UDC 378.147.091.33-027.22:[005.53:004.9]

Liudmyla Nezhyva
Doctor of Pedagogical Sciences, Professor of the Department of Primary Education
Borys Grinchenko Kyiv University, Kyiv, Ukraine
ORCID ID 0000-0001-9520-0694
l.nezhyva@kubg.edu.ua

Svitlana Palamar
Candidate of Pedagogical Sciences (PhD), Senior Research Officer, Deputy Dean of Faculty of Pedagogical
Education responsible for Scientific work
Borys Grinchenko Kyiv University, Kyiv, Ukraine
ORCID ID 0000-0001-6123-241X
s.palamar@kubg.edu.ua

Nataliia Semenii
PhD of Pedagogical Sciences, Senior lecturer of the Department of Primary Education
Borys Grinchenko Kyiv University, Kyiv, Ukraine
ORCID ID 0000-0003-0095-8449
n.semenii@kubg.edu.ua

THE USING OF DIGITAL TOOLS IN THE PROJECT ACTIVITIES OF STUDENTS OF PEDAGOGICAL SPECIALTIES OF HIGHER EDUCATION INSTITUTIONS

Abstract. The article substantiates the importance of projects for forming future teachers' readiness to work in the conditions of the «New Ukrainian School» reform, particularly the organization of project-based training. The possibility, suitability, and effectiveness of using digital tools at various stages of the design activities of education seekers to achieve quality results were analyzed. Digital resources Canva, TickTick, Harvest, Miro, Piktochart, Prezi, and Visme, were tested in the process of project training on professional methods of students majoring in «Primary Education» of the Faculty of Pedagogical Education of Borys Grinchenko Kyiv University.

The main criteria for selecting digital tools were: simple interface (so students can master its functionality faster); compliance to the State Standard for Primary Education; didactic value; accessibility (the age of pupils and the ability to comprehend tasks developed with the help of the proposed digital tools were taken into account); technical and methodological support (present on all proposed digital resources, which facilitates understanding of their interface); very important criterion is the wide functionality on a free basis; the ability to adapt in various modern conditions during offline and online learning.

For increase students' readiness to use digital tools during project activities, the authors developed an methodology for using digital tools at each stage of work on projects and investigated their effectiveness. The use of digital resources is aimed at forming subject-methodical competence, as well as improving students' digital literacy, and the ability to work in a team, make decisions effectively, and distribute responsibilities among group members.

The effectiveness of the developed methodology was checked by conducting input and final monitoring. The results of the final monitoring showed significant differences in favor of the developed methodology for providing material to students during the implementation of project activities, which indicates the effectiveness of the introduction of the latest digital tools into the educational process.

Keywords: digital tools; project activity; professional education; subject-methodical competence; training of primary school teachers.

1. INTRODUCTION

Formulation of the problem. The world is constantly changing, giving more and more opportunities to use effective technologies in education to rapidly socialize education seekers, preparing them for the realities of life and professional activity. Socio-economic conditions

present higher pedagogical education with the task of training competitive teachers who can flexibly solve professional tasks, competently work with information, and effectively organize educational activities, in particular within project-thematic training. The project method plays an important role in the formation of students' readiness to work under the conditions of the «New Ukrainian School» reform.

The effectiveness of project-based learning at various levels of education is confirmed by world practice. Project-based learning is gaining more and more momentum, as it is very effective and relevant in both teaching and learning. Authoritative studies show that after its successful implementation, students' motivation to study improves and the level of achievement increases [1] - [4]. Also, this form of work helps to implement the task of career guidance of education seekers, and promotes the development of cooperation, communication, and teamwork skills [2]; [4]. According to Ukrainian scientists, the problem of forming a «project culture» is gaining relevance for the education system, «because it meets the needs of forming a new quality of a modern person and developing the creative activity of the subjects of the educational process» [4, p. 7]. Modern teachers pay special attention to project activities and the development of project thinking as «the art of planning, invention, the transformation of the world based on pre-planned projects» [4, p. 8].

Projecting is a special type of educational intellectual activity, which involves the activation of cognitive activity in students initiative. It develops of analysis and synthesis skills, as well as the identification of creativity. Also method formats of a desire for self-education and cooperation in the process of researching various sources, independently searching for them on the Internet. By implementing the tasks of the educational project, students learn to consciously plan their research, analyze and compare phenomena, make balanced and rational use of the latest sources, media, and the Internet, make generalizations and conclusions, defend their views, as well as effectively use digital resources at various stages of project activities to achieve quality results. Project-based learning involves not only the acquisition and systematization of knowledge but also creativity. The result of the project implementation is the creation of its product with the possibility of its practical application. For students of pedagogical specialties, it can be prepared and demonstrated a video film, a knowledge map, a photo collage, a lap book, a quest, a board game, the development of tasks and tests for students using modern applications (Learning Apps, Online Test Pad, Quizizz, Wordwall, etc.), a multimedia presentation or a thematic publication in the form of a newspaper, booklet, magazine, collection, etc. Under the condition of quality production, such digital content will complement the methodological portfolio of future primary school teachers.

Digital resources in primary school can be used to solve a wide range of educational tasks: to present educational material in an interesting and interactive way; to create individual learning paths for students; to facilitate distance learning. Modern education is implementing the following innovations in the use of digital resources in primary school classes: using virtual reality; using machine learning services to create adaptive tasks; using mobile devices for learning on the move.

Using digital resources in the elementary school lessons have the following benefits: improve learning; develop pupils' creativity; prepare pupils for life in the digital world; develop their creativity and creativity.

