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**IMPLEMENTATION OF STUDENTS' PROJECT WORK WITHIN
DIGITAL ENVIRONMENT**

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Abstract

Modernization of higher education and increasing the specialist's competitiveness in recent years remain the priority areas of the development of society. The practice of pedagogical activity of higher education includes more and more project activities, which are fixed by the introduction of the Federal State Educational Standards of Higher Education of the third generation. The article provides definitions of such concepts as "project", "project activity", "project within digital environment". It describes the principles of project-based learning and reveals the characteristic features of students' project activities within digital environment. The authors emphasize various types of projects within digital environment (class telecommunication project, telecommunication educational project, distance multimedia Internet project, mobile Internet project, and smart Internet project). They consider teacher and student activities at all stages of the project life cycle. The article pays special attention to the use of digital environment services during the project life cycle. It describes the method of forming project teams and distributing roles according to the model of M. Belbin. The study has shown that arrangement of project activities within the digital environment provides cognitive interaction of students, development and improvement of their abilities in the process of joint activities, mastering a variety of ways to implement project work, as well as the inclusion of students in the process of solving applied problems.

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1. Introduction

At the present stage of the world community development, the requirements for the level of specialists' training in any field of professional activity have significantly increased. Thus, according to the Federal State Educational Standard of Higher Education (3++), a graduate who has completed a bachelor's degree program must acquire a universal competency UK-2 from the category "Project Development and Implementation", along with the rest competencies. A student should be able to define the scope of tasks within the frameworks of the purpose in hand and choose the best ways to solve them, based on existing legal norms, available resources and restrictions. In addition, the competency approach, which is one of the main educational approaches of the present time, involves such educational activities that will allow each participant of the educational process to build their own individual trajectory that meets their internal needs and motives. The competency approach involves the use of interactive teaching methods in the process of developing students' competencies, including project competency (Lebedev, 2004). The formation of project competency occurs during the implementation of project activities; its introduction into the practice of modern higher education can provide high-level professional competence of students.

Project activity is a joint activity of students trying to find an effective solution of a problem during the life cycle of the project, from the statement of the problem to the result.

Henry (1994) studied the project system of education. He analyzed how the European university students took project activities. Among the positive results of the work students note the development of initiative, deeper insight into the research subject, the capability to work independently, the development of intellectual skills, the ability to lead the creative activity and present its product, and the acquisition of new types of activity.

Moreover, it is noted that after shifting to a learning technology on the basis of the project, one of the biggest challenges many teachers face is that they need to give up some degree of control over students. Many traditional practices remain the same, but the project reveals the necessity to review them.

The basis of the global project technology is a joint work on problem solving, or, in other words, work on a project.

The existing standards for project management allow determining the project features which are the following:

- presence of a specific goal (result): the goal is defined at the first stage of project implementation; sometimes the main project goal is achieved through obtaining the intermediate goals also determined in advance;
- project uniqueness: the project can be unique as a whole, or it can have individual unique features (technologies, methods, tools, etc.);
- limited time: any project has its own start and end, it can last from several hours to decades; project is considered to be completed after achieving the project goal or when it is determined that the goal cannot be achieved;
- limited resources: any project has its own budget and it should be implemented within its framework.

It should be noted that the project is a non-recurring activity that is why a set of recurring actions cannot be considered a project, because, otherwise, it turns into a process; none of the stages of the project imply a return to a particular project point, although the activity can be repeated.

In general, modern studies present two approaches to the interpretation of the essence of the "idea" of project (Boronina, 2015):

- system approach determines a project as a system of actions aimed at achieving a unique result and limited by a time frame;
- activity-based approach interprets the project as the activity of the subject to transfer the object from the existing state to a certain desired state that most fully meets its ideas.

This determines the dual nature of project activity: on the one hand, it is an ideal activity, since it is related to the design of the future, and on the other hand, it is a technological activity, since it reflects the processes of implementing what is intended (Henry, 1994).

2. Problem Statement

2.1. Teacher and Student's Roles in Project Activities

The arrangement of project activities at the university is mainly aimed at creating conditions and opportunities for students to get communication skills by means of working in groups with other students having different interests, as well as to develop research skills (the ability to analyze, generalize, observe, hypothesize). In this case the aim of this activity is to ensure that while working on the project the student spends most of the time on independent activities with various resources outside the educational institution. This entails significant changes not only in the forms of organizing the educational process, but also in the redistribution of teacher and student's roles.

