

**CASE STUDIES IN TEACHING LANGUAGES AND SCIENCE
FOR SUSTAINABLE DEVELOPMENT (AS PART OF A PREPARATORY
DEPARTMENT OF EDUCATIONAL PROGRAMME)**

**ПРИМЕНЕНИЕ КЕЙС-ТЕХНОЛОГИИ ПРИ ОБУЧЕНИИ ЯЗЫКАМ И
ЕСТЕСТВЕННЫМ НАУКАМ В ИНТЕРЕСАХ УСТОЙЧИВОГО РАЗВИТИЯ (В
РАМКАХ ОБРАЗОВАТЕЛЬНОЙ ПРОГРАММЫ ПОДГОТОВИТЕЛЬНОГО
ОТДЕЛЕНИЯ)**

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The article considers case-based teaching as part of a preparatory department educational programme. The authors justify the feasibility of incorporating case studies into classes of Chemistry and the English language and illustrate the possibility of promoting environmental sustainability in international students through case-based learning by relating the course content to real life for stimulating active participation in analyzing and considering the solutions of urgent ecological problems.

В статье рассматривается применение кейс-технологии при обучении слушателей в рамках образовательной программы подготовительного отделения. Авторы обосновывают целесообразность внедрения кейс-технологии в процесс обучения химии и английскому языку и демонстрируют на примерах возможность повышения экологической устойчивости иностранных слушателей посредством обучения на основе конкретных случаев, связывая содержание курса с реальной жизнью в целях мотивации активного участия в анализе и рассмотрении возможных вариантов решения актуальных экологических проблем.

Keywords: education for sustainable development, environmental sustainability, case-based teaching, international students, preparatory department.

Ключевые слова: образование в целях устойчивого развития, экологическая устойчивость, кейс-технология, иностранные слушатели, подготовительное отделение.

<https://doi.org/10.46646/SAKH-2023-1-25-28>

The issue of sustainability in students' education has been an important part of all curricula in International Sakharov Environmental Institute. Stable and environmentally friendly social development is possible with the formation of ecological consciousness and culture. Our practice of interaction with international preparatory department students convinces us that this important component of a person's moral maturity is not completely formed. Teaching students from different countries helps us to observe that this problem is global and has been caused mainly by lack of knowledge therefore it is primarily an education problem.

We all need to learn how to live sustainably and transform our educational systems to ensure sustainable life for future generations. As María J. de la Fuente notices, "The education for sustainable development framework, a guide for institutions and educators to redesign curricula and pedagogies around sustainability principles, is used by hundreds of universities worldwide. Education for sustainable development should permeate the curricula of all the university's disciplines and areas of knowledge, giving the area's multidisciplinary and multidimensional nature, seems just logical... There are at least three dimensions of sustainability: environmental, social, and economic, which interact in complex, systemic ways. A fourth cultural dimension has been recently added that underscores the need to maintain cultural practices and heritage for future generations" [5].

Developing ecological consciousness and culture in international students will be effective only if teachers take the right stand and accept the ethical foundations of sustainability [3].

Sustainability is the idea that it is necessary for people to form a new type of ecological consciousness. Instead of changing nature, we should change our relationship with it. People's outlook, values and norms must change. Development of ecological consciousness in students includes the development of moral models based on conscious environmental and

human health protection. Ecological consciousness and culture are formed more successfully if the students have developed a positive motivation for mastering environmental knowledge and skills, as education for sustainable development forms a careful attitude not only to the environment, but also to their own health [1].

The process of training should be properly organized. The principles of consistency and variability, innovative developing forms of education should be applied; teachers should use students' life experience for their further development [3].

International students who have chosen the preparatory educational programme of the biological; medical and pharmaceutical; ecological; veterinary; agrarian; catering educational profiles study the English language as well as Chemistry, Biology and Physics in English. The latter subjects are connected with the study of nature and environment, hence the preparatory course should include discussions based on a set of questions related to environment protection issues, brainstorming tasks consisting ideas or giving solutions to a given problem, role-plays based on role-cards presenting conflicting opinions, mind mapping, compare and contrast tasks calling for a comparative analysis of a given issues in different countries [1].

Solving sustainability problems through debate and negotiation requires complex modes of communication. Thus we consider case studies to be the technique that can facilitate the process of subject training on the one hand and development of ecological consciousness on the other.

Incorporating case studies into the preparatory department educational programme provides the teachers with the possibility of promoting environmental sustainability in international students by relating the course content to real life for stimulating active participation in analyzing and considering the solutions of urgent ecological problems.

This method is highly relevant for the theme of sustainable development in global, regional and local contexts: working with case studies allows us to collect experiences from different regions while opening them up for discussion about sustainability practices under specific cultural, environmental and other circumstances – to uncover common principles and differences within local cases, and foster the application of knowledge to real-life situations. Case study investigations undertaken by students within the learning process rely on the students' involvement in the issue, and possibly also cooperation as part of a team with the subsequent necessary definition of responsibilities [4].

