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DIGITALIZATION OF TECHNOLOGICAL EDUCATION IN THE CONTEXT OF THE INFORMATION SOCIETY

DIGITALIZACIÓN DE LA EDUCACIÓN TECNOLÓGICA EN EL CONTEXTO DE LA SOCIEDAD DE LA INFORMACIÓN

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ABSTRACT

The article analyzes the existing formats of project activities in the field of technological education. An innovative component of the project activities organization model has been developed - a digital environment for supporting project activities of future teachers of technological education, ensuring the formation of digital aspects of competencies. A set of pedagogical conditions aimed at achieving a new result of project activities has been developed and substantiated. Experimental work has been carried out to implement project activities of future teachers of technological education. Design and creation of an innovative component of the model for organizing project activities of future teachers of technological education - project activities based on social networks allows taking into account the modern information behavior of future teachers who actively use social networks in everyday life. Project activities - an environment designed by a teacher (based on social network technologies) allows integrating combinations of educational and extracurricular (professionally oriented) activities. The possibility of using the digital environment as a tool to support project activities of future teachers of technological education is substantiated. A set of pedagogical conditions necessary for achieving a new result of project activities is substantiated.

Keywords:

Socio-political information, network technologies, mediatization, convergence.

RESUMEN

El artículo analiza los formatos existentes de actividades de proyecto en el ámbito de la educación tecnológica. Se ha desarrollado un componente innovador del modelo de organización de actividades de proyecto: un entorno digital para apoyar las actividades de proyecto de los futuros docentes de educación tecnológica, garantizando así la formación de competencias digitales. Se ha desarrollado y fundamentado un conjunto de condiciones pedagógicas para lograr un nuevo resultado en las actividades de proyecto. Se ha llevado a cabo un trabajo experimental para implementar las actividades de proyecto de los futuros docentes de educación tecnológica. El diseño y la creación de un componente innovador del modelo para la organización de actividades de proyecto de los futuros

docentes de educación tecnológica: actividades de proyecto basadas en redes sociales, permite considerar el comportamiento informativo actual de los futuros docentes que las utilizan activamente en su vida cotidiana. Actividades de proyecto: un entorno diseñado por el docente (basado en tecnologías de redes sociales) permite integrar combinaciones de actividades educativas y extracurriculares (de orientación profesional). La posibilidad de utilizar el entorno digital como herramienta para apoyar las actividades de proyecto de los futuros docentes de educación tecnológica es sustancial. Se fundamenta un conjunto de condiciones pedagógicas necesarias para lograr un nuevo resultado en las actividades de proyecto.

Palabras clave:

Información sociopolítica, tecnologías de red, mediatización, convergencia.

INTRODUCTION

he modern era is increasingly characterized by the emergence and consolidation of what is commonly referred to as an information society, a post-industrial society, or more specifically, a digital society. In this context, the digital economy is not only developing rapidly but is also asserting itself as a dominant force shaping contemporary economic, social, and educational landscapes. This marks a significant new stage in the evolution of digital technologies, which are now deeply embedded in nearly every sphere of life, including industry, commerce, governance, communication, education, and culture.

The accelerating pace of digital transformation imposes growing demands on individuals and institutions alike. In order to navigate, participate in, and contribute meaningfully to this evolving digital ecosystem, people must acquire a new set of competencies that go far beyond traditional knowledge and skills. These include, but are not limited to, digital literacy, critical thinking, adaptability, creativity, problem-solving, technological fluency, and the ability to collaborate effectively in virtual and interdisciplinary environments. In other words, the 21st-century individual—particularly the future educator—must be equipped not only with subject-specific expertise, but also with the ability to integrate digital tools meaningfully into teaching and learning processes.

In this regard, the foundation for researching the application of the project-based method in the professional training of future teachers of technological education is rooted in a comprehensive analysis of several key areas. Firstly, it requires a thorough understanding of the historical and contemporary development of professional pedagogical education. Secondly, it necessitates an exploration of the evolution and pedagogical significance of project-based learning within the subject area of "Technology," which emphasizes practical, creative, and design-oriented tasks. Thirdly, it involves examining how digital environments can enhance or transform the training process by offering new platforms, tools, and opportunities for learning, collaboration, and innovation.

Thus, the current research initiative emerges at the intersection of pedagogical tradition and technological innovation. It seeks to investigate how the integration of project-based learning methods within digital educational environments can contribute to the formation of highly competent, adaptable, and innovative educators. These future teachers must be prepared not only to transfer knowledge, but also to inspire creativity, foster autonomy, and facilitate the acquisition of lifelong learning skills among their students—skills that are indispensable for active participation in a digital and knowledge-driven society.