Applying digital resources in the classroom in primary school requires certain skills and knowledge from teachers. Teachers need to be able to use digital resources to solve learning tasks, as well as understand their potential and limitations.

Reforming higher pedagogical education and the Concept of a new Ukrainian school requires the use of effective technologies, methods, and techniques in the system of professional and practical training of future teachers and a creative approach to the implementation of educational tasks. This approach involves the organization of project activities of education

seekers with the activation of their cognitive, research, creative, and inventive activity and ensuring the systematic integrated development of professional competencies, among which information-digital and subject-methodical ones are of particular importance. So, the problem of opportunities and effective use of digital tools in the process of organizing project activities of future teachers determines the relevance of this research.

Analysis of recent studies and publications. The problem of development and implementation of project technologies was investigated by O. Onoprienko, O. Kobernyk, V. Kyrychuk, O. Prashko, O. Smotrin, S. Marchenko, I. Ermakov, L. Zazulina, G. Isayeva, and others. In particular, O. Onoprienko considers the concept of «project activity» in two aspects: «1) in the context of pedagogical design as a process of development by individual teachers or groups of teachers of goals and constructive schemes for their achievement, theoretical models - educational programs and methods of their application; 2) as a project activity of students — a component of educational activity, which has only some features of professional pedagogical activity» [1, p. 11]. The scientist emphasizes that the goals of the activity determine the design, planning, and prediction of the result. Following this system of goals, the author structured the content of the project activity of the subjects of education according to the following stages: «1) formulation of the leading problem and goal of the project activity; 2) planning the content of project activities; 3) finding out ways to solve the problem; 4) obtaining the result of activity» [1, p. 18].

V. Kyrychuk, V. Nedilko, S. Rudenko, O. Prashko, V. Smotrin, and others considered the peculiarities of the organization of socio-pedagogical planning. The authors classified the types of projects, described the practice of their use in the activities of the educational institution, and paid special attention to the professional self-determination of students in project activities. The manual substantiates the use of career guidance projects that expand the scope of professional interests and the formation of professional orientation; ensure mastery of professional skills and abilities; contribute to the formation of professional self-awareness and adequate self-esteem [3, p. 195].

Some aspects of the organization of project activities in the process of professional training of various qualified workers were highlighted in scientific works by domestic scientists V. Anishchenko [4], M. Artyushina, T. Herlyand [5], N. Kulalayeva, M. Mykhnyuk, G. Romanova, M. Shimanovsky [4] and others. The scientists substantiated: the theoretical foundations of project-based learning in professional education institutions, namely the main approaches, and principles, didactic and social-psychological conditions (M. Mykhnyuk, M. Artyushina); peculiarities of development and application of project technologies of professional training (M. Romanova); method of project training for professional training of qualified workers (T. Herlyand, T. Pashchenko, L. Romanov) [4]; the methodology of modeling skills formation based on STEM projects, which describes the stages of the project and the effectiveness of its implementation in the educational process of a higher school (O. Semenikhina, M. Drushlyak, and I. Shishenko) [6]; etc.

N. Lyubchak focuses attention on the peculiarities of the use of project technologies in the educational process of higher education institutions, namely: the requirements for their use, the sequence of activities of the teacher and the student in the process of implementing the project technology of learning and the system of actions of the teacher and students at various stages of work on the project [3]. O. Kobernyk substantiated the essence of pedagogical design and project technology, defined general approaches to step-by-step design; revealed the possibilities of using project technology in the system of higher pedagogical education. The researcher considers pedagogical design «as an individual activity of the teacher, aimed at the preliminary development of the main elements of the pedagogical situation or a holistic pedagogical process: goals and tasks, plan, organizational forms, methods and means, forms and methods of control, correction, and evaluation of the results of pedagogical and educational

work» [7, p. 14]. According to the scientist, the object of pedagogical design can be a pedagogical system, process, technology, method, task, situation, or content of education, curriculum, textbook, study guide, etc.

Despite the large number of scientific publications on the problems of project-based learning, there is no systematic study of digital resources, the use of which will ensure the quality of development and the effectiveness of project implementation. Therefore, in this study, we will rely on the experience of using ICT and individual digital tools in the practice of student education. These issues were highlighted in the works of V. Bykov, S. Lytvynova, V. Lugovoi [8], R. Gurevich, L. Konoshevskyi, and N. Opushko [9]. The study of L. Nezhiva, S. Palamar [10], and T. Kachak [11] is dedicated to the analysis of the features of the use of digital tools in the process of organizing integrated with the teaching methodology of literary education of future primary school teachers. The application of IR technologies in the context of the formation of subject-methodical competence of future primary school teachers is highlighted in the author's works of L. Nezhiva, S. Palamar [12].

The work of domestic scientists confirms the views of modern foreign scientists. Investigating the effectiveness of the implementation of project-based learning in higher education, Pengyue Guo, Nadira Saab, Lysanne S. Post, and Wilfried Admiraal conducted a theoretical analysis of empirical research by specialists in various fields and determined that insufficient attention is paid to the application of project-based learning methods in higher education. The results of the study proved that PjBL has a more positive effect on the academic achievements of students than traditional teaching [13].

The meta-analysis of the importance of project activities for increasing the level of academic achievements of students by scientists Cheng-Huan Chen and Yong-Cih Yang is fundamental. The main idea of the conducted meta-analysis was to prove the effective impact of project-based learning on student achievement. During the implementation of projects and demonstration of the final product, students gain knowledge that they lack, demonstrate independence, and acquire life skills [14].