Traditionally, the teachers' dominant role is being a source of knowledge, now they play the role of facilitators (assistants) who help the students to acquire new knowledge and skills. The role of students also changes: now they are not passive participants in the educational process anymore, they are the main subjects of activity, preserving their freedom in choosing types and ways of activities to achieve learning outcomes. The fact that teachers and students have other roles has significantly influenced the existing system of education, which has been the basis of the educational process for centuries and contributed to the linear formation of the student's personality (Toktarova, 2015). The only way to transfer knowledge at that time was the channel from the teacher to the student. The various digital services (the Internet, modern libraries, interactive spaces, and others) are being developed which provides the students with many other alternative ways of obtaining information.

2.2. Students Teamwork in the Process of Project Activity

Project execution involves teamwork. The project team's actions are aimed to solve the tasks of the project: searching for information, developing solutions, participating in final discussions, etc. According

to international statistics, up to 80% of project activities success depend on the well-coordinated project team work, which is ensured by an effective role distribution among its participants depending on their individual characteristics and abilities (temperament, character, abilities, feelings and emotions, will) (Belbin, 2009).

There are various ways to form project teams and assign roles in them: from trivial (by eye color, by month of birth, by account, etc.) to professional (methods of Mescon, Albert, Kheduori, Belbin, etc.).

The members of the project team can use the model of M. Belbin (2009) to distribute the roles. He took the individual characteristics and abilities of the participants and identified nine main roles, dividing them into three large categories: active, roles oriented at actions (Completer Finisher, Implementer, Shaper), people-oriented roles (Coordinator, Teamworker, Resource Investigator) and roles oriented at thinking (Plant, Monitor Evaluator, Specialist). Thanks to the lack of function duplication and the presence of all qualities necessary for the team work, the teams assembled by Belbin's method are effective when they want to achieve the project goals.

3. Research Questions

In course of the study the following questions were raised:

- How is the concept of a project changing within the digital environment?
- What are the main types of projects in the digital environment?
- What digital services can be used to implement project activities?
- How do members of the project team use digital services at all stages of the project life cycle?

4. Purpose of the Study

Modern educational standards backed by the theoretical representation of competencies and the competence approach contain an orientation to the appropriate methods and learning forms. The successful and productive formation of professional competencies needs the improvement of the educational process in the direction of updating the educational content, the introduction of new technologies and educational forms, the activation of independent students' work, the use of the digital educational environment in the practice of higher education. However, despite the fact that the need for this process is understood, there is currently an acute problem of insufficient justification for the possibility of using digital services in this direction (Toktarova & Semenova, 2020).

In this regard, the article is aimed at revealing the opportunities offered by the digital environment and its services in the implementation of project activities.

5. Research Methods

Authors used the universal scientific research methods as well as methods for comparative and statistical analysis.

5.1. The Idea of a Project in Digital Environment

A project within digital environment is

- the process of creating a website by students that allows them to solve an interesting, useful and real-life problem (web project) (Andreeva, 2015);
- a set of hypertext documents that reflect the general idea (plan) or preliminary schemes for creating an information infrastructure (Petyushkin, 2002);
- educational technologies that allow their participants to solve their educational tasks by organizing their own activities in cooperation with partners and colleagues (including from different countries) and using Internet resources (Savelova, 2001);
- a flexible pedagogical tool that can be represented by a wide variety of ways of organizing and conducting activities and that can be used to solve many pedagogical tasks (Yarmolinskaya, 2016).

5.2. Main Project Types within Digital Environment

Projects within digital environment are mostly characterized by joint work on the implementation of a certain idea by means of digital services, but there are also fundamental differences depending on the type of a project. The authors define the following main project types within digital environment:

- class telecommunication project is a joint (with a common problem, goal, techniques and methods of activity to achieve a common result) educational, cognitive, creative or game activity of students with the use of computer telecommunications (Polat, 2001);
- telecommunication educational project is a joint, organized team activity (of scientists, teachers, students) implemented using telecommunications technologies; this activity is time-limited; the aim of this activity is to achieve a coordinated pedagogical result (Akhayan, 2000);
- distance multimedia Internet project is a technology of arranging educational activities when the stages are pre-defined; the participants interact with the help of network communications (Adamsky et al., 2013);
- mobile Internet project is a joint activity with the use of mobile Internet technologies; its aim is to achieve a unique result while there is a present time and certain resources;
- smart Internet project is a flexible Internet project involving a great quantity of sources and a scope of different multimedia; it can be managed and accessible from anywhere; it can easily and quickly adjust depending on the needs and level of a student.

