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## THE PROJECT METHOD OF EDUCATION IN TRAINING FUTURE SPECIALISTS IN THE SPHERE OF INFORMATION TECHNOLOGIES

### *Abstract*

This article addresses the relevant topic of practice-oriented education in higher education institutions. Its objective is to examine the utilization of the project method as a teaching technology for IT students, analyzing its primary features and real-life application in pedagogical activities. The focus of the article is on the practical application of the project method in the study of "Web-technology" at Innovative Eurasian University in Pavlodar. It provides an overview of key concepts related to the project method, examines international experiences of this technology in education, and outlines the various stages involved in studying "Web-technology" with the project method. The experiment resulted in students developing projects that focused on local businesses in Pavlodar, which were well-received during the defense and used as a basis for diploma projects. The positive outcomes of this study demonstrate the practical relevance of the project method in education.

**Keywords:** project method, project technology, web-technologies, distance learning, education, information technologies.

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## АҚПАРАТТЫҚ ТЕХНОЛОГИЯЛАР САЛАСЫНДАҒЫ БОЛАШАҚ МАМАНДАРДЫ ДАЯРЛАУ КЕЗІНДЕГІ ОҚЫТУДЫҢ ЖОБАЛЫҚ ӘДІСІ

### *Аңдатпа*

Бұл мақалада қазіргі білім беру үшін жоғары оқу орындарының білім беру процесіндегі практикаға бағдарлану мәселесі қарастырылады. Мақаланың мақсаты ІТ мамандықтарының студенттерін даярлаудың педагогикалық технологиясы ретінде жоба әдісін қолдануды қарастыру болып табылады. Бұл жұмыста оның негізгі аспектілері және нақты педагогикалық іс-әрекетте қолданылуы қарастырылады. Мақалада Павлодар қаласындағы Инновациялық Еуразия университеті базасында «Web-технологиялар» пәнін оқытуда жобалар әдісін қолдану туралы айтылады. Жоба әдісімен байланысты негізгі анықтамалар беріліп, пәндік салаға талдау жасалды. Аталған технологияны білім беру үдерісінде қолданудың халықаралық тәжірибесі қаралды. Өткізілген эксперимент нәтижесінде студенттер Павлодар қаласының жұмыс істеп тұрған кәсіпорындарына бағдарланған жобалар әзірледі, олар қорғауда оң баға алды және дипломдық жобаларды әзірлеу үшін база ретінде пайдаланылды. Пәнді оқытуда Жоба әдісі технологиясын қолдану нәтижелері зерттеудің өзектілігін растайды.

**Түйін сөздер:** жобалар әдісі, жобалау технологиясы, web-технологиялар, қашықтықтан оқыту, білім беру, ақпараттық технологиялар.

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## ПРОЕКТНЫЙ МЕТОД ОБУЧЕНИЯ ПРИ ПОДГОТОВКЕ БУДУЩИХ СПЕЦИАЛИСТОВ В СФЕРЕ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ

### *Аннотация*

В данной статье рассматривается актуальный для современного образования вопрос практико-ориентированности в образовательном процессе высших учебных заведений. Целью статьи является рассмотрение применения метода проектов как педагогической технологии подготовки студентов ІТ

специальностей. В данной работе рассматриваются её основные аспекты и применение в реальной педагогической деятельности. В статье речь идет о применении метода проектов в изучении дисциплины «Web-технологии» на базе Инновационного Евразийского университета города Павлодар. Даны основные определения связанные с методом проектов и проведен анализ предметной области. Рассмотрен международный опыт применения данной технологии в образовательном процессе. В результате проведенного эксперимента студентами были разработаны проекты ориентированные на действующие предприятия города Павлодар, которые получили положительные оценки на защите и использованы в качестве базы для разработки дипломных проектов. Полученные результаты применения технологии метода проектов в изучении дисциплины подтверждают актуальность проведенного исследования.

**Ключевые слова:** метод проектов, проектная технология, web-технологии, дистанционное обучение, образование, информационные технологии.

