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PROJECT-BASED TECHNOLOGY FOR THE DEVELOPMENT OF CREATIVITY IN FUTURE TECHNOLOGY TEACHERS

Abstract

The issue of developing an individual's creativity is an important objective in the training of future technology teachers, as it reflects the professional formation of a specialist who must be competent in pedagogical activity and creative in project-based and technological work. The development of students' creativity is one of the key factors contributing to successful learning, further adaptation to changing life conditions, and professional success.

The purpose of this article is to substantiate project-based technology as one of the innovative pedagogical methodologies that enables the effective development of creativity in future technology teachers.

The importance of fostering creativity in future specialists is emphasized in the educational policy documents of Ukraine, the European Union, and in the declarations of the World Economic Forum. The main objective of teacher education is to train competent and creative teachers who are capable not only of applying knowledge and skills in practice but also of making original decisions in their professional activities, particularly within the framework of the New Ukrainian School.

For a long time, the interpretation of creativity was considered synonymous with творча діяльність (creative activity), while the distinction of this concept and its wider dissemination in the scientific community took place in the twentieth

century. Creativity is the ability to generate new and original ideas and serves as an essential motivational foundation for creative activity.

In the context of developing the creativity of future technology teachers, project-based learning technology acquires particular significance. The successful implementation of project-based technology is determined by the role of the teacher, who acts as a facilitator in organizing the educational process. In the process of training technology teachers, the introduction of the creative project method occurs mainly during the study of elective disciplines within the cycle of professional training, which have an applied orientation.

An important criterion for selecting a project topic is its significance for the student, social orientation, the presence of entrepreneurial potential, practical applicability, and creative potential. Effective types of projects that contribute to the development of creativity in future technology teachers include informational, research, creative, game-based, and practice-oriented projects.

In conclusion, it is emphasized that project-based learning technology creates favorable conditions for the development of creativity in future technology teachers and for the training of specialists with a high level of professional competence and creative thinking.

Keywords: education, learning, project-based technology, creativity, future technology teacher.

Problem statement. The contemporary era requires new approaches to the acquisition of knowledge and its practical application; therefore, the problem of developing the creativity of the younger generation has become particularly relevant, as specialists capable of non-standard thinking are a fundamental prerequisite for the development of modern society. Creativity is becoming an essential component of graduates' competitiveness and their successful professional self-realization. In particular, the importance of fostering creativity in

future specialists is emphasized in the educational policy documents of our state, including the State National Program "Education" (Ukraine of the 21st Century), the National Doctrine for the Development of Education, the Law of Ukraine "On Higher Education", the Doctrine of Balanced Development "Ukraine 2030", and others.

The issue of developing an individual's creativity is one of the important tasks in the training of future technology teachers. Despite the considerable number of scientific studies and publications, the problem of creativity development among future technology teachers remains relevant, since there is still no clearly defined structure or sufficiently developed theoretical and methodological foundations for its enhancement. On the one hand, this problem is associated with the specific features of the development of modern society; on the other hand, it reflects the professional formation of a specialist in the field of technological education, who must demonstrate not only competence in pedagogical education but also a creative approach to project-based and technological activities.

Analysis of recent research and publications. The development of individual creativity has been the subject of extensive scholarly inquiry by numerous researchers. In particular, the scientific foundations of creativity have been examined by D. Bohoyavlenska, J. Guilford, D. Cougar, V. Moliako, O. Ponomaryova, V. Romenets, S. Sysoieva, R. Sternberg, P. Torrance, D. Treffinger, and others. Many Ukrainian scholars investigate the problem of creativity within the broader framework of studies on creativity, creative thinking, the development of creative abilities, and giftedness. Specifically, N. Kichuk conducted a methodological and substantive analysis of the creative personality of a teacher; M. Musiichuk identified pedagogical conditions for the effective development of creative abilities in prospective teachers; H. Siemonova substantiated pedagogical conditions for developing creative abilities of future

teachers based on a learner-centered approach; while H. Ponomaryova, L. Petrychenko, I. Poliakova, A. Kharkivska, O. Antonova, and S. Burchak explored the creativity of prospective teachers within the general theory of creativity.

One of the effective means of fostering individual creativity is project-based learning, which is widely implemented in educational institutions across the European Union. The founders of the project method were Cecil Reddie and Rufus Stimson. A detailed examination of the organization of learning through the project method is presented in the works of J. Dewey, W. Kilpatrick, and E. Collings. The development of the project method in domestic schools is associated with the names of V. Ihnatiev, M. Krupenina, V. Shulhin, H. Vashchenko, and E. Polat. Certain aspects of organizing project-based technological activities of prospective technology teachers have been studied by I. Androshchuk, O. Kobernyk, V. Kurok, V. Sydorenko, V. Steshenko, A. Tereshchuk, V. Tytarenko, and others.