So, the basis for a project within digital environment is the joint activities completed by the members of the project team with the use of Internet technologies. Attracting digital resources, including Internet technologies, to complete project activities has the following advantages: it organizes joint activities of students on the creation of a product of project activities and ensures the interaction of the team members and the constant growth of project work quality.

The digital environment can act not only as a source of information, but also as a platform for project implementation. The project implemented within the digital environment will contribute not only to the development of students' cognitive skills, the ability to structure and update their knowledge, but also to the formation of their critical and creative thinking, as well as the ability to see, justify and effectively solve problems, navigate the information space. The inclusion of Internet social services into the project implementation process promotes a combination of collective, group and individual forms of work (Kondakova & Podgornaya, 2005).

5.3. Digital Services for Project Activities Implementation

The constant updating of the educational content, the need for saturation with "correct" educational content, for integration of all pedagogical functions on a single resource, and the demand for network learning technologies largely explain the need to use various digital services in education that ensure the implementation of project activities, as well as the development of communications between participants in the educational process. The content of teacher and student's activities, as well as digital services and their application at the stages of the project life cycle are presented in Table 1.

Table 1. The content of teacher and student's activities, digital services and their application at the stages of the project life cycle

Student activities	Teacher activities	Digital services and their application
PROJECT SEARCH STAGE		
discusses the project topic with the teacher and receives additional information, if necessary; defines the project goals	motivates students; helps in defining the project goal; monitors students' work	the Internet - for searching and analyzing information; forums – for communication on the topic, collecting information; chats, e-mail – for communication with the teacher; bookmark storage tools – for creating a network community and searching for information; social network services for storing multimedia resources – for selecting and structuring the information.
PROJECT ANALYTICAL STAGE		
formulates the project objectives; develops an action plan; selects and justifies the project success criteria	offers ideas, makes suggestions; monitors students' work	mindmaps - for structuring information, identifying reference concepts, and modeling the relationship between them; blogs – for creating a topic brunch to discuss the project with the online community; chats, e-mail – for communication with the colleagues and organizing feedback; WikiWiki – for organizing a network discussion and posting comments or making changes to the content; geoservices – for organizing search and research work.
PROJECT PRACTICAL STAGE		
performs project tasks of the stages	monitors, advises, and indirectly directs students' activities	social network services for storing multimedia resources – for storing and transmitting information in various formats; chats, e-mail – for communication with the colleagues and organizing feedback; blogs – for organizing online discussion; webinars – for discussing the project, posting comments, or as a source of information and reference resources.
PROJECT CONTROL STAGE		
performs research and work on the	monitors; evaluates	social geoservices – for organizing search and research work;

Student activities	Teacher activities	Digital services and their application
project, analyzing the information; designs the project		mindmaps – for forming a mindmap of the implemented project and reflecting the relationships within and outside it; WikiWiki – for organizing online discussion; chats, e-mail – for communication with the colleagues and organizing feedback; blogs – for organizing online discussion.
PRESENTATION CONTROL STAGE		
represents the project; participates in its collective analysis and evaluation	monitors; evaluates	social network services for storing multimedia resources – for storing and transmitting information in various formats; text, video, sound, graphics, animation – for presenting project results; social geoservices – for storing and transmitting information in various formats; WikiWiki – for posting project materials; webinars – for organizing online broadcast of the project presentation.
IMPLEMENTATION STAGE		
represents the project; consults project users	monitors, advises, and indirectly directs students' activities	social network services for storing multimedia resources – for storing and transmitting information in various formats; text, video, sound, graphics, animation – for building a user guide; webinars – for organizing online broadcast of project training events.

5.4. Using Digital Services for Project Activities Implementation

In our study, we used the model of Belbin (2009) for the role distribution of the project team members. The size of an ideal team according to M. Belbin is 5 to 7 people. The main thing is that the team "covers" the main functions which are leadership, communication, intellectual elaborations and project activity itself. At the same time, the members of the project team may take several team roles, and one of them should be prevailing. Testing showed the following percentage distribution (Figure 1).