Case-based teaching makes classes active and student-centred. The essence of case-based learning is comprehension, critical analysis and solving specific problems or cases. A case is a description of a situation that has taken place in a particular place and contains some problem that requires solving. This is a kind of teaching tool through which a part of real life, a practical situation is introduced into the classroom, as the cases suggested for considering are always connected with the burning issues the students native countries are facing. Reflection and critical-thinking, group discussion and opinion-forming make it possible to develop stable and environmentally friendly members of society. With the teacher as a mediator, learners develop the capability to recognize patterns and improve problem-solving skills. Due to the high concentration of roles in cases, the case study technique is close to game techniques and problem-based learning. Alongside other qualitative research approaches such as observation, interviews, analysis of narratives and documents, if appropriately used, it may cover specific methodological demands, especially where active exploration of a theme by students is desirable [4].

The case should contain the most realistic picture, as well as have a stable set of characteristics. Each case should be problematic, activity and event-based, time and place related. At the same time it should give the possibility of role-playing. Students' task is to comprehend the suggested situation, the description of which reflects not only the burning issue, but also actualizes the previously acquired complex of knowledge; clearly formulates and qualifies the problem and develops a certain algorithm of activity that leads to solving the problem [2].

The advantages of using case-based teaching as a vehicle for learning are well known and include subject-specific and general knowledge. Case-based teaching also intends to foster the development of specific competencies, such as those related to collaboration, communication, and decision-making. Cases are often approached and addressed by students in groups, allowing for many opinions and points of view to be explored during the discussion:

The flexibility of the research process, the complexity of the information obtained through it, and emphasis on the context are considered to be the main benefits of the case-based learning. Attention paid to the context makes research less abstract and allows us to build a "story" around the case; a holistic picture of reality can thus be developed. While quantitative methods might be realized routinely, case study research is often undertaken in unpredictable situations and so it deals with uncertainty, creativity and innovation. These characteristics can be identified as benefits also within the teaching/learning process, to open spaces for creativity and independent thinking [4]. By using cases, which are based on the real-world situations that students are familiar with in their daily lives and by mobilizing previous knowledge to solve the problems presented to them, case-based teaching is tapping into students' natural curiosity and enhancing their critical-thinking skills.

Case-based teaching, as described by many authors, involves: 1) familiarization with the situation; 2) identification of the problem; 3) determination of ways to solve it (usually with the use of "brainstorming"); 4) analysis of the consequences of possible solutions; 5) case solution: an idea (or several ideas) is proposed to solve the problem, the consequences of the decision are analyzed [5].

The use of case studies in chemistry classes with international students makes it possible to implement a practice-oriented approach in teaching and comprehensively consider not only the physical and chemical properties of compounds, but also the impact on the environment, human health and life, which is an integral guideline within the framework of the sustainable development programme. Case-based teaching allows us to consider all the features of chemical industry, to detect shortcomings in the methods and offer solutions for improving the technological process. Particular attention is paid to reducing environmental damage, since chemical industry is one of the main "pollutants of our planet". In addition

to improving technology and increasing product yield, options are being considered to optimize and reduce the environmental burden, leading to changes in ecosystem components.

Case-based learning involves group work and a clear division of responsibilities – each member of the group performs a special task. International students are always suggested cases based on the issues connected with the branches of the chemical industry that are most important for the economy of their countries. For example, students from Iran are offered a case study on improving the technology of oil production and refining, since the country is one of the leaders in the production of this energy resource and increases export income by establishing economic ties with other countries. The increase in oil production and refining leads to deterioration and changes in ecosystem components. So, at the stage of oil production, oil gas is additionally extracted, which is subsequently burned, and with it benzene, phenol and toluene, toxic organic substances that cause diseases of the nervous system and skin, enter the atmosphere. Polymer drilling fluids are added to the well itself, helping to clean it from the destroyed rock. If this chemical solution is not neutralized afterwards, this will lead to degradation of soil layers and, if it gets into groundwater, this will make the water in the area unusable. Petroleum production is accompanied by the release of heavy metal compounds, dioxins and other substances that cause diseases of the respiratory system. Polluted water used in technological process enters natural reservoirs after purification, but unfortunately, complete purification does not occur, which leads to the accumulation of toxic substances and deterioration of water quality. There is also the issue of safe export of oil and petroleum products, since oil spills at sea lead to detrimental consequences not only to biodiversity, but also to humans. Thus, developing the case, students give their ideas for modernization and greening of the processes of extraction, processing and transportation of oil and petroleum products.

