Digital Technologies in Project Practice-Oriented Activity of Students

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Abstract—The article analyzes students' project activities in the prism of application of modern digital learning technologies. The authors of the study consider cloud technologies, online courses, gamification and mobile learning as such technologies. In order to improve the efficiency of students' practice-oriented activities, the key digital technology is identified using the tools of the hierarchy analysis method.

Keywords—Project activities, digital technology, cloud technology, online courses, gamification, mobile learning, hierarchy analysis method.

I. INTRODUCTION

It is already difficult to imagine the modern world without digital solutions being implemented everywhere. At the same time, with the development of digital technologies in industry, their importance in education is increasing. The practice of applying digital technologies in education is very diverse. In one case, modern digital software packages are introduced into the educational process, for example, for CAD and CAE modeling. In another case, digital technologies are actively used in project activities for integrated, including online, mode of team work on the project.

Project activities are aimed at developing students' skills and competencies in team building, goal setting, planning and teamwork.

The basis of such training is the solution of a specific professional task, presented in the form of a practically significant or theoretical problem within the framework of the implementation of profile areas of the department, faculty, institute or university. Thus, the formation of target professional and universal competences takes place: the ability to determine the range of tasks within the set goal and choose the optimal ways of their solutions, to carry out social interaction and realize their role in the team, etc. This method is largely designed for independent work of students and its integration into the solution of team tasks in the course of group work on the project. The teacher in this case acts as a mentor or tutor (depending on the specifics and complexity of the stage).

The results of project activities are:

• formation of the learner's request to acquire knowledge (both independently and with the help of the teacher);
• acquisition of knowledge, formation of practical skills, based on the need to solve real professional problems presented in the form of a project idea;
• mastering professional competencies established as educational outcomes of the main educational program (hard skills);
• development of professional and personal skills of the student, ensuring the formation of universal competences.

II. LITERATURE REVIEW

Kozlenkova E. N. N. and A. N. Volkova in [1] call the use of digital technologies one of the ways to optimize the implementation of project research activities. Transferring part of the interaction and activities of project work participants to the digital space will solve one of the main difficulties in the realization of project activities, which is expressed in the lack of time.

A. A. Belolobova notes that the process of preparation for the launch of the project is quite labor-intensive and requires sufficient digital literacy from the teacher. The use of modern educational environments can make the process of organizing and conducting the project as comfortable as possible for all participants of project activities. It is noted that through the use of modern services it is possible not only to familiarize students with the topic of the project, but also to develop ICT competence of students, as well as to increase students' interest in studying modern technologies and improve the ability to navigate in the information space [2].

In the work of Tikhova M. A., it is noted that, firstly, when using computer technologies, the speed of interaction between project participants increases regardless of their territorial proximity. Secondly, the development of functional capabilities of modern services allows expanding the scope of application of these tools, including interactive and emotional spheres of interaction, which expands the educational opportunities of teachers and students, offering a flexible approach to determining the conditions and circumstances of access to selected materials. Thirdly, a number of modern services allow visualizing the personal responsibility of project participants and thus increase the

level of executive discipline. All this contributes to the intensification of the educational process, the development of motivation and autonomy of students, their communicative, creative skills and critical thinking, stimulation of interaction and cooperation between different associations [3].

At the same time, as Kozlova N. Sh. notes, digital technologies provide a lot of opportunities to improve education, for example, new models of organizing and conducting educational work [4].

G. V. Akhmetzhanova, A. Yuryev. V. note that the digital educational environment provides fundamentally new opportunities: to move from learning in the classroom to learning anywhere and anytime; to design an individual educational route, thereby meeting the educational needs of the learner; to turn students not only into active consumers of electronic resources, but also creators of new resources, etc. [5].

The study [6] notes that the effectiveness and quality of education in modern society is impossible without the use of digital and information and communication technologies, which is due to the wide range of their potential capabilities.

Some of the authors consider the trends and preferences of higher school teachers' use of information and communication technologies, drawing attention to the need for comparative studies in different regional contexts [7].

Zhernovnikova O. A. et al. link the development of digital competence of teachers with the use of gamification tools and distinguish among the components of digital competence of a teacher: value-motivational, cognitive and operational components [8].

In [9], the authors note the use of a limited number of digital tools and on the example of Oldenburg University provide research data on the use and perception of digital tools by teachers.

The authors [10] also talk about the advantages of teachers' use of digital technologies in the educational process.