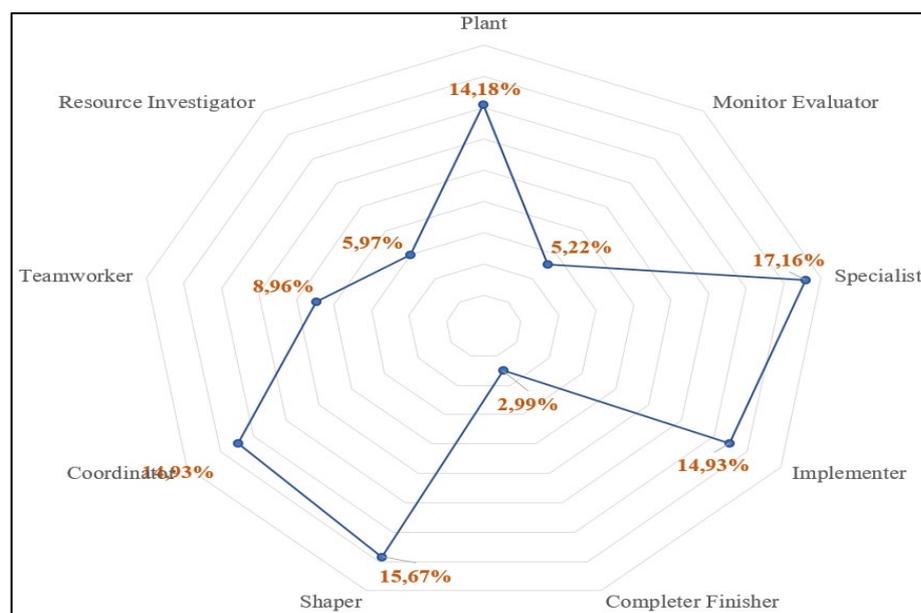


Figure 1. Distribution of focus group students by roles

6. Findings

6.1. Search Stage of the Project Life Cycle

At the search stage of the project, the responsibility was shared between the Shaper and the Coordinator. This is due to the fact that at this stage it is very important to give an impetus to the team to take active actions, which can be done by Shapers since they are people who can challenge the team, encouraging it to develop. They like to bring other people into action. It is also important to coordinate the work of the team, which the Coordinator successfully copes with.

At this stage, the person responsible for the first task formed the minimum working space of the project group: a group in the messenger for rapid information exchange, a kanban board in any service for organizing joint work on the project (and then he/she entered there the tasks of the first stage of the project life cycle), a mindmap for finding the project problem, as well as a place for storing project documents (most often it is cloud storage). The person responsible for goal setting received access to an auxiliary document on setting the SMART goals given by the teacher. The person responsible for searching for information created a space for adding shared bookmarks. Performers connected to the created groups and filled them with the necessary information.

6.2. Analytical Stage of the Project Life Cycle

At the analytical stage, most of the responsibility lies with the Specialist, because at this stage it is important to correctly set tasks in the project area, develop performance criteria and an algorithm for project implementation; Specialists are people with specialized subject knowledge necessary to achieve a team goal.

The responsible students created documents for shared use: a mindmap for generating ideas and joint documents to define the objectives and performance criteria of the project. The person responsible for the development of the project implementation algorithm fully formed the space in the service by dates for organizing joint work on the project. The person responsible for analyzing the project information created a Wiki document or any other document for shared use to fill the glossary. The task of the performers was to fill the documents with information in a timely manner and mark the stage of tasks implementation in the service for organizing joint work on the project.

6.3. Practical Stage of the Project Life Cycle

At the practical stage, the responsibility lay entirely with the Coordinator, since here it was necessary to distribute the team's forces according to the algorithm for achieving the goal. Coordinators often took on the role of a team leader and helped the team to reach the goal. They effectively delegated tasks.

If necessary, the responsible person created a project blog or groups in social networks, documents for working together on project implementation, and also adjusted the action plan for the implementation of the project in the service for organizing joint work. The performers continued to mark the stage of tasks implementation in the service for organizing joint work on the project in a timely manner.

6.4. Control Stage of the Project Life Cycle

The project control stage is aimed at finding errors and debugging the resulting project product. Here it is important to select such test data which will allow testing all aspects of the product. That is why, at this stage, the responsibility was shared by the Plant, the Implementer, and the Shaper.

