results showed that 54.1% of respondents demonstrated a substantively accurate understanding of environmental education, while 37.8% provided a partial definition. Students' environmental engagement was mainly expressed through everyday practices, including waste reduction, use of reusable items, and conservation of natural resources, whereas participation in organized environmental activities was less frequent. Most students assessed the integration of environmental education into academic courses as moderate. Open-ended responses revealed a demand for stronger practice-oriented and project-based learning, greater use of digital technologies, interdisciplinary approaches, extracurricular environmental engagement, and a more sustainable university environment. Overall, students demonstrated a general understanding of environmental education and engaged in certain environmental practices, while environmental engagement and perceptions of its integration into education remained heterogeneous. Students' expectations highlight the importance of a more practice-oriented, project-based, digital, and interdisciplinary approach to environmental education.

Keywords: environmental education, environmental awareness, pilot study, environmental culture, sustainable development.

ҚАЗАҚСТАН МЕН ТӘЖІКСТАН СТУДЕНТТЕРІНІҢ ЭКОЛОГИЯЛЫҚ БІЛІМІН ЗЕРДЕЛЕУ: ПИЛОТТЫҚ ЗЕРТТЕУ НӘТИЖЕЛЕРІ

Жубакова С.С.* – педагогика ғылымдарының кандидаты, қауымдастырылған профессоры, педагогика кафедрасы, Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Астана қ., Қазақстан Республикасы.

Абдуллозада З. – магистр, педагогика кафедрасы, Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Астана қ., Қазақстан Республикасы.

Мақала Қазақстан мен Тәжікстан студенттерінің экологиялық білім беруді қабылдауы мен осы саладағы тәжірибесін пилоттық зерттеу нәтижелері негізінде зерделеуге арналған. Зерттеудің өзектілігі жаһандық экологиялық сын-қатерлермен және қазіргі тұрақты даму міндеттері жағдайында жастардың экологиялық мәдениетін қалыптастыру қажеттілігімен айқындалады. Зерттеудің мақсаты студенттердің экологиялық білім беру туралы түсінігін, экологиялық практикаларға өзіндік бағалау негізіндегі қатысуын, экологиялық білім берудің университеттегі оқу үдерісіне ықпалдауын қабылдауын және оның одан әрі дамуына қатысты пікірлерін зерделеу болды. Зерттеу Қазақстан мен Тәжікстанның екі жоғары оқу орнынан 37 студент арасында жүргізілген барлау сипатындағы көлденең онлайн-сауалнама форматында жүзеге асырылды. Деректер құрылымдалған сауалнама арқылы жиналды; талдау сипаттамалық статистиканы және ашық сұрақтарға берілген жауаптарға сапалық контент-талдауды қамтыды. Нәтижелер респонденттердің 54,1%-ы экологиялық білім беру ұғымын мазмұндық тұрғыдан дұрыс түсінетінін, ал 37,8%-ы оның ішінара анықтама-сын бергенін көрсетті. Студенттердің экологиялық белсенділігі негізінен күнделікті практикалардан, соның ішінде қалдықтарды азайту, көп рет қолданылатын заттарды пайдалану және табиғи ресурстарды ұтымды пайдалану әрекеттерінен көрінді, ал ұйымдастырылған экологиялық іс-шараларға қатысу сирек байқалды. Студенттердің көпшілігі экологиялық білім берудің оқу пәндеріне ықпалдасу деңгейін орташа деп бағалады. Ашық сұрақтарға берілген жауаптар практикалық бағдарланған және жобалық оқытуды күшейтуге, цифрлық технологияларды пайдалануға, пәнаралық тәсілді дамытуға, сабақтан тыс экологиялық белсенділікті кеңейтуге және университеттің неғұрлым тұрақты ортасын қалыптастыруға сұраныстың бар екенін көрсетті. Жалпы алғанда, нәтижелер студенттердің экологиялық білім берудің маңыздылығын жалпы түсінетінін және белгілі бір экологиялық практикаларды жүзеге асыратынын, алайда олардың экологиялық белсенділік деңгейі мен экологиялық білім берудің оқу үдерісіне ықпалдауын қабылдауының әркелкі екенін көрсетеді. Студенттердің білдірген күтулері экологиялық білім берудің неғұрлым практикалық-бағытталған, жобалық, цифрлық және пәнаралық форматын дамытудың маңыздылығын көрсетеді.

Түйінді сөздер: экологиялық білім, экологиялық сана, пилоттық зерттеу, экологиялық мәдениет, тұрақты даму.

ИЗУЧЕНИЕ ЭКОЛОГИЧЕСКОГО ОБРАЗОВАНИЯ СТУДЕНТОВ В КАЗАХСТАНЕ И ТАДЖИКИСТАНЕ: РЕЗУЛЬТАТЫ ПИЛОТНОГО ИССЛЕДОВАНИЯ

Жубакова С.С.* – кандидат педагогических наук, ассоциированный профессор, кафедра педагогики, Евразийский Национальный университет имени Л.Н. Гумилева, г. Астана, Республика Казахстан.

Абдуллозада З. – магистр, кафедра педагогики, Евразийский Национальный университет имени Л.Н. Гумилева, г. Астана, Республика Казахстан.