Emphasis on the formation of self-reflection in students during the implementation of project activities is considered by scientist B. Altay [15]. Raz Shpeizer defines the fundamental goal of the project as the intensity of learning, that is, the focus is on the process of developing the project itself, during which students demonstrate their independence, show activity, and develop active communication skills to achieve a common goal [16].

Scientists J. Peng, M. Sun, and B. Yuan note that project-based learning directly affects students' higher-level thinking. They conducted a comparative analysis of the impact of project-based learning on students with different levels of academic success. They found that students who had a low level of success made more progress in the quality of project products and thinking skills than students with average and high levels of academic achievement. In their opinion, visible thinking approaches have the potential to make higher-order thinking processes accessible to students [17].

Analysis of research by scientists in higher education in various specialties identified the following advantages of PjBL (project-based learning):

– increasing the level of knowledge and skills (Costa-Silva, Cortes, Bachinski, Spiegel & Alves [18], T.-Y. Mou [19]);
– self-efficacy for the subject of study (Costa-Silva, Cortes, Bachinski, Spiegel & Alves [18], I. Bilgin, Y. Karakuyu, Y. Ay [20]);
– increasing the level of motivation to study (M.-J. Terron-Lopez, M.-J. García-Garcia, P.-J. Velasco-Quintana, J. Ocampo, M.-R. Vigil Montano, M.-C. Gaya-Lopez [21], M.E. Beier, M.H. Kim, A. Saterbak, V. Leautaud, S. Bishnoi, J.M. Gilberto [22]).

Therefore, the analysis of the sources of domestic and foreign scientists proved that the question of the effectiveness of using specific digital tools in the project activities of future

teachers, in their preparation for the implementation of the content and tasks of the New Ukrainian School, remains insufficiently covered.

The study aims to check the effectiveness and substantiation of the prospects for the use of digital resources in the process of professional training of primary school teachers for the organization of project-based learning.

To achieve this goal, it is necessary to solve the following tasks:

– to analyze scientific publications on the problem of organizing project activities of students of different levels of education and the use of digital technologies in the practice of education;
– explore the interface, the arsenal of functions of digital tools that: help to plan, structure, and organize joint work during the creation and implementation of projects; create digital educational content, and didactic media products and creatively present them;
– to monitor the readiness of students of the «Primary Education» specialty to use digital tools during the implementation of project activities.

2. RESEARCH METHODOLOGY

To determine the state of readiness of future primary school teachers to implement project activities using digital resources, we conducted a survey using the Google Forms tool, in which the participants answered the questions, and we interpreted and quantitatively analyzed them. The hypothesis of our research is to confirm that modern digital resources help to increase the level of subject-methodical and digital competence due to students' training in their use and contribute to increasing the general level of professional competence.

The respondents were bachelor students in the 2nd and 3rd years of studying in the «Elementary Education» specialty in the amount of 98 people. Monitoring was carried out from various professional methods, on which students used digital resources during the creation of projects. The results of the survey showed that the majority of students (87%) use only one resource for preparing projects, and communication during the planning and organization of project activities is not established.

We offer solutions to this problem. We tested the use of digital resources as Canva, TickTick, Harvest, Miro, Piktochart, Prezi, and Visme at all stages of project implementation. Thus, each stage of the student's work corresponded to a certain digital tool that he had to use to effectively prepare for the demonstration of the product of his activity. After the completed work, a cross-section of students' knowledge and skills was carried out, and the following results were obtained: out of 87% of people who had a low level of readiness to use modern digital resources during the implementation of project activities, mastered the offered resources and saw opportunities for their implementation in further professional activities. 74% of people demonstrated an average level of readiness to use these resources in project activities, and 26% achieved a high level, which indicates the effectiveness of digital tools implemented in the educational process.

3. RESEARCH RESULTS

The training of a teacher of the New Ukrainian School primarily involves the formation of such professional abilities as modeling the content of the education of younger schoolchildren following the mandatory results of their education; the use of modern methods and technologies for the presentation of the content of integrated thematic and project-based training; selection and use of modern and effective methods and technologies of teaching students; assessment and monitoring of student learning outcomes based on the competency

approach. This is stated in the professional standard for the professions «Teacher of primary classes of a general secondary education institution», «Teacher of a general secondary education institution», and «Teacher of primary education (with a junior specialist diploma)» in the list of job functions of subject-methodical competence [23, p. 6–7].

These tasks are implemented in mixed learning (face-to-face/distance learning, traditional/innovative), as well as projects aimed at researching methodological approaches to learning and effective teaching methods, allowing to demonstrate the skills and abilities of teaching in primary school. Such professional traits as the ability to work in a team, plan, forecast, project, achieve results, and correlate one's activities become more significant than the usual set of knowledge that a student acquires from professional methods. Under the challenges of the reform of the New Ukrainian School, the future primary school teacher needs to learn not only to navigate in the information space, to search and analyze modern methodological literature using E-resources, but also to acquire in the process of professional training creative skills to model and organize educational sessions (offline/online) using modern educational technologies of learning in the conditions of integrated thematic and project learning. In the context of the reform of the New Ukrainian School, this means planning and conducting various experiments involving the formulation and testing of hypotheses by younger schoolchildren; developing and organizing educational games; holding discussions; simulating various interactive exercises and tasks; converting text information into graphic information; creating and filling in «knowledge maps»; word clouds for thematic days and weeks, etc.

Let's consider the digital resources Canva, TickTick, Harvest, Miro, Piktochart, Prezi, and Visme, which were tested in the process of project training on professional methods of students majoring in «Primary Education» of the Faculty of Pedagogical Education of the Borys Grinchenko Kyiv University. The choice of digital tools is determined by the tasks of the project activity of the students of higher pedagogical education in the process of forming subject-methodical competence.