The responsible people created Google docs or Canva checklists to list errors found in the project and comments on them. The performers filled out the relevant documents and communicated on the project issues in previously created groups in social networks and messengers.

6.5. Presentation Stage of the Project Life Cycle

At the presentation stage and the implementation stage, it was extremely important to prepare high-quality descriptive materials for the project and organize presentation events. Here it was necessary to properly allocate the potential of the team. The Coordinators were responsible for these stages, as their distinctive feature is the ability to get others to work on distributed goals. They were advised by the Plants, as their ability to bring creativity and originality to design solutions helped to adapt the boring text of the accompanying documentation into a more adapted one.

The responsible people created templates of project documents for joint filling: text documents for the descriptive part of the project, manuals and methodological recommendations, a presentation (for presenting the project product), as well as a questionnaire in digital services for creating surveys to get feedback about the project. Moreover, the responsible person created a conference in the video conferencing services to hold online events for project presentation (if necessary). The performers filled out the necessary documents, as well as distributed a link to the survey by email, instant messengers, and social networks.

When working with the teams formed in this way, we noted that the roles oriented at thinking were involved in those events where brainstorming and idea generation were necessary, since they are the ones who see new ideas and approaches, tend to evaluate and analyze ideas, carefully weigh the pros and cons of all options, and have the knowledge necessary to do the work. Roles oriented at action have become more active when it is necessary to push for action, turn team ideas and concepts into practical actions and plans, and carefully check all the stages of project implementation. And roles oriented at people were actively included in the team's activities when it was necessary to set specific goals, explore existing opportunities, make contacts, support colleagues and make sure that people worked together smoothly and effectively.

7. Conclusion

The use of digital services in the implementation of project activities is aimed at the symbiosis of their didactic properties; as a result, project activities will acquire and reveal such properties as accessibility, multimedia, ability for commenting and joint discussion, access to information in various formats, organization of feedback, development of information and communication, as well as personal competencies, and others. Moreover, it is worth noting the development of student's communicative competencies through this symbiosis, since digital services, due to their ubiquity, significantly expand the geography of project participants.

Thus, the main advantages of implementing project activities within digital environment are free access to the distant sources of information, telecommunications (synchronous and asynchronous virtual communication), the development of operational and critical thinking styles of students, and visibility of the material presented.

References

- Adamsky, S. S., Mokievskaya, N. E., & Zaitsev, V. A. (2013). Technology of remote multimedia Internet project. *Advances in Modern Natural Science*, 10.
- Akhayan, A. A. (2000). Functions of telecommunication technologies in conducting telecommunication educational projects. *The Emissia. Offline Letters*. <http://www.emissia.org/offline/2000/797.htm>
- Andreeva, A. V. (2015). Information educational environment of mastering professional disciplines by students. *Scientific and methodological electronic journal "Concept"*, 1, 11-15.
- Belbin, R. M. (2009). *Management Teams: Why They Succeed to Fail*. Kivits.
- Boronina, L. N. (2015). *Fundamentals of project management*. Ural State University Press.
- Henry, J. (1994). *Teaching through projects*. BookEns Ltd.
- Kondakova, M. L., & Podgornaya, E. Ya. (2005). *Methodological recommendations on the organization of the educational process using distance educational technologies in the conditions of network interaction of educational institutions and organizations*. Sport academ press.
- Lebedev, O. E. (2004). *Competence approach in education*. School Technologies.
- Petyushkin, A. V. (2002). *Fundamentals of banner advertising*. BHV-Petersburg.
- Polat, E. S. (2001). *New pedagogical and information technologies in the education system*. Publishing center "Academy".
- Savelova, S. B. (2001). Internet projects and modern education. *Problems of Internet education*, 1, 35-47.
- Toktarova, V. I. (2015). Pedagogical Management OF Learning Activities of Students in the Electronic Educational Environment of the University: a Differentiated Approach. *International Education Studies*, 8(5), 205-212.
- Toktarova, V. I., & Semenova, D. A. (2020). Organization of project activities of university students using services of Internet technologies. *The World of University Science: Culture, Education*, 4, 29-40.
- Yarmolinskaya, M. V. (2016). *Internet project as a tool of forming the responsibility of older teenagers*. Saint Petersburg.