Статья посвящена изучению восприятия и опыта студентов в сфере экологического образования в Казахстане и Таджикистане на основе результатов пилотного исследования. Актуальность исследования обусловлена глобальными экологическими вызовами и необходимостью развития экологической культуры молодёжи в контексте современных задач устойчивого развития. Целью исследования является изучение понимания студентами экологического образования, их самооценки экологических практик, восприятия представленности экологического образования в университетском учебном процессе и мнений относительно дальнейшего развития. Исследование проведено в формате разведочного поперечного онлайн-опроса среди 37 студентов двух университетов Казахстана и Таджикистана. Данные собирались с использованием структурированной анкеты; анализ включал описательную статистику и качественный контент-анализ открытых ответов. Результаты показали, что 54,1% респондентов продемонстрировали содержательно корректное понимание экологического образования, тогда как 37,8% дали частичное определение. Экологическая активность студентов преимущественно выражалась в повседневных практиках, включая сокращение отходов, использование многоразовых предметов и рациональное использование природных ресурсов, тогда как участие в организованных экологических мероприятиях отмечалось реже. Большинство студентов оценили интеграцию экологического образования в учебные дисциплины как среднюю. Открытые ответы выявили запрос на усиление практико-ориентированного и проектного обучения, использование цифровых технологий, развитие междисциплинарного подхода, расширение внеучебной экологической активности и формирование более устойчивой университетской среды. В целом результаты показывают наличие у студентов общего понимания значения экологического образования и отдельных экологических практик при неоднородной экологической вовлечённости и восприятии его интеграции в образовательный процесс. Выявленные ожидания студентов подчеркивают значимость более практико-ориентированного, проектного, цифрового и междисциплинарного формата экологического образования.

Ключевые слова: экологическое образование, эко сознание, пилотное исследование, экологическая культура, устойчивое развитие.

Introduction. Environmental education is recognized as a key element of sustainable development, contributing to environmental culture, holistic awareness, and responsible attitudes toward nature. According to UNESCO [1], its purpose is not only to provide knowledge but also to develop values and practical competencies that enable individuals to make informed environmental decisions and address ecological challenges.

Its importance is increasing amid climate change, resource depletion, and environmental degradation. This is reflected in international frameworks such as the 2030 Agenda for Sustainable Development and UNESCO's Education for Sustainable Development: Towards achieving the SDGs [2]. Thus, environmental education is increasingly viewed as a strategic social priority rather than merely a component of formal education.

Contemporary research defines environmental education as a holistic process combining cognitive, value-based, and practical dimensions. Active learning helps students apply environmental knowledge in real-life contexts [3]. Palmer (1998) and Tilbury (1995) emphasize that environmental competence goes beyond factual knowledge and includes an environmental worldview, readiness for engagement, and the ability to apply environmental principles in everyday and professional life [4;5]. Beisenova (2000) similarly argues that environmental culture develops through systematic education, awareness-raising activities, and practical experience [6]. Odunyemi et al. advocate making environmental education mandatory to strengthen students' environmental literacy and contribute to a sustainable future [7].

For Central Asia, environmental education is particularly important due to the region's vulnerability to climate change, water scarcity, and soil degradation. Studies by Korotkova and Zakirova (2021) and Khaydarova (2023) reveal uneven development and systemic challenges in higher education, including methodological fragmentation and insufficient practice-oriented approaches [8;9]. Umarov and Sirojov (2023) also note that students' environmental literacy remains fragmented and that curricula often lack courses fostering a holistic understanding of environmental interconnections [10].

Environmental awareness is shaped not only by formal education but also by informal learning, media, personal experience, and social interaction [5;10]. Beisenova (2000) and Sapanova et al. (2024) highlight students' potential readiness to participate in environmental initiatives when universities provide adequate organizational support [6;11]. Therefore, strengthening practice-oriented education through student environmental projects, volunteering, green campuses, and interdisciplinary modules is essential for integrating environmental knowledge with practical action.

The main research question addressed in this pilot study is as follows: What do the pilot data reveal about students' understanding of environmental education, participation in environmental practices, and perceptions of environmental education in two university contexts in Kazakhstan and Tajikistan?

Object of the study: students' experiences and perceptions related to environmental education in two university contexts in Kazakhstan and Tajikistan.

Subject of the study: students' understanding of environmental education, reported environmental practices, and perceptions of environmental education and university environmental initiatives.

The purpose of this pilot study is to explore students' understanding of environmental education, participation in environmental practices, and perceptions of environmental education and university environmental initiatives, and to identify key areas for further investigation.

Research objectives:

- to explore students' understanding of basic environmental concepts;
- to examine students' participation in everyday and organized environmental practices;
- to explore students' perceptions of the integration of environmental education into university activities and curricula;
- to identify key issues that should be considered in the design of a larger-scale study.

This pilot study contributes preliminary empirical evidence on students' environmental awareness, reported environmental practices, and perceptions of environmental education in two university contexts in Central Asia. Its practical contribution lies in identifying potential areas for further investigation, including the integration of environmental topics into university curricula, student participation in environmental initiatives, and the development of practice-oriented approaches to environmental education. Given the exploratory design and limited sample, the findings are intended to inform the design of larger-scale research rather than to support generalizations about students in Kazakhstan or Tajikistan as a whole.