An important and difficult stage of project-based learning is its planning. For more effective performance of this type of activity, modern online tools will be convenient and effective to use, which will help students to properly organize their time and direct their efforts to structure the content part of the educational project.

Among the popular and easy-to-use online graphic design tools is Canva (https://www.canva.com/uk_ua/).With the help of this resource, the student can graphically depict, develop the structure of the project, and determine the time he plans to use for its implementation. The resource provides an opportunity to use templates of free and paid images and quotes, as well as create one's own. Its main goal is to activate the student's activities and teach him/her to plan his time during the implementation of the project. One of the options for organizing work using this online tool is to create a planner.

We offer an algorithm for creating a planner: go to the link to the resource, register with an e-mail, login, find «Planner» among the variety of graphic designs, click on it, and start creating one's planner. One needs to choose the appropriate design, style, elements, and text fonts, and add images, videos, audio, etc. from the many templates displayed on the left sidebar. In the library, one can choose drawings and graphics that are most suitable for illustrating the project activity plan. It is possible to choose a different color scheme, combinations of fonts, etc. After working on the design, one needs to download and save the design in PNG or JPG formats, one can print, edit, and if necessary, change the design.

Canva can be used at all stages of project implementation, its wide arsenal of tools allows for the creation of a variety of project products: comics, infographics, flyers, lesson plans, diagrams, mind maps, presentations, posters, booklets, photo collages, etc. The intuitive interface demonstrates the ease and convenience of using this online tool in the teacher's professional activity.

Another visual tool to help students organize their project work is Trello (https://trello.com/uk/tour).This is a service that allows collection of all tasks, and ideas and creates special boards for discussion based on them.

In this way, it is possible not only to demonstrate one's assets and completed project tasks, but also to exchange materials, set tasks, and see the results of their implementation by each team member. The basis of the interaction between the participants of the project work is a special board. It demonstrates the state of performance of assigned tasks by all project participants. Members can upload files, assign artists, hold discussions, set deadlines, and add comments.

The service is available not only in the web version but also as an application for popular platforms. That is, the arsenal of gadgets for using the application is much wider than in other online services. Using the service allows one to archive already developed projects and start work on new ones. No less important for saving information is the option that does not remove processed cards from the board. In this way, it is possible to see which tasks the group has already completed, and which ones need to be refined. The disadvantage of this application is that its free version has a file size limit of 10 MB. This problem can be solved by adding links to cloud environments. The service is similar to a bulletin board with advanced functionality, which makes it easy to use. Such an online tool helps to organize and plan group activities of students during project implementation.

An alternative to use is the TickTick task manager (https://ticktick.com/home). The service is quite popular, so it is synchronized on all devices. It helps to set tasks for oneself or the team and achieve them. After creating a task, one can assign a specific deadline and make it recur. The ease of use and creation of tasks, and notes both for the day and the long-term perspective will help in the implementation and planning of the project.

The resource provides an opportunity to collaborate in a team with the right of access to tasks. Users share and create to-do lists, add comments, set deadlines, and more. One can also track statistics and the period of task execution, prioritize tasks, view them in the calendar, search by tags, attach files, etc. The main idea of such planning is the formation of students' ability to concentrate on solving a certain task in a certain period. This resource makes it possible to draw up step-by-step and distribute tasks that need to be completed both independently and in a team.

The Harvest app (https://play.google.com/store/apps/details?id=com.mobileapp.harvest&hl=uk&gl=US) is similar in purpose and different in structure. It is focused on tracking the time spent by the student during the implementation of a certain task of the project. For this purpose, a list of tasks is created, and the time spent on solving them is tracked during their execution. At the same time, it is necessary to record the start of work, breaks, and completion of work. All data can be exported to Excel tables. This is how students are trained to effectively allocate their time, understand when he/she is most productive and when the least, and develop the ability to complete tasks according to a set deadline.

Such applications and web tools activate the activity of students and accustom them to systematically solve the tasks that come before them. They are also effective during team or individual work on projects and help when establishing group communication in distance learning conditions.

The online board «Miro» (https://miro.com/) will help to increase the performance of the project during team interaction. This is a service that allows participants to work together at the same time, add images, videos, documents, and texts, draw shapes, highlight the necessary material, use video chat, screen broadcasting, make a presentation, etc. After solving the project task, it is possible to save what was created for demonstration. This resource is not only a successful project implementation tool, but also its product, as it provides an opportunity to

create knowledge maps, presentations, and an interactive whiteboard that can post all the necessary information about the project being developed by students.

Among the options of online tools that can act as a product of project implementation, there can be presentations developed in Piktochart, Prezi, and Visme services.

The Piktochart service (https://piktochart.com/) allows one to create infographics, posters, flyers, reports, and presentations. An interactive presentation can contain graphics and charts with animations that move when one hovers. The program contains variable fonts, graphic elements, photos, etc. The use of the program is justified when demonstrating an analytical presentation that needs to demonstrate quantitative indicators. The advantages of the service are a variety of ready-made presentation templates, instructions for working with the service, and the ability to download a ready-made presentation in JPEG and PNG formats. A significant disadvantage is the lack of an opportunity to work on the presentation offline. The presentation of the project using the specified service will make it animated and visually attractive.

