Building axiological competence of graduate students by means of project-based learning

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Abstract. The article defines the essence of axiological competence, objectives and pedagogical conditions of its formation among the students of graduate program in Biotechnology. The authors provide requirements for energy-saving technologies project-based learning and specify the application of the latter with the view of competence building.

1.Introduction

According to the modern university graduate competence model, a two-tier higher education (undergraduate and graduate studies) should be student-oriented. Along with subject knowledge and skills it is necessary to form personal qualities which are highly demanded by this professional field. Natural disasters of the last decade have proven conclusively that industry and agriculture should not be the only sectors developed in terms of environmental protection. It is essential to organize the educational process on the basis of the fundamental unity of its scientific and humanitarian components. The latter implies the development of axiological competence, ability to harmonize relations in the system "man-nature-society", which is vital for graduate students in Biotechnology.

At the same time, project-based learning has recently been widely used in education. Its didactic nature is focused on the development of skills for effective operation in real life situations. This fact determines our choice of project-based learning as a tool for building axiological competence, promoting adaptation of future graduates to changing social and economic conditions and their successful performance in real professionally significant circumstances.

2. Governing equations

Considering the essentials for the formation of axiological competence, it is worth mentioning that competencies are the basis of competitive graduates. In fact a competence characterizes a process [1, p. 33], an area of activity [2], which a person is well aware of, has relevant knowledge and experience. A person competent in a specific field possesses appropriate knowledge and skills to enable him to judge reasonably about this field and to work effectively. Axiological competence, according to the classification of A.V. Khutorskoy [3] belongs to the key competences.

Axiological competence, as we understand, is characterized by the following: the ability to see, understand, cherish the natural world and nature; take scientific knowledge as a value; be able to perfectly adapt to the modern world, choose the system of values, targets and meanings for one's innovative activities, identify one's own contradictions and make decisions. Further livelihoods of

people, their self-determination and self-development largely depend on this competence. Moreover, axiological component is included into all other competencies.

Like any other competencies axiological competence is based on activity component. From the structural perspective axiological competence integrates knowledge, environmentally oriented thinking as the quality of a person and a number of skills. The most important, in our opinion, is the ability to formulate one's own goals of innovation, comparing them with the values of the modern world; to make decisions under irregular circumstances, realizing the value and essence of one's activities; select and implement individual educational trajectory in accordance with personal goals.

Based on the foregoing assumptions, the system of building axiological competence of future graduate students, who study energy-saving technologies, include the following tasks:

1) formation of environmentally oriented thinking (new mentality associated with views on the environmentally sound and sustainable development of society);

2) development of independent thinking (the ability for self-development, self-sufficiency in getting new knowledge, skill to self-identify contradictions in dealing with complex educational and cognitive problems);

3) provision with methods of innovation.

Pedagogical conditions of building axiological competence of graduate students in learning energy-saving technologies are the following: development and application of special assignments directed at the formation of independent thinking through the solution of comprehensive educational and cognitive problems; the use of environmentally focused project-based learning; organization of training based on interactive and information technology.

Technique of axiological competence building includes a set of methods, tools, approaches and means used in the educational process in order to achieve a particular goal. We believe that project learning is an effective tool for the formation of the value attitude to scientific knowledge, for independent innovations with the view to harmonize the relations in the system "man-nature-society" [4]. The following part of the article will describe requirements for project-based learning and the specifics of its application.

Project culture is seen today as a mandatory component of the general culture of a modern man. [5] Students' project culture elements establishment was described in the papers of Russian teachers. However, the problems of personal development and the formation of axiological competence of future graduates through project-based learning of energy saving technologies have not still been resolved.

Project-based teaching method is aimed at the acquisition of new knowledge in close connection with the real-life practice. Project-based learning allows to engage students in active learning process by setting problems and choosing possible solutions, collecting necessary information, etc., thus acquiring new training and life experience.

Let's consider the example of selecting relevant topics for environmentally focused energy saving projects. It is commonly known that, one of the major challenges of the XXI century is a global environmental crisis caused by the anthropogenic impact on the environment. For example, according to research Steffen A., Douglas T., Amyot M. et al. [6], as a result of fuel combustion, mercury, contained in industrial emissions, is oxidized in the atmosphere. In the future, due to the metabolism of microorganisms oxidized mercury is transformed into highly toxic methyl mercury, which by its toxic effect outranks the metal itself. Based on this scientific fact one can formulate several project topics related to the study of processes of movement and control of mercury compounds in the environment, taking into account energy saving measures. Implementation of these projects necessitates integrated knowledge, creativity and environmentally oriented thinking. It is virtually impossible to select the most "reasonable" topics among the mentioned ones, as project learning is in general based on the creativity of teachers and students.

Choosing the project topics it is necessary to consider the possibility of 1) formulating an interesting problem (or problems), which require integrated knowledge and research approach to solve it; 2) theoretical, practical or cognitive significance of the expected results; 3) independent or group

activities of the project participants; 4) structuring an informative part of the project (specifying step-by-step results); 5) application of research methods (hypothesis suggestion, theoretical justification of the problem solution hypothesis, choice of research methods, data analysis, its presentation, correction, conclusions drawing).

The specifics of energy-saving technologies project-based learning consists in the fact that it is expected to focus on the humanization of the course (historical and methodological, environmental and applied aspects).

During the implementation of the historical and methodological aspects of the project methodological issues are revealed. For example, a history of a substance as a part of nature; history of industrial production; history of development and establishment of energy saving; life and work of scientists in the field of energy saving and efficiency. These projects form the students' value attitude to integrated knowledge, broaden their horizons and establish interdisciplinary communication to reconstruct the complex evolution of scientific knowledge, to show the value and role of scientific prediction. The environmental aspect allows to expand the role of science in the fight against environmental problems; to attract students' attention to research on the state of the environment; foster a sense of personal responsibility for its preservation. Working on the project, students build the environmentally focused axiological competence, live and work without destroying the world, consciously participating in nature protection. Applied aspects of the project allow to give meaning to learning activities, to expand scientific and technical outlook. Applied research projects are easy to implement in such areas as energy and manufacturing; use of energy sources in industry; energy-saving technologies in heating, water, gas, and electricity supply, maintenance of microclimate.

The mentioned aspects may be integrated into one project. This is the specifics of energy-saving technologies project-based learning. The procedure of the project includes, as a rule, five stages: exploration, analysis, practice, presentation and control.

Axiological competence possesses various characteristics, which were discussed above. In this paper, we consider the possibility of building valuable attitude to scientific knowledge in the context of the main learning stages. This process is considered in the context of energy-saving technologies project-based learning for graduate students with a major in Biotechnology.

Graduate students have not received topics for group projects immediately. Initially, they were offered exemplary individual mini-projects, such as "Energy as a cultural phenomenon", "The most important regularities in the development of energy conservation and efficiency," "Development of state power supply ", "Problems of nuclear energy", "The problem of clean fuels", and others. Then graduate students performed group projects according to their choice from the following list: "Alternative and renewable energy in the energy economy of the state," "Power management and energy efficiency in the urban economy", "Energy saving management of industrial enterprises", "Energy supply and energy efficiency in agriculture" "Energy-saving technologies in crop and mobile energy", "Energy-saving technologies in animal husbandry and stationary power."

3.Conclusion

The effectiveness of using project-based learning for building axiological competence (the ability to accept natural sciences as a value) was determined by three main criteria (education, motivation and activity). The obtained results show the positive dynamics in the development of abilities to identify the problem and plan the work, search (research), communication, presentation and reflective skills that are so important for graduate students.

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