Literature Review. In a broad context, environmental education is defined as a continuous learning process aimed at acquiring environmental knowledge, developing skills and competencies, and fostering environmental culture. Sapanova and Childibaev (2022) emphasize its crucial role in developing environmental awareness as a prerequisite for sustainable development [12].

Pedagogical studies in Kazakhstan (Nurgabylov, 2018; Stamkulova & Dailbaeva, 2024) emphasize the importance of environmental education in shaping young people's environmental culture and integrating it into the educational process amid education system modernization [13;14].

In Kazakhstan, environmental education is developed through curricula and extracurricular initiatives, including "green campus" projects and environmental practices in higher education. These initiatives are supported by national strategies such as the Taza Qazaqstan concept (2024) [15], which introduced the Ecology and Life Safety course into the general education cycle of all academic programs to improve students' environmental literacy (Nurbek, 2025) [16]. Environmental volunteering also promotes student engagement in practical activities and the development of sustainable behavior [14]. Domestic scholars emphasize the need to integrate environmental knowledge, skills, and practice-oriented approaches into university curricula, including at Narxoz University [14].

Comparative studies across Central Asia, including Kazakhstan and Tajikistan, indicate that Education for Sustainable Development (ESD) is gradually being integrated into university curricula, although students' awareness of the global Sustainable Development Goals, particularly environmental ones, remains limited. Bepalyy et al. (2024) found that students more often obtain environmental information from the media and Internet than from formal academic curricula, while environmental education is only beginning to evolve toward more comprehensive integration of sustainable development topics [17].

In Tajikistan, environmental education in higher education has traditionally received less attention, and national reports indicate insufficient integration of environmental and climate-related topics into university programs. However, textbooks and modules on climate change and sustainable development have been introduced in some institutions [18]. State policy also supports environmental awareness through ecology departments and courses such as Nature Protection and Fundamentals of Ecology for students of different majors [18].

Kalandarov and Mansurova (2015) argue that Tajik universities should implement continuous environmental education programs to foster responsible attitudes toward nature, environmental interest, and active participation in its protection and restoration [19]. Amirzoda and Khakdod link environmental education at all levels with socio-economic development and improved quality of life [20].

Despite existing publications and initiatives, a significant gap remains in systematic empirical research on environmental education and sustainable student behavior in Kazakhstan and Tajikistan. Existing studies often focus on theoretical analyses or general initiatives rather than assessing students' environmental awareness and its influence on practical behavior, which supports the relevance of the proposed pilot study.

Materials and Methods. Research Design and Participants. The study employed an exploratory cross-sectional survey design and was conducted as a pilot study examining university students' perceptions and experiences of environmental education. Data were collected online via Google Forms from November 20 to December 6, 2025.

The sample comprised 37 students from two higher education institutions: 27 from L. N. Gumilyov Eurasian National University (ENU), Kazakhstan (73.0%), and 10 from the Russian-Tajik (Slavonic) University (RTSU), Tajikistan (27.0%). Participants represented all four years of study: 6 first-year (16.2%), 20 second-year (54.1%), 4 third-year (10.8%), and 7 fourth-year students (18.9%). In terms of age, 25 participants were under 19 (67.6%), 9 were aged 20–21 (24.3%), and 3 were 22 or older (8.1%). Given the small and unequal sample, the study was exploratory, and the findings are presented descriptively rather than as representative of students in Kazakhstan or Tajikistan.

Survey Instrument and Analytical Structure. A structured questionnaire developed for the pilot study was administered in Russian and included nine questions: three contextual questions (university/country, age, and year of study) and six substantive questions addressing students' understanding of environmental education, personal environmental practices, its integration into university courses, teaching approaches, and recommendations for improvement.

The substantive questions were organized into four analytical blocks:

1. Understanding of environmental education – students' definitions of the concept.
2. Personal environmental practices – participation in activities such as environmental campaigns, waste reduction, resource conservation, and dissemination of environmental knowledge.
3. Environmental education in the university learning process – perceived integration into courses and teaching approaches used in environmental disciplines.
4. Improvement and development – students' recommendations for strengthening environmental education at their universities.

Open-ended responses were analyzed using qualitative content analysis, with responses coded into recurring thematic categories and summarized through frequencies and percentages.

Operationalization of the Main Concepts. Environmental education was conceptualized as a broader educational process involving environmental knowledge, values, attitudes, skills, and readiness for responsible action. Environmental awareness referred primarily to students' understanding of environmental issues and the meaning they attributed to environmental education.

Environmentally responsible practices were measured through self-reported participation in activities such as waste reduction and sorting, use of reusable products, resource conservation, environmental campaigns, and dissemination of environmental knowledge. The questionnaire also examined students' perceptions of environmental education within university courses and their experiences with teaching approaches and pedagogical innovations. Environmental literacy and environmental culture were treated as broader conceptual categories rather than independently measured variables.

Thus, the analysis focused on four interconnected dimensions: understanding of environmental education, environmental practices, perceptions of the university learning environment, and students' recommendations for its development.

Data Collection and Analysis. Participation was voluntary and anonymous. The online questionnaire included information about the research purpose, and no intervention or experimental manipulation was conducted. Closed-ended questions were analyzed using frequencies and percentages. For multiple-response questions, percentages represent the proportion of respondents selecting each option and may therefore exceed 100% in total.