The focus of modern scientists is on the use of information and digital technologies in the educational process: joint network activities of educational entities (Stevens, 2007; Batagan et al., 2011; Lunenburg & Ornstein, 2012; Gioffre, 2017; Krasnenko, 2020).

Of particular importance for our study are the works of such authors as: (Bray, 2007; Fnu, 2023; Acosta et al., 2025; Casimiro et al., 2025) and others, which examine the organization of e-learning in educational institutions of various levels from different angles and show the high efficiency of this form of organizing the educational process.

In pedagogical research, researchers pay special attention to the issues of transforming the activities of subjects of the educational process in the context of a digital educational environment, new values and meanings, and changing the role of a teacher and a student. However, it should be noted that methodologically sound approaches and theoretical foundations for training future teachers of technological education to use digital environment resources when implementing the project method are insufficiently developed.

Thus, despite the development of individual theoretical and methodological approaches to using the project method in training future teachers of technological education, there is a need and opportunity to improve the model for organizing students' project activities: ensuring the formation of the readiness of a future teacher of technological education to implement digital educational interactions, building horizontal connections between subjects of the educational process in professional activities. In this regard, a scientific search for a set of pedagogical conditions that ensure the implementation of such a model is required.

The analysis of scientific, pedagogical and methodological literature, practical experience in training future

teachers of technological education, in comparison with the study of modern trends in digitalization and transformation of technological education allowed us to identify a number of contradictions between:

1. the rapid development of technology and the objective need to include future teachers of technological education in the process of mastering advanced computer tools and digital instruments for successful application in their own professional pedagogical activity;
2. the objective need for active participation of future teachers of technological education in the implementation of their own project activities and their insufficient involvement in the development of projects in the educational process;
3. between the capabilities of the modern digital educational environment and its insufficient use for the targeted organization of project activities of future teachers of technological education.

The above contradictions outlined the research problem, which consists in developing the readiness of future teachers of technological education to solve new problems of professional activity related to project activities in the context of digitalization.

The purpose of the article: development and experimental verification of the effectiveness of a digital environment to support project activities of future teachers of technological education.

The object of the article: project activities in the professional training of future teachers of technological education in the context of digitalization of education.

The subject of the article: a digital environment to support project activities of future teachers of technological education as a means of developing skills for building project-based educational interactions in a new format.

The hypothesis of the study is the assumption that in order to achieve new goals, demands for training modern specialists in the context of a changing labor market, the development of the digital economy, it is necessary to introduce a digital support environment into the project activities for training future teachers of technological education, along with an instrumental environment that contributes to the formation of basic competencies, aimed at:

- taking into account the modern information behavior of future teachers;
- forming digital aspects of competencies implemented through new forms of organizing project activities and enriching its content;
- structuring, visualizing and evaluating the stages of project implementation to improve the project implementation process;
- transforming the project implementation process by strengthening interactions outside the audience; which allows achieving a new quality of the planned results of professional training.

MATERIALS AND METHODS

To solve the set tasks, a set of research methods was used: theoretical (analysis of psychological and pedagogical literature, study of the content of articles, regulatory documents, dissertation research, structuring and comparison of domestic and foreign pedagogical experience, modeling); empirical (observation, questionnaires, study of the products of the activities of future teachers of technological education, pedagogical experiment) and mathematical methods of processing statistical data.

The methodological basis of the study is based on the activity-based and environmental approaches: based on the theory of human development in activity, the work examines the content of project activities of future teachers of technological education; based on the theory of the influence of educational environment conditions on the development of the student, the use of specially created project activities of future teachers of technological education aimed at the developing subject, his requests and educational needs is studied.

RESULTS AND DISCUSSIONS

Based on the theoretical analysis of regulatory documents and pedagogical research addressed to the problems of project activities in the professional training of future teachers of technological education, a conclusion is made about the need to transform the content, forms and methods of implementing project activities in connection with the new conditions and aspects of the professional activity of a future teacher of technological education associated with the processes of digitalization of education. The role of project activities is emphasized: the project method is becoming the leading method in all types of educational activities, which contributes to the formation of a culture of project and research activities in students (Pukhno, 2024).

Transformation of the subject area «Technology», modernization of educational programs, determines the need to train a specialist capable of carrying out professional activities in conditions of uncertainty, ready to carry out continuous self-education in the formation of key competencies of the digital economy. This determines the need for advanced training of future teachers of technological education, ready to carry out professional activities not only in the traditional classroom, but also in the new digital environment (Mykolaiko, 2023).