Students speak from the point of view of a technologist, an environmental chemist, a logistician and an engineer. The ways of modernization of processes are suggested, namely: the introduction of new fossil extraction technologies aimed at preserving nature; the search for ways to dispose of associated gases; improvement of technologies for cleaning contaminated surfaces; improvement of methods of storage and transportation of substances. Taking into account the knowledge about the approximate composition of oil and petroleum products, it is not difficult for students to come up with ways to introduce adsorbents and filters to reduce the concentration of hazardous substances in the air and reservoirs, to propose measures to protect the soil from degradation and erosion, to choose the safest transportation route – the oil pipeline and suggest its possible location, taking into account the geographical features of the country. So, after analyzing the case, students come to the conclusion that this set of measures allows to reduce the concentration and volume of toxic emissions and great attention should be paid to the issues of modernization and greening of technological processes as it is vitally important for preserving biodiversity and human health protection.

The most apparent connection between education for sustainable development and foreign language learning is the fact that multilingualism and multiculturalism are part of our present reality. The abilities to understand and tolerate culturally different points of view, negotiate differences, and develop sensitivity to local cultures, are vital to modern professionals in different fields [5].

Case-based teaching of foreign languages in a multinational group of international students is the most effective way to promote both higher level language skills and sustainability literacy, as it creates a learning environment in which each participant can reflect upon their experiences. As soon as the identities, experiences, and aspirations of students in a multinational group are heterogeneous, analyzing sustainability issues or cases students develop communicative competencies in a foreign language as well as cross-cultural sustainability awareness and knowledge.

Case studies offer a structured, guided approach to foreign language learning. A case study presents a real and complex situation and often involves a problem. In foreign language courses and curricula working with sustainability cases, the structured format is very valuable because it allows for the use of relatively detailed cases so that students can explore all the perspectives in some depth. By structuring a case, we can integrate smaller tasks along the way. A task is an activity that students need to carry out using the foreign language; it has a primary focus on meaning; it engages cognitive processes such as selecting, classifying, or evaluating, and requires a final product [5].

All the cases suggested for consideration are always connected with the burning issues the students native countries are facing. One of them is “Health threats of climate change in the Islamic Republic of Iran”. Students analyze and evaluate the case and decide on a sustainable solution that takes into account different points of view. The first (analytical) stage of the case is based on studying the information on current and future climate hazards in the Islamic Republic of Iran, students complete a decision-making task. “Decide as a group, from the point of view of an environmentalist, a doctor, Ministry of Health and Medical Education representative, some residents of different parts of the country, what the main (a) social, (b) environmental, and (c) economic consequences will be if there is no response to the hazards. Then share your opinions with the class”. Working through the case involves (a) analyzing it and (b) identifying possible solutions and making decisions. Analyzing a case starts with understanding its context – geographical, historical, and sociopolitical – the people involved in it, and other essential facts. This first step will help students identify the nature of the problem and its causes. The problem needs to be clearly formulated and then analyzed, keeping in mind the environmental, social, and economic dimensions. Complexity increases from the analysis to the decision-making stage.

After a thorough study of current and future climate hazards a new stage – analyzing the consequences – begins. Students watch a video and read some facts about vulnerability factors and health risks due to climate change. In-class tasks target higher-level thinking skills. Students are engaged in analyzing the multiple aspects of the problem and discovering the connections between them. If the group is multicultural, they may also try to compare how other peoples and cultures see the same problem.

The second part of the case is decision-making. It involves exploring possible solutions, making suggestions, and supporting them with arguments. It also requires deciding on a solution and considering what will happen if no action is taken. Class is divided into groups, each representing one expert (an environmentalist, a doctor, Ministry of Health and Medical Education representative) or one resident of the part of the country, suffering the greatest effect of climate change.

The last stage is a panel debate in the form of a role-play. All experts and residents are represented. The goal is to find a sustainable solution that considers the needs and views of most, if not all, members. Before the panel, each group elaborates its plan, develops arguments, and prepares possible counterarguments. The panel discussion takes place, with the instructor acting as moderator, in the next class session.

Sustainable education as content for teaching, is an effort worth pursuing as we give students knowledge, competencies, and tools to live sustainably, and to find solutions to the sustainability challenges. Case-based teaching can be a successful and meaningful methodology in the education of responsible citizens capable of understanding the complexity and urgency of contemporary problems, how the knowledge is linked to real-life situations and how one's actions may deeply impact the future.

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ФИЗИЧЕСКАЯ КУЛЬТУРА В ЭКОЛОГООРИЕНТИРОВАННОЙ ПОДГОТОВКЕ СПЕЦИАЛИСТОВ: ФОРМАТ РЕАЛИЗАЦИИ В УЧЕБНОМ ПРОЦЕССЕ

PHYSICAL CULTURE IN ENVIRONMENTAL-ORIENTED TRAINING OF SPECIALISTS: THE FORMAT OF IMPLEMENTATION IN THE EDUCATIONAL PROCESS

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В статье раскрыта образовательная составляющая организации учебного процесса и подходов к преподаванию дисциплины «Физическая культура», а также проанализированы результаты анкетирования студентов первого курса МГЭИ им. А. Д. Сахарова БГУ. Выявлено мнение респондентов о вопросах экологии физической культуры и формате проведения занятий по данной учебной дисциплине.