The Internet service Prezi (https://prezi.com/) is different from the usual presentation formats. Despite the English-language interface, as in the previous resource, Prezi, in addition to the online mode, has a desktop version. With the help of the service, dynamic, non-linear interactive presentations are created. The placement of the necessary information and its construction takes place on one canvas with the transition from one part to another using the zoom function (zooming in, rotating, and zooming out of individual objects) of the information on the slides. Slides can contain both text information and video, animation, gif animation, audio recordings, etc. One can work with each element separately: change color, size, add/remove text and much more.

The creative resource provides an opportunity to work online in a group, which is a positive moment when creating a project. In this way, each participant can supplement the slides, and the result of joint work will be a project in the form of a presentation in Prezi. This format allows one to present information in an unusual, creative, and dynamic way. There is a special application for work on a mobile phone. Among the shortcomings of the service is the impossibility of displaying voluminous material with analytical indicators. However, this shortcoming can be solved by the Piktochart service.

The next Internet service that will help to present the project is Visme (https://www.visme.co/). Among its capabilities: the creation of presentations, infographics, analytical reports, flyers, logos, postcards, etc. As one can see, the service combines the functions of previous Internet services. In it, one can implement joint work and upload it to the site in HTML format, which is a significant advantage over previous services. Similar to Piktochart and Prezi services. It is possible to choose templates, pictures, video, and audio, as well as to record voice, vector images, maps, and widgets, with their help one can demonstrate analytical reports. The demonstration of the presentation can take place both in private access and with the help of a link or an insert on the site. The finished presentation can be demonstrated in an offline format, as well as in Prezi and Piktochart. A clear advantage is that the presentation can be viewed and demonstrated from any device.

Table 1.

Peculiarities of using digital resources in project activities

Stages of the project	Project activities	Digital resources	Features of the use of digital resources
Project organization	Identifying the range of interests	Harvest URL:https://play.google.com/store/apps/details?id=com.mobileapp.harvest&hl=uk&gl=US, TickTick URL: https://ticktick.com/home, Trello URL: https://trello.com/uk/tour	Visual tools that help to express in text format the opinions of a group of project participants and to determine a common circle of interests for the further

			implementation of project activities
	Search for areas of activity	Harvest URL:https://play.google.com/store/apps/details?id=com.mobileapp.harvest&hl=uk&gl=US, TickTick URL: https://ticktick.com/home, Trello URL: https://trello.com/uk/tour	Organization of work on the project to develop a clear plan of action and setting tasks for group members
Choosing a project topic	Formulation of the problem	Canva URL: https://www.canva.com/uk_ua/ Piktochart URL: https://piktochart.com/ Prezi URL: https://prezi.com/	Graphic representation of the main idea of the project
Project planning	Drawing up a work plan	Canva URL: https://www.canva.com/uk_ua/ Harvest URL:https://play.google.com/store/apps/details?id=com.mobileapp.harvest&hl=uk&gl=US, TickTick URL: https://ticktick.com/home, Trello URL: https://trello.com/uk/tour Miro URL: https://miro.com/	Development of the project structure
	Determination of performance evaluation criteria	Canva URL: https://www.canva.com/uk_ua/ Prezi URL: https://prezi.com/ Miro URL: https://miro.com/	Presentation design of project activity assessment criteria
Implementation of the project	Information search	Canva URL: https://www.canva.com/uk_ua/ Visme URL: https://www.visme.co/, Miro URL: https://miro.com/	Resources for finding the visual design of the project
	Production of a joint product	Visme URL: https://www.visme.co/, Miro URL: https://miro.com/, Canva URL: https://www.canva.com/uk_ua/ Prezi URL: https://prezi.com/	Creation of presentations, infographics, flyers, logos, leaflets, knowledge maps, lapbook
Summary of the project	Presentation and protection of projects	Visme URL: https://www.visme.co/, Miro URL: https://miro.com/, Canva URL: https://www.canva.com/uk_ua/, Prezi URL: https://prezi.com/, Piktochart URL: https://piktochart.com/	Visual demonstration of the product of the project activity
	Discussion and assessment	Visme URL: https://www.visme.co/ Miro URL: https://miro.com/	Creation of a virtual online board for discussion and evaluation of projects

The specified digital resources and their application for the implementation of project activities make it possible to diversify the educational process and demonstrate the possibilities of using digital resources in professional and educational activities. It is worth noting that the specified resources are offered and demonstrated in the specified quantitative composition, however, the student was allowed to freely choose the tool that was most interesting to him and easier for personal perception.

Assigning specific tools to each stage caters to the unique needs of each phase, ensuring students use the most relevant resources for optimal results.Offering a range of tools within each stage gives students choice and caters to different learning styles and preferences.Tools like Canva, Visme, Miro, and Prezi encourage the use of visuals and graphics, making project activities more engaging and impactful.Several tools like Trello, Miro, and Piktochart support collaboration and communication, fostering teamwork and peer learning.

During the research, we focused on the students' ability to use these digital tools in their professional activities, work in a team, develop digital literacy and subject-matter competence. It should be noted that the implementation of project activities by students allowed them to better understand how to implement the project method in their future professional activities.