The purpose of the developed model is to provide organizational assistance to the teacher in preparing future teachers of technological education for professional activities in the context of digitalization of education. The model of organizing project activities in preparing future teachers of technological education includes traditional components: content, organizational, motivational, instrumental and evaluative-effective, as well as an innovative component: a digital environment for supporting project activities. Based on the digital environment, the innovative contour of each component is updated, determining: new content, new forms of organization, new values and motivations, new tools, as well as the exit of project activities beyond the educational process, as a result of which new products of activity and new results can be obtained, consisting in new content, new forms of organization of project activities, new motivations and satisfaction with the activities by the students themselves; finding personal meanings, forming new digital competencies, mastering the skills of working in those areas that are in demand in the modern digital society (Pukhno, 2024).

To include future teachers in the implementation of projects, integration of educational and extracurricular activities, accumulation of digital traces that allow the teacher to carry out step-by-step monitoring of the educational process, support those who are experiencing difficulties, and for the future teachers themselves to reflect on the results achieved, closing "horizontal" feedback loops, mutually evaluating and commenting on the results of the partners' activities.

The formation of the involvement of the future teacher of technological education in extracurricular project activities can be revealed through independent work.

Basic, advanced and high levels of inclusion of the future teacher of technological education in extracurricular project activities are defined. The level of involvement was assessed by the following assessment criteria: cognitive, motivational, activity. Each of the criteria has a system of indicators characterizing the manifestation of the studied qualities according to this criterion. The degree of manifestation of indicators for each criterion is measured using measuring instruments (indicators) and certain research methods.

With the help of the cognitive criterion, knowledge, ideas of future teachers of technological education about project activities, understanding of the essence of project tasks are revealed; a qualitative assessment of knowledge is made (awareness; systematicity; effectiveness). With the help of the motivational criterion, the desire of the future teacher to prove himself as a creative person, the presence of interest in project activities is determined. The activity criterion reveals the ability to plan and implement creative project tasks, think imaginatively, originally, and unconventionally; qualitative assessment of project activities (Shapoval et al., 2021).

At the ascertaining stage, which included a pilot study of the involvement of future teachers in the development of projects within the framework of extracurricular activities, the motivation and predisposition of students to implement project activities outside the classroom environment were identified.

The results of the analysis revealed insufficient involvement of future teachers in the implementation of projects, since only 30% are involved in extracurricular project activities and are active members of student communities. Thus, the organization of project activities in the preparation of future teachers of technological education is not carried out effectively enough and it is necessary to develop special pedagogical conditions that contribute to its effective development.

During the first sub-stage, the project activities of future teachers of technological education were designed, developed and implemented into practice, and initial diagnostics of implementation was carried out. In the process of development, the structure, basic platform and functions of the digital environment, as well as resources were defined: information (products of students' activities, digital educational objects, regulatory documents); management of educational and cognitive activities aimed at regulating independent project activities of future teachers (services for planning activities; services for organizing independent activities; services for structuring information and organizing communications; services for recording and setting deadlines for submitting the results of project activities); accumulated communication resources (in the process of discussing completed assignments through commenting and assessing in the relevant thematic sections; inclusion in various events through the news feed; support for the project activities of future teachers through personal messages and special services; establishing and maintaining feedback through Google forms, e-mail; presentations of intermediate results of work on the project through online services.

The project activities were organized in the form of blended learning: distance video lectures based on the Moodle platform; laboratory classes in the classroom and organization of extracurricular independent work based on the Moodle platform with an exit to project activities (remotely) (Khitskov et al., 2017). The tasks of independent work were aimed at forming digital competencies through working with digital tools and editors; at developing horizontal interactions and forming "senior-junior" connections through presentation, commenting and

information exchange between subjects of the digital environment; at implementing external assessment by external partners of another department; at supporting and accompanying the activities by the teacher. The extracurricular activities were updated through the information part of the digital environment (Alforova et al., 2021).

The results of the comparative analysis of the monitoring data allow us to state that the absolute increase in the level of inclusion after the implementation of the increased level of the motivational criterion is 5.8%, the cognitive criterion is 17.7%, the activity criterion is 17.6%; at a high level of the motivational criterion it is 17.7%, the cognitive criterion is 23.6%, the activity criterion is 41.2%.