Purpose of the article. The aim of the article is to substantiate project-based learning as an innovative pedagogical approach that effectively fosters the development of creativity in prospective technology teachers.

Presentation o f the main material o f the study. In contemporary educational practice, the development of creativity in prospective teachers is regarded as one of the key factors of successful learning, further adaptation of specialists to changing life conditions, and an essential determinant of professional success. Creativity shapes an individual's readiness for change and the ability to move beyond stereotypical thinking. According to V. Pavlenko, in today's world it is crucial that a teacher who effectively fosters students' creativity is themselves a creative individual, striving to overcome patterns and formalism in the teaching process [1]. Thus, the primary goal of modern teacher education is to train competent and creative educators who are capable not only of applying knowledge

and skills in practice, but also of making original decisions in their professional activity, particularly within the framework of the New Ukrainian School.

It is important to note that the problem of developing individual creativity is at the center of attention in pedagogical systems across various European countries and the United States. Early methods for developing creative thinking were proposed by such scholars as J. Guilford, E. Torrance, R. Crutchfield, and E. De Bono, and have been widely implemented in educational practice. A review of the scientific literature indicates that for a long time creativity was interpreted as synonymous with "creativeness" and was associated primarily with the characteristics of the creative process. The differentiation of this concept and its wider adoption within the academic community occurred only in the twentieth century, largely due to the works of J. Guilford, who introduced the term to denote a high level of intellectual ability characterized by the capacity to solve problems rationally and efficiently, often relying on intuition, and valuing irrationality both in oneself and in others. J. Guilford identified the following core indicators of creativity: the ability to formulate problems, generate a large number of ideas, respond to stimuli in non-standard ways, enhance the perception of an object by adding specific details, and solve problems through analytical and synthetic operations [2].

According to a dictionary of foreign words, the term "creativity" derives from the English "to create" and denotes "an individual's creative orientation, readiness to formulate, accept, and generate fundamentally new ideas and solutions that differ from traditional or generally accepted ones" [3]. In a modern explanatory psychological dictionary, creativity (from the Latin *creatura* – creation) is defined as "the ability to generate unusual ideas, deviate from traditional patterns of thinking, and quickly resolve problem situations" [4]. A dictionary of terms and concepts of contemporary education interprets creativity as "a characteristic feature of a creative personality manifested in transforming the

cultural universe, the ability to produce something new: to find novel solutions to problems, new methods and tools, and to create new artistic products" [5].

An analysis of interpretations of the term "creativity" proposed by Ukrainian scholars demonstrates that it is not possible to provide a single, universally accepted definition of this phenomenon. However, these interpretations can be systematized into several groups: creativity as the ability for creative activity, the rejection of stereotypical thinking, and the presence of a certain level of creative abilities and personal potential; the capacity to comprehend and understand novelty without fear of departing from the familiar; the ability to generate ideas and bring them to concrete practical outcomes; the highest level of an individual's intellectual capabilities; creativity not as an innate trait, but as a holistic process that requires continuous development [6].

In agreement with S. Burchak, creativity is understood as an integrative set of personal qualities that motivate an individual toward creative activity and manifest across various domains of engagement; it is considered a relatively independent factor of giftedness and a condition for self-realization. Creativity is the ability to generate new and original ideas; it constitutes a creative capacity and a necessary motivational foundation for creative activity [6].

The development of learners' creative abilities is a key task of the teacher, the implementation of which involves managing processes of creative inquiry, creating situations that foster creative activity and orientation, and promoting the development of imagination, associative thinking, the ability to discern patterns, and a sustained drive for self-improvement and for solving increasingly complex creative tasks. The key aspects of fostering creativity in learners include the following:

1) identifying students' creative abilities, recognizing the uniqueness of each individual, taking into account their individual and age-related characteristics, and emphasizing each student's creative potential;

2) ensuring a supportive and stimulating educational environment characterized by mutual understanding, encouragement, tolerance, and a positive attitude, where students feel openness and freedom in expressing their ideas;

3) recognizing the importance of and actively promoting the development of creative skills;

4) employing tasks that stimulate interest and foster curiosity, thinking, imagination, fantasy, active cognition, and the creative abilities of learners;

5) applying innovative approaches and educational technologies to support and develop students' creative thinking, including the creation of problem-based and non-standard situations, the use of stimulating tasks, interactive methods, the promotion of collaborative learning, and the implementation of innovative practices;

6) encouraging research-oriented activities and fostering students' initiative and independence in expressing their creative ideas;

7) developing a structured work plan that enables effective planning, systematization, and continuous improvement of learning processes.