Before implementing the developed methodology, we conducted an input monitoring with 2–3year students of the Primary Education speciality. The results showed that students did not have structured knowledge and specific skills in implementing project activities using digital tools.
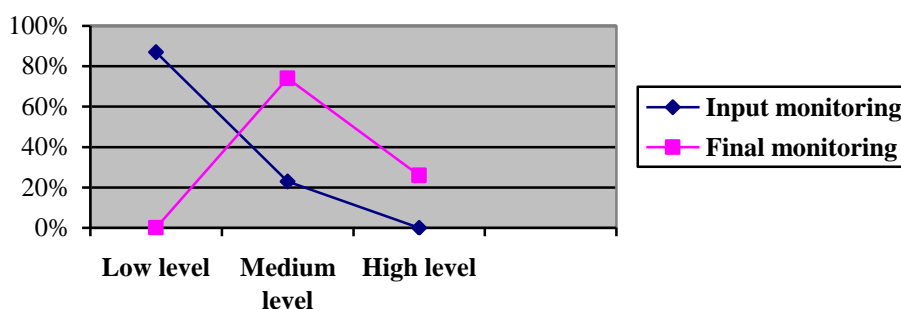

Fig.1. The dynamics of students' readiness to implement digital resources in project activities

Confirmation of the effectiveness of the applied digital resources during the implementation of all stages of the project activity is the result of the initial/final monitoring, which was carried out using a Google Forms survey. His data showed significant growth and awareness of students regarding the researched issue.

During the evaluation, we measured students' knowledge, skills, and attitudes toward the project topic before and after the project was implemented. Tools such as Google Forms facilitated data collection and analysis.

We monitored the quality of student projects, taking into account such criteria as creativity, content accuracy, presentation effectiveness, and teamwork. It is worth noting that all students demonstrated high levels of creativity and active teamwork, which indicates their interest in the digital tools offered and, therefore, their success.

To evaluate the effectiveness of the proposed digital tools, student engagement in the tasks, and cooperation during the project, we analyzed the results of the activities during the implementation of the proposed algorithm.

The survey and interviews with students also helped to determine the effectiveness of the digital tools under consideration. The questions were designed to identify experiences, benefits, challenges, and suggestions for using digital tools.

Thus, the low level of students' readiness to use digital resources in project activities has disappeared. It was 87%, the result on the final monitoring show that it disappeared altogether. The medium level was 23% and growth till 74%. The high level increased from 0% to 26%. The disappearance of the low level and the growth in both medium and high levels point to a successful of the proposed methodology for using digital tools in project activities.Using digital tools in education is an effective way to improve the quality of education. However, it is important to use digital tools correctly so that it can bring maximum benefit.

In the course of the study, we implemented project activities using the digital tools described above. Their effectiveness is confirmed by a survey among students and the finished quality products of projects developed by students.

Some tools may be more effective than others, and the effectiveness of a tool may vary depending on the specific context in which it is used. It is also important to remember that educational technology tools should not be seen as a replacement for traditional teaching methods. Rather, they should be used to supplement and enhance traditional teaching methods.

Here are some tips for using educational technology tools effectively:
- choose tools that are aligned with your curriculum and learning objectives;
- provide students with training on how to use the tools effectively;
- monitor student progress and make adjustments as needed;
- use the tools to create a positive and engaging learning environment.

The integration of digital tools into the project activities of pedagogical students in higher education is rapidly transforming the learning environment. These tools offer many benefits, increasing student engagement, developing their skills, and preparing them for future careers in education.

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The project method is a teaching approach in which students learn by working on real-world projects. It is a student-centered approach that emphasizes learning by doing. Students are given the opportunity to choose their own projects and to work on them independently or in groups. The teacher acts as a facilitator, providing guidance and support as needed.

The project method can be used in any subject area and at any grade level. It is particularly well-suited for teaching skills such as critical thinking, problem-solving, teamwork, and communication.

During realization the project method students are more engaged and motivated; develop deeper understanding of the material; develop important skills such as critical thinking, problem-solving, teamwork, and communication; develop a sense of ownership over their learning etc.

It is a powerful teaching approach that can help students to learn deeply and develop important skills for success in university and in life.

Thanks to the projects in the system of professional pedagogical education, it is possible to create appropriate conditions: independent search by education seekers of methodical content necessary for the implementation of pedagogical tasks; effective application of new knowledge to solve cognitive and practical professional tasks; active development of creative skills of pedagogical modeling; effective use of modern digital tools for organizing project-based learning in primary school. It should be noted that the implementation of methodological projects is an important component of preparing students for pedagogical practice in the conditions of the New Ukrainian School and further professional activity.

The analyzed Internet resources have a wide arsenal of functions and help not only to learn how to plan, structure, and organize joint work during the creation and implementation of

projects, but also to present them creatively. The easy and intuitive interface of the described services and the possibility of free use are their advantages.

Digital tools in project-based learning are a perspective direction for the development of the educational process. It can help future teachers develop the necessary competencies to work in the New Ukrainian School.

The popular digital tools were considered (Canva, TickTick, Harvest, Miro, Piktochart, Prezi, Visme). These tools have a wide range of functions and capabilities, which allows them to be used to solve various design problems. The methodology developed allows the use of certain digital tools at all stages of project implementation: organisation, topic selection, planning, implementation, and evaluation.

We have developed an algorithm for using digital tools at every stage of the project. There are:

1. 1.Project organization – identifying the range of interests, search for areas of activity (Harvest, TickTick Trello).
2. Choosing a project topic – formulation of the problem (Canva, Piktochart, Prezi).
3. Project planning – drawing up a work plan (Canva, Harvest, TickTick, Trello, Miro), determination of performance evaluation criteria (Canva, Prezi, Miro).
4. Implementation of the project – information search (Canva, Visme, Miro), production of a joint product (Visme, Canva, Miro, Prezi).
5. Summary of the project – presentation and protection of projects (Visme, Miro, Canva, Prezi, Piktochart), discussion and assessment (Visme, Miro).

The products of the projects were comics, infographics, flyers, mind maps, presentations, infographics, posters, booklets, photocollages, etc.