In addition to studying the level of inclusion of future teachers of technological education in extracurricular project activities according to the developed criteria and indicators, a network analysis of project activities was conducted, as well as an analysis of digital traces and developed projects of future teachers of technological education, which helped to identify new educational effects of the results of introducing the designed digital environment into educational practice. Network analysis was carried out using classical statistical tools (number of links, correlation analysis) in order to study relationships within the network using special indicators - network metrics. Network analysis, as well as analysis of digital traces, made it possible to track the dynamics of inclusion of future teachers in work on the project in a new format that goes beyond the classroom environment. The analysis was carried out using the main network metrics: audience involvement, audience activity, attendance and views, analysis of posts. The data obtained showed sufficient involvement of future teachers in viewing educational content, which indicates the relevance, usefulness and interest of the target audience in the published material; average level of audience activity, increasing during the period of preparation and submission of final works; high rate of views and attendance, and as a result of network analysis of publications, we concluded that the most popular are publications with a presentation of intermediate and final results of project activities and exchange of opinions with colleagues. Analysis of the products of the activity allowed us to conclude that technical skills in using digital technologies were formed in 94% of future teachers who successfully passed the interim certification procedure; the ability to meaningfully use digital technologies for work and study was also formed in 94%, but at different levels: excellent - 70%, good - 24%; motivation to participate in project activities in a new format was assessed by such qualitative indicators as: readiness for increased labor costs, demonstration of initiative in additional search for information; independent search and study of new technologies and tools. The results indicate an average level of the motivational aspect, while the results of joint reflection showed that 47% of the group have high motivation to develop the developed project in this format, which is also confirmed by the results of the initial diagnostics (45% wanted to engage in multimedia (music and video art) projects).

It has been established that when implementing certain pedagogical conditions in the training of future teachers of technological education, inclusion in extracurricular project activities has a positive trend.

An innovative component of the model for organizing project activities in the training of future teachers of technological education has been developed - a digital environment for supporting project activities.

It has been established that one of the forms of pedagogical support for project activities of future teachers of technological education, expanding the space of project interaction of subjects of the educational process.

The effectiveness of implementation in the training of future teachers of technological education has been experimentally proven.

Thus, the study confirmed the hypothesis put forward, and the positive dynamics of the results allows us to assert that the objectives of the study have been fulfilled, the goal has been achieved. The conducted study does not exhaust all aspects of organizing project activities of future teachers of technological education. The issues of advanced training of future teachers of technological education in the context of digitalization need further development, namely: issues of studying educational relations between subjects in the digital space; issues of personalized training of future teachers of technological education, ensuring the transition from external management to mutual management and self-management; further study of the role of digital tools and digital resources in project-based professionally oriented activities.

Scientific results of the text are:

1. Design and creation of an innovative component of the model for organizing project activities of future teachers of technological education - project activities based on social networks - allows us to take into account the modern information behavior of future teachers who actively use social networks in their everyday lives. Project activities - an environment designed by a teacher (based on social network technologies) - allows integrating a combination of educational and extracurricular (professionally oriented) activities.

2. The use of project activities in professional training improves the quality of the planned universal and general professional competencies through the introduction of new digital objects, tools, and interactive forms of

presenting information into the content of project activities. The new quality of the planned results is manifested in the formation of digital aspects of competencies: skills in building educational interactions in the digital space, acquiring experience in using digital tools when creating computer models (projects).

3. Transformation of project activities of future teachers of technological education is ensured by the implementation of the following pedagogical conditions:

a. the desire and readiness of the teacher to work in a classroom environment: design, create and maintain the environment; monitor and implement through correction the activities of future teachers of technological education;

b. create a clear and convenient structure reflecting the stages of project activities that involve the presentation of practical results of the work: the stage of practical implementation and defense of the project. Support for visualization of intermediate and final results, as well as assessment of the implementation of these stages allows to improve the project implementation process;

c. ensure a variety of communication channels that allow: - to build and develop horizontal connections;

- to carry out information and organizational pedagogical support for the future teacher of technological education in choosing the object of design or inclusion in existing projects;
- implement joint activities based on special network services.

4. Application at certain stages of project activities allows to transform the process beyond the audience: to create digital connections and interactions between future teachers of technological education and teachers (discussion, evaluation, commenting), accumulate evaluative opinions that demonstrate a personal attitude, positions of subjects of the educational process (preserved in the form of digital traces). Analysis of digital traces allows teachers and students to adjust their learning activities.

CONCLUSIONS

An innovative component of the model for organizing project activities of future teachers of technological education has been developed and implemented - a digital environment for supporting project activities, ensuring the actualization of new contours of traditional components of the model.

Pedagogical conditions aimed at achieving a new result of project activities are substantiated; as well as the use of project activities in the preparation of future teachers of technological education, ensuring the integration of educational and extracurricular activities, the inclusion of participants in the educational process in innovative activities. Criteria (cognitive, motivational, activity) and indicators of the levels of inclusion in extracurricular project activities (basic, advanced, high) of future teachers of technological education are defined.

The possibility of using the digital environment as a tool to support project activities of future teachers of technological education is substantiated. A set of pedagogical conditions necessary for achieving a new result of project activities is substantiated.

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