Open-ended responses were analyzed thematically to identify recurring ideas and complement the quantitative findings. Due to the pilot nature and small sample, country-specific results were interpreted descriptively and not as statistically significant differences. The study does not establish causal relationships between environmental education, environmental awareness, and student behavior; observed institutional or pedagogical factors are therefore considered tentative and require further investigation.

Ethical Considerations. Participation was voluntary and anonymous. Respondents were informed about the study's purpose and their right to participate. No personally identifying information was collected, and the data were used exclusively for research purposes.

Results and Discussion. In accordance with the adopted analytical framework, the results were presented across four interrelated dimensions: students' understanding of environmental education, their personal environmental practices, their perceptions of environmental education within the university learning environment, and their views and recommendations regarding its further development.

1. Understanding of Environmental Education

The questions in this analytical block were designed to assess the depth of students' understanding of basic environmental concepts. In particular, respondents were asked to define the concept of "environmental education". The responses were coded according to their level of substantive completeness into four categories: complete understanding (substantively accurate understanding), partial understanding, incorrect responses, and no response.

A total of 20 students (54.1%) provided complete, substantively accurate responses. These responses conceptualized environmental education as a process of developing environmental knowledge, values, ecological culture, responsible behavior, and a caring attitude toward the environment. Several responses also explicitly linked environmental education to understanding environmental problems and sustainable development.

Partial understanding was demonstrated by 14 students (37.8%). Their responses primarily focused on individual aspects of environmental education, such as learning about the environment, acquiring environmental knowledge, or developing a responsible attitude toward nature. Examples included responses such as "knowledge about the environment," "the study of ecology and the environment," and "teaching people how to protect nature." Although these responses reflected a general understanding of the concept, they did not conceptualize environmental education as a comprehensive process involving the development of knowledge, values, skills, and behavioral patterns.

Two students (5.4%) provided incorrect responses that did not reflect the substantive meaning of environmental education. One respondent defined the concept in terms of respecting personal boundaries, while another provided the response “good.”

One response (2.7%) contained no meaningful information and was therefore classified as a non-response.

These results indicate the fragmented nature of environmental knowledge, which was previously noted in the studies of Tajik scientists (Khaidarov, 2020).

2. Self-Assessment of Environmental Practices

This analytical block included the question: “What personal contribution do you make to addressing environmental problems?” Respondents were provided with several response options (Figure 1).

The largest proportion of respondents, 16 students (43.2%), reported reducing waste, using reusable items, and sorting waste. Nine respondents (24.3%) indicated that they conserve natural resources, while six students (16.2%) reported participating in environmental campaigns. Other forms of individual engagement, including disseminating environmental knowledge, collecting litter, or combining several responsible environmental practices, were mentioned by individual respondents (2.7% each). One respondent (2.7%) reported making no personal contribution, while one response (2.7%) was classified as non-informative.

These findings suggest limited integration of environmental practices into the educational process and a relatively low level of active environmental engagement among students. Students' reported environmental behavior was predominantly reflected in everyday practices, such as waste reduction, the use of reusable items, and resource conservation, whereas participation in organized environmental activities was less common. This pattern may indicate a gap between individual environmental practices and more systematic forms of environmental engagement within the university context. However, the factors underlying this pattern cannot be established based on the present pilot study and require further investigation. A similar concern regarding limited student engagement in environmental activities has been reported by Kazakhstani researchers, who have highlighted the potential importance of informational and organizational mechanisms in supporting such engagement (Umarov and Sirojov, 2023).

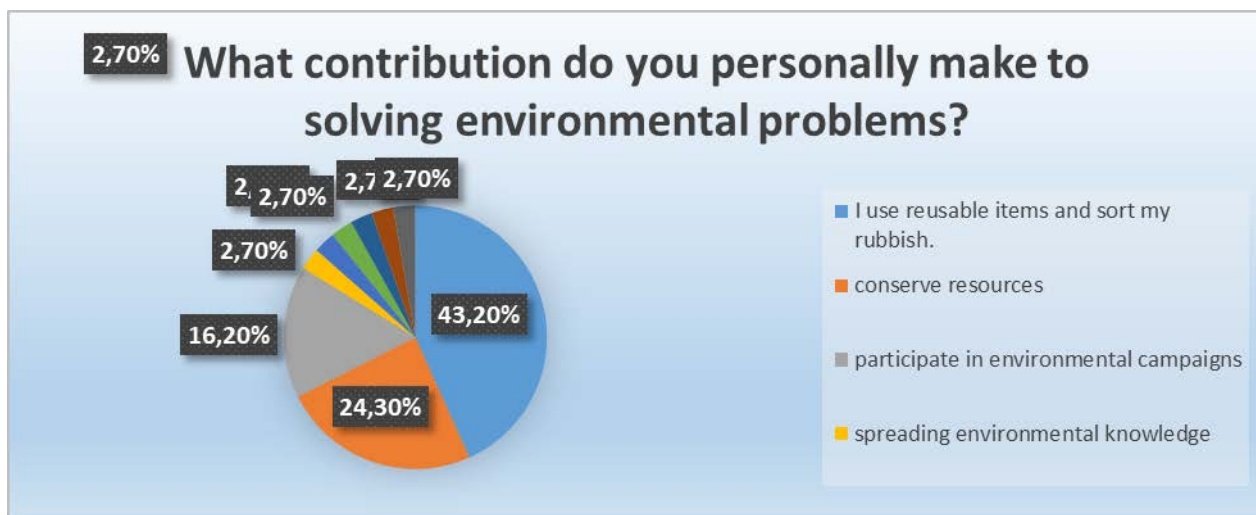


Figure 1 – Student Participation in Environmental Activities

Note: Multiple responses were allowed; percentages represent the proportion of respondents selecting each option and therefore do not sum to 100%.