## **Introduction**

At the present stage of society development there is a need for graduates of higher education institutions, who can apply their knowledge in real professional activities, to independently identify and solve emerging problems, to be able to think creatively. Every year the need to train and educate the younger generation in such a way that they can live in a modern open society, able to communicate with all the diversity of the real world, have a holistic view of the surrounding world and its informational unity is increasing. The need to orient education not only to the formation of a certain baggage of knowledge in students, but also to the development of cognitive and creative abilities, is obvious. Students should develop independence, initiative, be able to set goals, define tasks, and look for ways to achieve them. All these competences will allow successfully adapting to the future profession, as well as socializing in the society. The use of project activity in the training of future IT specialists allows the teacher to expand didactic capabilities, which allow transforming ordinary lessons into interactive, visualized ones, where a student can visually see the real process of software product development.

Authors, Btemirova R.I. considers the project activity of students as one of the main interactive forms of work with students. The paper describes in detail the analysis of the essence of the project method, which allows us to conclude that the project method stimulates the activity of the learning process, the development of creative abilities, forms professional competencies, increasing independence and personal growth. The author concludes that it makes sense to integrate this method into the educational process of a higher educational institution [1].

The analysis of the results of research on project activities, project technology, project method showed that these concepts are identical. Most researchers consider the project method as one of the ways to organize the educational process in the direction of individual research design.

Boone M., Orozco M., Sivakumar K., and Johnson K.W., researchers from abroad, have observed that current undergraduate and graduate programs are designed to train students to become researchers and professionals who can perform applied scientific research. Their research focuses on instructing students on the methodology of conducting scientific research. In modern academic education, research is often carried out through project-based learning, an innovative educational approach that emphasizes learning through practical application [2, 3].

The project method is multifaceted and finds its application in various areas of training future specialists. As an example, we consider the work of a team of scientists led by Larsen P., which examines the extensive experience of teaching compulsory philosophy courses to students from several programs at the University of Copenhagen. The authors highlight some of the lessons they learned to demonstrate the application of practice-oriented learning in teaching philosophy to science students [4].

The team of scientists Green S., Andersen H., and others in their work describe the application of the project method to teaching computer systems development. The authors show that motivation is improved by using valid examples taken from industrial projects and by using a set of industrial tools. The paper is illustrated with examples from courses and discussions of student evaluations and exam

results. The paper emphasizes the need for practice-oriented exercises and tests to support the development of abstraction skills [5, 6].

Ezeamuzie, N.O. looks at the development of several instructional approaches for teaching programming. Thirty-eight students from schools without technology participated in this study. The experiment consisted of 10 hours of project-based instruction. Using Friedman's repeated measures test and Spearman's rank correlation, trends in students' programming abilities were assessed. The results showed that students' programming abilities increased on the first day, remained stable throughout the intervention [7].

The project method can also be considered through the prism of engineering education, which according to Solodikhina, A., Solodikhina, M. should be changed following the changes in the labor market. The authors believe that the cult of innovation has led to the demand for innovators who have both the mindset of an inventor, who can see a problem and find a way to solve it, and the mindset of an entrepreneur, who is ready to implement this solution [8].

S.V. Zaitsev's research findings led us to the conclusion that project-based learning is a framework for enabling students to engage in independent and innovative activities. It is unique and specific as it allows to effectively use the creative potential of both the teacher and the student, integrate their knowledge, experience, while generating new ideas and solutions, promotes activation of independent and scientific work [9].

At the present stage of the development of the education system, the relevance of research using the project method is emphasized by the need to search for innovative and sustainable approaches to achieving success in the professional sphere. The relevance of research on the project method in this context is manifested by several key aspects, such as scientific and practical significance, optimization of the project management methodology, and the solution of practical problems. The study is based on experiments and practical experience and provides valuable information for the scientific and practical community in the field of education. The results obtained can be used to develop more effective strategies for applying the project method in real conditions.

Our research is focused on creating and evaluating a methodology for teaching future specialists in the information technology field using the project-based learning approach. The problematic provisions of the study are the methodological features of the organization of project activities of IT students, which contribute to the formation of professional competence of students. The project method consists in the fact that the students are set a goal - to develop a real software product, the range of tasks is determined, the time limit is set. In this case, the teacher guides students, observes their cognitive and research activities, allowing independent and creative approach to the learning process. Also, the teacher needs to emphasize the current state of the issue, supervise some specific points, correct inaccuracies in time, thus organizing an external evaluation of the activity. The productivity of a student's self-directed work is evaluated based on the quality and amount of knowledge gained, rather than the quantity of tasks completed, through the implementation of the devised methodology.