One of the most effective instruments for achieving the goals of developing learners' creativity is the use of innovative educational technologies, which ensure positive motivation for knowledge acquisition, activate students' intellectual and volitional functions, create situations of success, and provide favorable conditions for full creative self-realization. Among the innovative approaches examined by researchers, particular attention should be paid to the ideas of interactive learning (proposed by O. Pometun and L. Pyrozhenko), project-based technologies (developed by K. Bakhanov, V. Huzeiev, I. Yermakov, O. Piekhota, and O. Kobernyk), and learner-centered education (advanced by O. Savchenko and S. Podmazin).

The updated content, goals, and objectives of technological education necessitate the application of new teaching technologies, methodological

approaches to organizing the educational process, as well as conscious and creative engagement on the part of the prospective teacher. It should be emphasized that the training of technology teachers is impossible without acquiring experience in project-based technological activity, which is recognized as fundamental in technology lessons in general secondary education institutions. During their studies in higher education institutions, students receive essential psychological, pedagogical, and methodological training. However, in the process of designing and manufacturing project-based products, prospective technology teachers significantly enhance their capacity for independent thinking, learn to solve problems arising during design and production processes, develop their communicative skills, teamwork abilities, and capacity for independent decision-making.

In the context of fostering creativity in prospective technology teachers, project-based learning acquires particular significance. The key aspects that substantiate the implementation of project-based learning in the professional training of students include the following:

1) active learning, as project-based learning involves the acquisition of new knowledge and the search for solutions required for the creation and implementation of projects, thereby contributing to more conscious and in-depth knowledge assimilation and the development of students' cognitive activity;

2) the development of critical thinking, since the design process frequently presents tasks that require analysis, evaluation, and critical reflection;

3) interdisciplinary integration, as educational projects may encompass multiple disciplines, facilitating the synthesis of diverse information and the understanding of interconnections among educational components. This not only enhances the assimilation of theoretical knowledge but also promotes the development of key competencies necessary for future professional activity;

4) the development of communication skills, as group work and interaction with peers within project activities foster communication and collaboration abilities;

5) the application of acquired knowledge, since project work engages students in practical tasks and the application of theoretical knowledge in the process of product creation. Moreover, project activities enhance students' ability to navigate the information space through tasks involving the search for relevant technical and technological information;

6) independence and responsibility, as project work promotes the independent construction of knowledge, develops students' abilities to search for, analyze, and systematize information, and make independent decisions, thereby fostering responsibility and a sense of personal significance;

7) motivation, as projects are typically engaging for students, which positively influences their motivation to learn.

Thus, the overarching goal of implementing project-based learning in the system of training prospective technology teachers is not only the transmission of knowledge, but also the development of flexible skills (soft skills), particularly creativity, which will be valuable in their future professional activity.

The effectiveness of applying project-based learning in the preparation of future technology teachers is determined not only by students' activity, but also by the crucial role of the teacher as a facilitator who organizes the educational process. In the course of organizing students' project activities, the teacher performs a range of functions, each of which plays a significant role in the development of the professional competence of prospective technology teachers, particularly in fostering their creativity. These functions can be considered in more detail as follows:

1) support and encouragement. Creating a positive learning environment and situations of success in which students feel valued, and their initiative and

creativity are recognized. This can be achieved by emphasizing the importance of each student's contribution, supporting their ideas, providing verbal praise, and applying various forms of encouragement;

2) assistance in information search. Teaching students how to identify the most relevant resources for their projects and developing their information-search skills is a key task of the teacher within project-based learning;

3) coordination of work. Effective management of group activities, the distribution of tasks according to students' abilities and interests, monitoring the process, and providing timely support constitute an essential function of the teacher in organizing project-based activities of prospective technology teachers;

4) development of creative thinking. This is achieved by proposing tasks and situations that stimulate students to generate new ideas and solutions;

5) consultative role. Providing guidance to students in addressing complex aspects of tasks and offering necessary explanations;

6) assessment. Objective and well-balanced evaluation of students' work, taking into account both the process and the final outcomes, is an important stage in supporting creative inquiry and its further development and refinement.

In summary, the role of the teacher in the project-based activities of prospective technology teachers is to create conditions conducive to students' creative development by enabling them to realize their potential and independently explore topics of interest. In organizing both individual and collaborative project work, the teacher should foster a supportive and friendly atmosphere, anticipate and prevent potential conflicts, and demonstrate the ability to navigate effectively within an interdisciplinary environment.