3. Perceptions of Environmental Education in the University Learning Environment

This analytical block included the question: “How would you assess the level of integration of environmental education into the academic disciplines offered at your university?” (Figure 2).

Only one respondent (2.7%) assessed the level of integration as very high, while six students (16.2%) rated it as high. The majority of respondents, 21 students (56.8%), assessed the level as moderate. Seven students (18.9%) reported a low level of integration, and two respondents (5.4%) rated it as very low.

Overall, the distribution indicates that students predominantly perceive the integration of environmental education into the university curriculum as moderate rather than high. Notably, only 18.9% of respondents provided a high or very high assessment, whereas 24.3% rated the level as low or very low. This pattern may indicate that environmental education is not yet perceived by a substantial proportion of students as a strongly integrated component of the university curriculum. However, the findings should be interpreted as students' perceptions rather than as a direct assessment of the actual extent of curricular integration.

The findings suggest a perceived discrepancy between the importance attributed to environmental education and its perceived integration into university teaching practice. This observation is consistent with the

trend reported by Korotkova & Zakirova (2021), who highlighted the limited integration of environmental components into higher education curricula in Kazakhstan. However, the present findings reflect students' perceptions and should not be interpreted as a direct assessment of the actual extent of curricular integration.

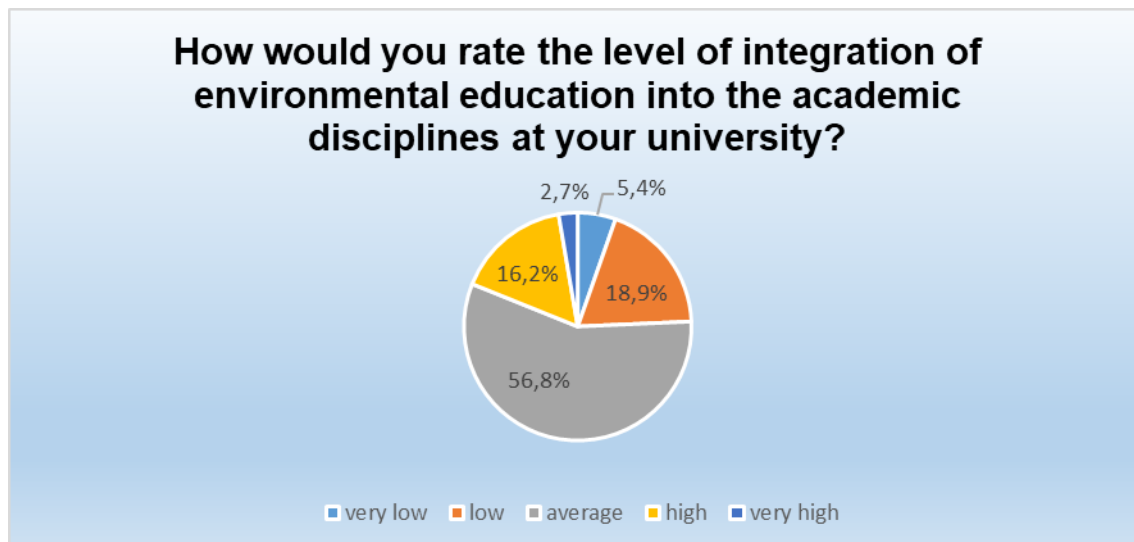


Figure 2 – Perceived Integration of Environmental Education into Academic Disciplines

This analytical block also included a follow-up question: “Which psychological and pedagogical innovations do your instructors most frequently use in classes related to environmental disciplines?” (multiple responses were allowed) (Figure 3). The majority of students, 22 respondents (59.5%), reported the use of interactive teaching methods, particularly discussions and case-based activities. Fifteen students (40.5%) indicated the use of digital technologies, including online platforms and simulations, while nine respondents (24.3%) reported the use of project-based learning. At the same time, five students (13.5%) indicated that innovative teaching practices were almost entirely absent.

Overall, the results indicate that students encounter a range of innovative teaching practices in environmental education, with interactive methods being the most frequently reported. Digital technologies and project-based learning were also represented, although to a lesser extent. The simultaneous presence of responses indicating an almost complete absence of innovative practices suggests variation in students' experiences of instructional approaches across courses or instructors.