The implementation of the monitoring research made it possible to determine that the digital resources offered and used as a basis help students to better understand the structure of project implementation. It is also a way to develop various tasks to improve the quality of the educational process. Among the 98 students who took part in the study, there is not a single one who did not realize the importance of using the proposed digital tools in the implementation of project activities, as reflected in the questionnaire. The dynamics of students' readiness to use digital resources in project activities is positive and demonstrates the following indicators according to the final monitoring: the low level is absent, the medium level has increased by 51%, and the high level by 26%. The presented results demonstrate the effectiveness of the developed methodology.

Prospects for further research are the analysis of mobile applications that facilitate communication between the teacher and students during their planning and creation of projects in elementary school.

Mobile apps are playing an increasingly important role in the educational process, particularly in primary schools. They can be used for a variety of purposes, including communication between teachers and students. The issues that need to be addressed may include: the analysis of the functionality and capabilities of mobile applications; research on the effectiveness of using mobile applications; identification of the advantages and disadvantages of mobile applications for teacher-student communication; determination of factors that influence their effectiveness in the educational process; development of recommendations for the use of mobile applications.

These are just some of the possible areas of research. The detailed study of this topic can help to improve the use of mobile applications for teacher-pupil communication in primary school and make the educational process more effective and interesting.

REFERENCES (TRANSLATED AND TRANSLITERATED)

[1] O. Onopriyenko, *Project activity in primary school*. Kyiv, Ukraina: CITYPRINT, 2013. (in Ukrainian).

[2] V. Kirichuk et al., *Project technologies of a comprehensive educational institution in the system of the educational process*. Kyiv, Ukraine: Institute of the Gifted Child of National Academy of Pedagogical Sciences of Ukraine, 2014. (in Ukrainian).

[3] N. Lyubchak, « Project technologies: essence and features of use in the educational process», *Bulletin of the Chernihiv National Pedagogical University. Series: Pedagogical sciences,* vol. 122, pp. 144–150, 2014. (in Ukrainian).

[4] V. Anishenko et al., *Theory and practice of project-based learning in vocational and technical educational institutions*, N. Kulalayeva, Ed., Zhytomyr, Ukraine: «Polissya», 2019. (in Ukrainian).

[5] T. Gerlyand, «Project learning technologies in vocational education: essence and content», *Theory and methodology of vocational education,* no. 2 (10), 2016. [Online]. Available: https://lib.iitta.gov.ua/704659/1/gerliand.pdf. Accessed on: May 19, 2023. (in Ukrainian).

[6] O. Semenikhina, M. Drushlyak, and I. Shishenko, «STEM project as a means of learning modeling for pre-service mathematics and computer science teachers», *ITLT*, vol. 90, no. 4, pp. 46–56, 2022. doi:10.33407/itlt.v90i4.4946. (in English).

[7] O. Kobernik, «Project technology: possibilities of application in education», *Higher and secondary school pedagogy, vyp.* 36, pp. 11–18, 2012. (in Ukrainian).

[8] V. Bikov, S .Litvinova, V. Lugovij, *Theoretical and methodological principles of informatization of education and practical implementation of information and communication technologies in the educational sphere of Ukraine.* Kyiv, Ukraine: Komprint, 2019. (in Ukrainian).

[9] R. Gurevich, L. Konoshevskij, N. Opushko, «Digitization of education in modern society: problems, experience, prospects», *Educational Discourse,* no. 3–4 (38-39), pp. 22–46, 2022. doi:10.28925/2312-5829.2022.342. (in Ukrainian).

[10] L. Nezhiva, S. Palamar, «Innovative technologies in the literary education of future primary school teachers», *Educational Discourse,* no. 4 (31), pp. 129 – 142, 2020. (in Ukrainian).

[11] T. Kachak, «Digital instruments of literary education of future primary school teachers in the conditions of distance learning», ITLT, vol. 86, no. 6, pp. 144–169, 2021. doi: 10.33407/itlt.v86i6.4079. (in Ukrainian).

[12] L. Nezhiva, S. Palamar, «The application of IR technologies in the context of the formation of subject-methodical competence of future primary school teachers», *Pedagogical education: theory and practice. Psychology. Pedagogy,* no. 39 (1), pp. 51–58, 2023. doi: 10.28925/2311–2409.2023.39. (in Ukrainian).

[13] Pengyue Guo, Nadira Saab, Lysanne S. Post, Wilfried Admiraal, «A review of project-based learning in higher education: Student outcomes and measures», *International Journal of Educational Research: Elsevier,* vol. 102, 2020. doi: 10.1016/j.ijer.2020.101586. (in English).

[14] Cheng-Huan Chena, Yong-Cih Yang, «Revisiting the effects of project-based learning on students' academic achievement: A meta-analysis investigating moderators», *Educational Research Review,* vol. 26, pp. 71–81, 2019. doi:10.1016/j.edurev.2018.11.001. (in English).

[15] B. Altay, «User-centered design through learner-centered instruction», *Teaching in Higher Education*, no. 19, issue 2, pp.138–155, 2014. doi:10.1080/13562517.2013.827646. (in English).

[16] Raz Shpeizer «Towards a Successful Integration of Project-based Learning in Higher Education: Challenges, Technologies and Methods of Implementation», *Universal Journal of Educational Research, no.* 7(8), pp.1765–1771, 2019. doi: 10.13189/ujer.2019.070815. (in English).

[17] J. Peng, M. Sun, B. Yuan, et al. «Visible thinking to support online project-based learning: Narrowing the achievement gap between high- and low-achieving students», *Education and Information Technologies*, 2023. doi:10.1007/s10639-023-11896-1. (in English).