When organizing project-based learning for prospective technology teachers, at the introductory stage the teacher acts as an initiator, guiding students' activities in the appropriate direction. Gradually, as learners master the fundamental principles and skills of project work, they are involved in discussing

the project topic and, subsequently, in selecting a specific project. In this way, the independent and research-oriented work of prospective technology teachers is significantly intensified, enabling them to participate not only in the implementation of the project, but also in its planning. In groups where favorable conditions for dialogue and discussion are established, students develop the ability to express and justify their opinions freely, even when these differ from those of the teacher or their peers. Thus, the project method has a positive impact on the development and self-realization of learners. An important aspect in this regard is respect for each student and the creation of conditions that facilitate effective knowledge acquisition, the formation of skills, and the development of personal qualities and competencies.

It should be noted that, in the process of training technology teachers, the implementation of the creative project method occurs primarily within the study of elective courses in the professional training cycle, where the outcome of learning activities in specialized disciplines is typically a project. The content of the elective component of bachelor's degree curricula is generally practice-oriented and is implemented through practical forms and methods of instruction, thereby creating favorable conditions for the application of project-based learning. The main requirements for project-based learning in the preparation of prospective technology teachers, particularly with regard to fostering their creativity, include the following:

- the presence of a problem or task that requires the integration of knowledge and the application of creative inquiry for its solution;
- the theoretical and practical significance of project activities;
- the alternation of different types of independent student work (individual, pair, and group) depending on the nature of the task;
- the identification of the structural components of the project and the formulation of its stage-by-stage outcomes;

- the use of research-based teaching methods, which involve defining the problem, formulating tasks, proposing hypotheses, discussing research methods, conducting empirical investigations, analyzing the obtained data, presenting final results, summarizing findings, making adjustments, and drawing conclusions.

An important criterion for selecting a project topic is its relevance and significance for the student, including personal value as well as its usefulness for the family, academic group, faculty, or community. It is also essential to consider the social orientation of the project or its entrepreneurial potential. Designing and producing an item solely for the purpose of mastering a technology or obtaining a grade is deemed inappropriate. The products created by prospective technology teachers in the course of project activities should have practical application, evoke a sense of pride, and reflect their achievements and creative potential.

Within the educational activities of prospective technology teachers, effective types of projects that contribute to the development of creativity include informational, research, creative, role-playing, and practice-oriented projects. It is advisable to begin students' project work with informational projects, which involve collecting specific information, studying it, analyzing, and synthesizing the obtained data. Such projects are characterized by a well-structured design and systematic guidance throughout the process. Students are encouraged to carefully define the project objectives and relevance, select appropriate methods of data collection (including the study of literature, mass media sources, and empirical methods such as conversations, interviews, and surveys), and plan the processing of information (analysis, synthesis, comparison, argumentation, and drawing conclusions). It is also important to anticipate the expected outcomes and determine the forms of their presentation (e.g., classroom reports, essays, conference presentations, or academic publications).

In contrast to informational projects, creative projects are characterized by the absence of a clearly defined structure and evolve toward achieving a planned outcome. Practice-oriented projects, in turn, have a predetermined result, which may include the production of a tangible product or the provision of a specific service. As for role-playing projects, they involve participants assuming roles determined by the project content. For example, if a project is related to the organization of folk or calendar-based celebrations, students may simulate social and professional interactions complicated by hypothetical situations. However, within such activities, all participants are required to address specific technical and technological tasks defined by the instructor.

Research projects are the most complex, as they must conform to the logic of scientific inquiry and possess a well-developed structure. They include clearly defined aims and objectives, a substantiated relevance of the research subject, and its social significance for each project participant, as well as specified research methods and anticipated outcomes. Depending on the number of participants, projects may be individual, pair-based, or group-based. In terms of duration, they may be short-term (spanning several classes), medium-term (up to one month), or long-term (several months). It is important to note that, in the practice of training prospective technology teachers, mixed types of projects are most commonly encountered.

When organizing students' project activities, it is also essential to establish criteria for assessing the quality of projects. This enhances the effectiveness of project implementation, helps to avoid potential difficulties, and allows for timely adjustments. The final assessment of a creative project not only summarizes students' work but also carries significant educational value.

Conclusions. Thus, the formation of a creative and innovative prospective technology teacher, equipped with well-developed critical thinking and the ability to effectively solve a wide range of professional tasks, is impossible without the

integration of project-based learning into the educational process. This approach contributes to the comprehensive development of students, taking into account not only their academic skills but also their social, communicative, creative, and critical thinking abilities. Project-based learning directs students' attention to identifying real-world problems, the solution of which requires research, the results of which serve as a basis for generating original solutions and their creative implementation. In this way, students are able to bring their learning closer to real-life contexts. The process of project work creates favorable conditions for the development of creativity in prospective technology teachers and for preparing specialists with a high level of professional competence and creative thinking.

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