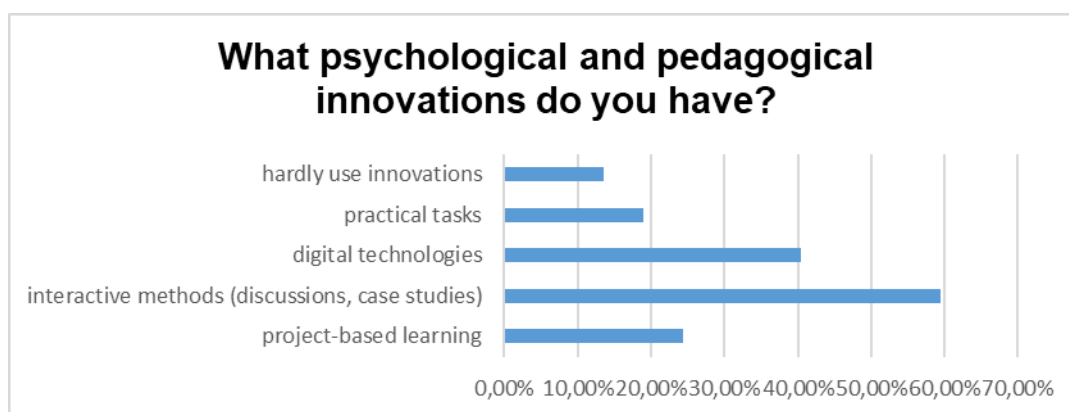


Figure 3 – Psychological and Pedagogical Innovations Used by University Instructors

Note: Multiple responses were allowed; percentages represent the proportion of respondents selecting each option and therefore do not sum to 100%.

4. Students' Views and Recommendations for the Further Development of Environmental Education

Analysis of responses to the open-ended questions concerning the improvement and further development of environmental education revealed several interrelated themes reflecting students' expectations. As individual responses could contain multiple suggestions, the thematic categories were not mutually exclusive.

The most prominent theme was the need to strengthen practice-oriented and project-based learning, identified in approximately 43.2% of responses. Students emphasized the need for more practical classes, practice-oriented assignments, field studies, laboratory work, and projects addressing real environmental pro-

blems. Responses to the question concerning specific proposals further elaborated this theme, with students suggesting projects focused on waste sorting, campus greening, water-body clean-up, the development of ecological trails, and environmental monitoring. These responses suggest that students associate effective environmental education with opportunities to apply acquired knowledge to real-world environmental challenges.

The second most prominent theme was the digitalization of environmental education (24.3% of responses). Students proposed more extensive use of GIS, interactive maps, digital platforms, virtual laboratories, environmental simulations, sensors, and drones. Some respondents also suggested using online platforms to disseminate information and report the outcomes of environmental initiatives. These responses indicate that students perceive innovation in environmental education not only in terms of updated content but also through the incorporation of contemporary digital tools.

Approximately 21.6% of responses addressed the development of an interdisciplinary approach. Students suggested integrating environmental education with IT, economics, law, sociology, psychology, and urban development, as well as developing interfaculty environmental projects. This pattern suggests that students perceive environmental issues as complex challenges that can benefit from knowledge and approaches drawn from multiple fields.

An equally prominent theme was greater student involvement in extracurricular environmental activities (21.6%). Respondents mentioned environmental campaigns, volunteering programs, eco-clubs, competitions, forums, festivals, and student research projects. Thus, students' responses indicate that environmental education is perceived not only as a component of formal instruction but also as an opportunity for practical engagement and collective environmental activity.

Another theme concerned expanding the scope and systematic integration of environmental education (18.9% of responses). Students proposed introducing environmental courses for a broader range of students, increasing the number of instructional hours, and expanding environmental content within academic programs. Some respondents referred to the relatively late introduction of environmental topics into their studies and the limited duration of environmental instruction. Suggestions to introduce compulsory courses on sustainable development and environmental culture may therefore reflect students' expectations for a more systematic, university-wide approach to environmental education.

A further 18.9% of responses focused on environmental infrastructure and sustainable campus practices. Students suggested implementing separate waste collection, installing additional waste bins, expanding green spaces, introducing energy-efficient solutions, and developing environmental initiatives on campus. Individual responses also mentioned tree planting and increasing activities aimed at improving the environmental condition of the campus. These suggestions highlight the university environment as an additional context in which environmental awareness and practices may be developed.

Students also emphasized the importance of interaction with external specialists and organizations, suggesting that universities invite environmental professionals and other practitioners and strengthen cooperation with environmental organizations, industry, businesses, and NGOs. Some respondents also called for updating educational content in line with contemporary environmental challenges and technologies and for strengthening environmental awareness and education.

Overall, the responses to the two open-ended questions showed substantial overlap in the main priorities while also complementing one another. The question concerning necessary changes helped identify the main areas perceived by students as requiring improvement, whereas the question concerning specific proposals provided more concrete examples of possible ways to address these areas. Taken together, the findings indicate a student demand for a transition from a predominantly theoretical format toward a more practice-oriented, project-based, interdisciplinary, and digitally supported model of environmental education, accompanied by greater student engagement and the development of a more sustainable university environment.

Although the survey was not specifically designed to generate policy recommendations, the open-ended responses provide insight into students' expectations regarding a more systematic approach to environmental education. Considered alongside the quantitative findings, these results help identify several areas requiring further attention in environmental education in Kazakhstan and Tajikistan, as summarized in Table 1.

Table 1 – Problem Areas in Environmental Education Identified by Students

№	Identified problem	Brief description
1	Predominantly general environmental knowledge	Students demonstrate a general understanding of basic environmental concepts, while a substantial proportion provided only partial definitions of environmental education. This pattern is consistent with previous research highlighting the need for a more systematic environmental knowledge base in higher education.
2	Limited participation in organized environmental practices	Students' reported environmental engagement was predominantly expressed through everyday practices, while participation in organized environmental activities was less frequently reported. The factors underlying this pattern cannot be established based on the present pilot study.