III. RESEARCH METHODOLOGY AND METHODOLOGY

The aim of our study is to identify the advanced digital technology in project work of learners in their higher education.

Different digital technologies are used in the group for optimal project work: cloud technologies, online courses, gamification and mobile learning.

Cloud technologies allow to create one virtual workspace where each of the project participants can work with the proposed material. In the common digital workspace, the necessary information, goals and objectives, project charter are placed and individual tasks are marked for each learner. The head of the space can set deadlines for tasks, adjust them online, monitor the activities of each participant of the space and form a common strategy for working on the project.

Online courses allow project participants at any moment and regardless of location to master one or another competence necessary to fulfill a task within the project and achieve a common goal. This allows prompt, integral and qualitative improvement of the level of the student - a future certified specialist.

Gamification allows simultaneously fulfilling two global tasks of collective learning - to organize a competitive spirit that promotes the development of search activity and internal self-organization, and to adapt the learning process to a simple and interesting school of knowledge, which leads to increased motivation, unlocking of potential and improved performance achievements in the project.

Mobile learning allows synchronizing the above digital educational technologies and integrating them into one simple and most common tool - the smartphone. Thanks to this technology, all project participants can exchange information and share experience among themselves, receive consultations with the project manager, and use other digital technologies. This helps to create conditions in which each of the participants feels comfortable, which contributes to their becoming an active subject of the educational process within the framework of a practice-oriented project.

These digital technologies have proved to be optimal in many respects in the implementation of project activities at the university. The results of the use of digital technologies in project-based learning are more and more often the final project defenses. These are finalized scientific works of engineering and technological orientation, which are able to enter the real sector of economy. Digital technologies in project activities allow to speed up the process of obtaining a product and reduce the time and organizational costs of its creation.

In order to determine the optimal digital technology for implementation in the project activities of university students, we apply the method of analysis of hierarchies (MAH). This method consists in decomposing the problem into simpler constituent parts and further processing the sequence of expert judgments by pairwise comparisons. MAH serves to justify decision making under conditions of certainty and multicriteria [11].

The MAH algorithm includes such stages as the formation of a hierarchy of objectives, prioritization, calculation of local priority vectors, checking expert judgments for consistency (calculation of the index and consistency ratio) and calculation of priorities of objectives and activities for the hierarchy as a whole based on the synthesis of global priorities.

So, the purpose of the study is to determine the optimal digital technology in project-based practice-oriented activities of students.

As criteria for evaluating the proposed solutions (digital technologies) we will consider:
- availability of licensed use of digital technology service (criterion №1);
- universality or adaptability of the digital technology for various projects (criterion №2);
- ease of use of digital technology without special knowledge (criterion №3);
- interest in the use of the technology by project participants (criterion №4).

The alternatives of choice are the above-mentioned cloud technologies (DT1), online courses (DT2), gamification (DT3) and mobile learning (DT4).

Experts in the study were experts in the field of digitalization of the real economy (Group 1), teachers of leading universities of the Russian Federation (Group 2) and students involved in project activities (Group 3).

IV. STUDY RESULTS

According to the results of expert assessment of three groups of respondents, each of which included three experts, the following results were obtained as a result of applying the method of hierarchy analysis.

The first group of experts identified cloud technologies (39%) as the key digital technology for organizing project activities of university students. The second place by its importance is occupied by online courses (27%). Mobile learning has 22% of importance, and finally, gamification (11%) closes the peculiar rating of digital technologies in this assessment.

The second group of experts (teachers) indicated their preferences as follows:

cloud technologies - 41%;
online courses - 34%
gamification - 13%;
mobile learning - 12%.

Students involved in project activities expressed their opinion, giving leadership to mobile learning (46%). The second most important digital technology that students emphasize is cloud technology (28%). Online courses (15%) and gamification (11%) come next.

The synthesis of global priorities yielded the following results (Table 1).

Table 1. Synthesis of global priorities

	Significance of criteria priorities			Global priorities
	Group 1	Group 2	Group 3	
	0,49	0,31	0,20	
DT1	0,39	0,41	0,28	**0,37**
DT2	0,27	0,34	0,15	**0,27**
DT3	0,11	0,13	0,11	**0,12**
DT4	0,22	0,12	0,46	**0,24**

Thus, the optimal digital technology for implementation in the project activities of university students was "cloud technology" (37%), the second place is occupied by "online courses" (27%), followed by "mobile learning" (24%) and "gamification" (12%).

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