[18] Costa-Silva, J.A. Cortes, R.F. Bachinski, C.N. Spiegel, G.G. Alves, «Teaching cell biology to dental students with a project-based learning approach», *Journal of Dental Education*, no. 82 (3), pp. 322–331, 2018. doi: 10.21815/JDE.018.032. (in English).

[19] T.-Y. Mou, «Students' evaluation of their experiences with project-based learning in a 3D design class», *The Asia-Pacific Education Researcher*, vol. 39, issue 9, pp. 1–12, 2019. doi: 10.1042/BSR20190489. (in English).

[20] I. Bilgin, Y. Karakuyu, Y. Ay, «The effects of project based learning on undergraduate students' achievement and self-efficacy beliefs towards science teaching», *Eurasia Journal of Mathematics, Science and Technology Education,* vol. 11, issue 3, pp. 469–477, 2015. doi: 10.12973/eurasia.2014.1015a. (in English).

[21] M.-J. Terron-Lopez, M.-J. Garcia-Garcia, P.-J. Velasco-Quintana, J. Ocampo, M.-R. Vigil Montano, M.-C. Gaya-Lopez, «Implementation of a project-based engineering school: Increasing student motivation

and relevant learning», *European Journal of Engineering Education*, no. 42 (6), pp. 618–631, 2017. doi: 10.1080/03043797.2016.1209462. (in English).

[22] M. E. Beier, M. H. Kim, A. Saterbak, V. Leautaud, S. Bishnoi, J. M. Gilberto, «The effect of authentic project-based learning on attitudes and career aspirations in STEM», *Journal of Research in Science Teaching*, vol. 56 (1), pp. 3–23, 2019. doi: 10.1002/tea.21465.(in English).

[23] *Ministry of Economic Development, Trade and Agriculture of Ukraine. (23.12.2020). Order No. 2736-20, On the approval of the professional standard for the professions «Teacher of primary classes of an institution of general secondary education», «Teacher of an institution of general secondary education», «Teacher of primary education (with a diploma of junior specialist)»*. [Online]. Available: https://zakon.rada.gov.ua/rada/show/v2736915-20#Text. (in Ukrainian).

ВИКОРИСТАННЯ ЦИФРОВИХ ІНСТРУМЕНТІВ У ПРОЄКТНІЙ ДІЯЛЬНОСТІ СТУДЕНТІВ ПЕДАГОГІЧНИХ СПЕЦІАЛЬНОСТЕЙ ЗАКЛАДІВ ВИЩОЇ ОСВІТИ

Людмила Нежива
доктор педагогічних наук, доцент, професорка кафедри початкової освіти
Факультету педагогічної освіти
Київський університет імені Бориса Грінченка, м.Київ, Україна
ORCID ID 0000-0001-9520-0694
l.nezhyva@kubg.edu.ua

Світлана Паламар
кандидат педагогічних наук, старша наукова співробітниця, заступник декана з наукової роботи
Факультету педагогічної освіти
Київський університет імені Бориса Грінченка, м.Київ, Україна
ORCID ID 0000-0001-6123-241X
s.palamar@kubg.edu.ua

Наталія Семеній
кандидат педагогічних наук, старша викладачка кафедри початкової освіти
факультету педагогічної освіти
Київський університет імені Бориса Грінченка, м.Київ, Україна
ORCID ID 0000-0003-0095-8449
n.semenii@kubg.edu.ua

Анотація. У статті обґрунтовано важливість проєктів для формування у майбутніх педагогів готовності до роботи в умовах реформи «Нова українська школа», зокрема організації проєктно-тематичного навчання. Проаналізовано можливість, придатність, ефективність використання цифрових інструментів на різних етапах проєктувальної діяльності здобувачів освіти для досягнення якісних результатів. Розглянуто цифрові ресурси Canva, TickTick, Harvest, Miro, Piktochart, Prezi, Visme, апробовані в процесі проєктного навчання з фахових методик студентів спеціальності «Початкова освіта» Факультету педагогічної освіти Київського університету імені Бориса Грінченка.
Під час вибору цифрових інструментів основними критеріями були: простий інтерфейс (для того, щоб студенти швидше опанували його функціоналом); відповідність Державному стандарту початкової освіти; дидактична цінність; доступність (враховано вікові особливості учнів та можливості сприйняття завдань, розроблених за допомогою пропонованих цифрових інструментів); технічна та методична підтримка (наявна на всіх пропонованих цифрових ресурсах, що полегшує розуміння їх інтерфейсу); вагомим критерієм є широкий функціонал на безоплатній основі; освітній потенціал; можливості адаптації в різних сучасних умовах під час офлайн- та онлайн-навчання.
Задля підвищення готовності студентів до використання цифрових інструментів під час проєктної діяльності авторами розроблено методику застосування цифрових інструментів на кожному етапі роботи над проєктами та досліджено їх ефективність. Застосування цифрових ресурсів спрямовано на формування предметно-методичної компетентності, а також на

підвищення цифрової грамотності студентів, умінь працювати в команді, ефективно приймати рішення, розподіляти обов'язки серед учасників групи.

Дієвість розробленої методики перевірялась за допомогою проведення вхідного та підсумкового моніторингу. Результати проведення підсумкового моніторингу продемонстрували суттєві відмінності на користь розробленої методики подачі матеріалу студентам під час реалізації проєктної діяльності. Це свідчить про необхідність постійного впровадження новітніх цифрових інструментів в освітній процес задля підвищення предметно-методичної та загальної компетентностей студентів.

Ключові слова: цифрові інструменти; проєктна діяльність; професійна освіта; предметно-методична компетентність; підготовка вчителів початкової школи.