Continuation of Table 1

3	Limited perceived integration of environmental education	Although students recognized the importance of environmental education, most assessed its integration into academic disciplines as moderate rather than high. This finding reflects students' perceptions and does not constitute a direct assessment of actual curricular integration.
---	--	---

When interpreting the identified problem areas, no causal inferences were made; potential factors that may account for the observed trends are considered solely as hypotheses requiring verification in future research.

Conclusion. Thus, the findings of the pilot study point to several problem areas in students' environmental education related to the nature of environmental knowledge, the level of participation in environmental practices, and the representation of environmental topics within the educational process. The identified trends should not be interpreted as evidence of causal relationships between characteristics of the educational environment and students' environmental behavior. Nevertheless, the findings help identify areas that warrant further empirical investigation.

The data do not allow for generalized conclusions regarding all students or universities in Kazakhstan and Tajikistan; however, they provide a basis for subsequent stages of the research. Promising directions for future research include comparative analysis of environmental education across universities in Central Asia, the development and validation of a student environmental literacy index, and the examination of relationships among environmental knowledge, characteristics of the educational environment, and practical environmental behavior using more representative samples.

Conflict of interest: The authors declare no conflict of interest.

REFERENCES:

1. **UNESCO. Education for sustainable development: A roadmap for the period 2020–2030.** Paris, UNESCO, 2020. Available at: <https://t-green.am/wp-content/uploads/2023/09/Education-for-Sustainable-Development-A-Roadmap-UNESCO.pdf> (accessed 12 September 2026).
2. **United Nations. Transforming our world: The 2030 agenda for sustainable development.** New York, United Nations, 2015, 29 p.
3. **Aldawsari N.D., Nemt-allah M.A., Abdellatif M.S. Environmental education awareness in light of sustainable development goals and its relationship with environmental responsibility among university students.** *Sustainability*, 2025, vol.17, iss. 21, art. 9393. <https://doi.org/10.3390/su17219393>.
4. **Palmer J. Environmental education in the 21st century: Theory, practice, progress and promise.** London, Routledge, 1998, 300 p.
5. **Tilbury, D. Environmental Education for Sustainability: Defining the New Focus of Environmental Education in the 1990s.** *Environmental Education Research*, 1995, vol.1, iss. 2, pp. 195 – 212. <https://doi.org/10.1080/1350462950010206>.
6. **Beisenova A.S. E'kologicheskaya kul'tura i vospitanie osnova ustojchivogo razvitiya chelovechestva** [Environmental culture and education are the basis for sustainable human development]. *Vysshaya shkola Kazakhstana*, 2000, iss. 2, pp. 43-52. (In Russian)
7. **Odunyemi M., Olaoye A., Ayodele K. Influence of environmental education on undergraduates' perceptions of sustainable development.** *European Journal of Education Studies*, 2023, vol.10, iss. 9, pp. 400 – 415. <https://doi.org/10.46827/ejes.v10i9.4983>.
8. **Korotkova T.S., Zakirova D.I. E'kologicheskoe obrazovanie i obrazovanie dlya ustojchivogo razvitiya: obshhee i osobennoe** [Environmental education and education for sustainable development: similarities and differences]. *Bulletin of "Turan" University*, 2021, vol. 1, pp. 110-115. <https://doi.org/10.46914/1562-2959-2021-1-1-110-115>. (In Russian)
9. **Hajdarova M. Rol' e'kologicheskogo obrazovaniya v formirovanii chuvstva patriotizma u studentov estestvennonauchny'h spezialnostej** [The role of environmental education in forming a sense of patriotism in students of natural science specialties]. *Nauchny'e zapiski. Seriya gumanitarny'h i sotsialny'h nauk Hudzhandskogo gosudarstvennogo universiteta imeni akademika B. Gafurova*, 2023, vol.2, iss.75, pp. 118–147. (In Russian)
10. **Umarov S., Sirojov F. Formation of ecological thinking among high school pupils.** *Actual Problems in the System of Education: General Secondary Education Institution – Pre-University Training – Higher Education Institution*, 2023, vol. 1, iss. 3, pp.142–146. <https://doi.org/10.18372/2786-5487.1.17689>.
11. **Sapanova N., Cessna S. G., DeChano-Cook L. M., Childibaev D., Balta N. Kazakhstani high school students' environmental knowledge, attitudes, awareness and concern.** *International Research in Geographical and Environmental Education*, 2024, vol. 33, iss. 2, pp. 139–156. <https://doi.org/10.1080/10382046.2023.2281697>.
12. **Sapanova N.D., Childibaev D.B. Formirovanie e'kologicheskikh znaniy i kultury' uchashhihsya na osnove proektnoj deyatel'nosti** [Developing students' environmental knowledge and culture through project-based activities]. *Bulletin of Abai Kazakh National Pedagogical Universitet. Seriya: Pedagogicheskie nauki*, 2022, vol.74, iss. 2, pp. 255 – 264. <https://doi.org/10.51889/2022-2.1728-5496.28>. (In Russian)

13. **Nurkabylova A.Sh. Osobennosti e'kologicheskogo obrazovaniya molodezhi v Respublike Kazakstan** [Features of environmental education for young people in the Republic of Kazakhstan]. *Vestnik Orenburgskogo gosudarstvennogo universiteta*, 2018, vol. 1, iss. 213, pp. 58–62. <https://doi.org/10.25198/1814-6457-213-58>. (In Russian)

14. **Stamkulova K., Dailbaeva A. Adaptatsiya sistemy' e'kologicheskogo prosveshheniya v interesah ustojchivogo razvitiya** [Adaptation of the environmental education system in the interests of sustainable development]. *Vestnik Universiteta Yassavi*, 2024, vol. 4, iss. 134, pp. 286–297. <https://doi.org/10.47526/2024-4/2664-0686.121>. (In Russian)

15. **Postanovlenie Pravitel'stva Respubliki Kazahstan ot 31 oktyabrya 2024 goda № 910 "Ob utverzhdenii Konceptii razvitiya e'kologicheskoy kul'tury" "Taza Kazakstan" na 2024 – 2029 gody"** [Decree of the Government of the Republic of Kazakhstan No. 910 dated October 31, 2024 "On the approval of the Concept for the Development of Environmental Culture 'Taza Kazakhstan' for 2024–2029"]. Available at: <https://adilet.zan.kz/rus/docs/P2400000910>. (accessed 14 September 2026). (In Russian)

16. **Nurbek S. Vuzy' Kazahstana razvivayut e'kologicheskoe obrazovanie i zapuskayut zeleny'e proekty'** [Kazakhstan's universities are developing environmental education and launching green projects]. 25 June 2025. Available at: <https://primeminister.kz/ru/news/vuzy-kazahstana-razvivayut-ekologicheskoe-obrazovanie-i-zapuskayut-zelenye-proekty-30198> (accessed 14 July 2026). (In Russian)

17. **Bespalyy S., Akhrorova A., Alnazarova G., Adieva A., Petrenko A. Education for sustainable development: comparative analysis and prospects at universities in Kazakhstan, Tajikistan, Kyrgyzstan and Uzbekistan**. *Discover Sustainability*, 2024, vol.5, art. 140. <https://doi.org/10.1007/s43621-024-00343-x>.

18. **UNESCO. Communication and education on climate change**. 2021. Available at: <https://education-profiles.org/central-and-southern-asia/tajikistan/~climate-change-communication-and-education> (accessed 12 September 2026).

19. **Kalandarov A.Sh., Mansurova Ch.S. Sovershenstvovanie form i metodov e'kologicheskogo obrazovaniya i vospitaniya v usloviyah globalizatsii obrazovaniya**. [Development of the forms and methods of ecological education in the condition of globalization of the education] *Vestnik Pedagogicheskogo universiteta*, 2015, iss. 3 – 2 (64), pp. 179–182. <https://cyberleninka.ru/article/n/sovershenstvovanie-form-i-metodov-ekologicheskogo-obrazovaniya-i-vospitaniya-v-usloviyah-globalizatsii-obrazovaniya> (accessed 12 September 2024). (In Russian)

20. **Amirzoda O.H., Hakdod M.M. E'kologicheskoe obrazovanie v interesah ustojchivogo razvitiya** [Environmental education for sustainable development]. *Vestnik e'kologii*, 2023, iss. 2, pp. 109–113. (In Russian)

Received: 17 May 2026. **Accepted:** 20 June 2026. **Published:** 30 September 2026.

Information about the authors:

*Zhubakova Saule Saibulatovna** – Candidate of Pedagogical Sciences, Associate Professor, Department of pedagogy, L.N. Gumilyov Eurasian National University, Republic of Kazakhstan, 010000, Astana, 2 Satpayev Str., tel.: 87784239257; e-mail: zhubakova.saule@mail.ru.

Abdullozoda Zaur – Master's degree, Department of pedagogy, L.N. Gumilyov Eurasian National University, Republic of Kazakhstan, 010000, Astana, 2 Satpayev Str., tel.: +992906352222; e-mail: zaura3333@gmail.com.

*Жубакова Сауле Сайбулатовна** – педагогика ғылымдарының кандидаты, педагогика кафедрасының қауымдастырылған профессоры, Л.Н. Гумилев атындағы Еуразия ұлттық университеті, Қазақстан Республикасы, 010000, Астана қ., Сәтбаев көш, 2, тел. 87784239257; e-mail: zhubakova.saule@mail.ru.

Абдуллозада Заур – магистр, педагогика кафедрасы, Қазақстан Республикасы, 010000, Астана қ., Сәтбаев көш, 2, тел. +992906352222; e-mail: zaura3333@gmail.com.

*Жубакова Сауле Сайбулатовна** – кандидат педагогических наук, ассоциированный профессор кафедры педагогики, Евразийский Национальный университет имени Л.Н. Гумилева, Республика Казахстан, 010000, г. Астана, улица Сатпаева, 2, тел.: 87784239257, e-mail: zhubakova.saule@mail.ru.

Абдуллозада Заур – магистр, кафедра педагогики, Евразийский Национальный университет имени Л.Н. Гумилева, Республика Казахстан, 010000, г. Астана, улица Сатпаева, 2, тел.: +992906352222, e-mail: zaura3333@gmail.com.