### **Materials and methods**

In our research, we carried out an experiment that involved implementing our project-based teaching methodology for the "Web-technology" course in a high school classroom. This methodology aimed to enhance students' research abilities, decision-making skills, independent analysis, and practical application of acquired knowledge, skills, and abilities, encouraging creative problem-solving. During "Web-technologies" at the Innovative Eurasian University, the students were tasked with developing a fully operational project (website) on a specific topic by the end of the semester. The sole requirement for conducting the experiment was the step-by-step development of the projects within the set timeframes. The project method includes the following stages: formulation of the problem; planning of ways to solve the problem, search and analysis of information; product development; defense of the project.

At the first stage of the experiment for two weeks students conducted a study of the object of research (as a rule it was real enterprises of the city) - collected the necessary information. Conducted an analysis of existing similar websites on their topics. The result of this stage was - the analysis of the subject area, the definition of the set of problems to be solved. As a result of this stage students formed a theoretical report. The role of the teacher at this stage was to accompany and guide students, explaining the main points. At this stage students had questions on the choice of sources for independent study of the subject area.

At the next stage of the experiment, which also lasted for two weeks, the algorithm and requirements for software and hardware were developed. A general algorithm for solving the tasks, requirements and selection of software tools, as well as a set of technical means were developed. At this stage, students applied the acquired knowledge in the study of other disciplines, such as "Computer systems architecture", "Operating systems" and the like. To implement the development of a website students independently determined what software will be used to achieve the goal. The choice has been made in favor of software CMS WordPress (with a condition of development of own themes), Django framework. As programming languages students have chosen PHP and Python. As a result, a report was also formed and further algorithm for the development of the software product. The main problematic issues of this stage were the choice of technology for the development of websites.

Then within 10 weeks there was the process of developing a website. This stage is the longest, most creative and therefore the most interesting. Students had to determine the functional load of the site, develop the structure of the website, determine the number and purpose of pages, set and location of visual components.

During the work on the projects students showed activity, creativity, independence. Students developed not only informational websites, but also automated workplaces. During the development of informational websites also showed creativity, such as the development of independent themes for CMS WordPress using HTML, CSS, PHP programming language, which allows you to develop the structure and content of the website strictly according to the requirements of the intended customer.

To evaluate the results of the projects, innovative criteria were identified, which took into account modern trends and requirements of Web development. Such criteria include the use of the latest technologies, mobile adaptability, security, Progressive Web Applications (PWAs), performance optimization, user interface (UI/UX), use of APIs and external services, modern patterns and architecture, automated testing, and compliance with standards. Each of these criteria can be adapted according to the specific requirements of the course and the objectives of the project in the discipline "Web-technologies".

### **Results and discussion**

The learning outcomes of the project method include the development of professional skills and preparation for successful practical activities rather than the classical assimilation of knowledge, skills and abilities. During the study of the discipline "Web-technologies" using the technology of the project method various websites were developed. Many websites had not only information component, but also automation of enterprise processes.

Since the project method involves not limiting students in the choice of means of solving the problem, the students themselves chose the development environment.

One of the results of work on the project was the developed website for the enterprise of Pavlodar region "Pavlodar heating networks" LLP (hereinafter LLP "PHN").

The website for PHN LLP is a web resource that combines information about the company and helps users obtain it in a high-quality and timely manner. In addition, the site makes it possible to automate the activities of the dispatch service and provide information about outages in real time.

The site for LLP "PHN" will be especially useful for:

- consumers of PHN LLP services;
- consumers who need information about outages.

Typical tasks solved with the help of the site for LLP "PHN":

- informing consumers about the company's activities;
- providing current information on blackouts.

The index.html home page contains a welcome screen, as shown in Figure 1 with a link to a page about the company and a news summary, where three recent news items are selected from the database, as shown in Figure 2. To make the site look more dynamic, the welcome text and button appear using the Animate.css library animations.

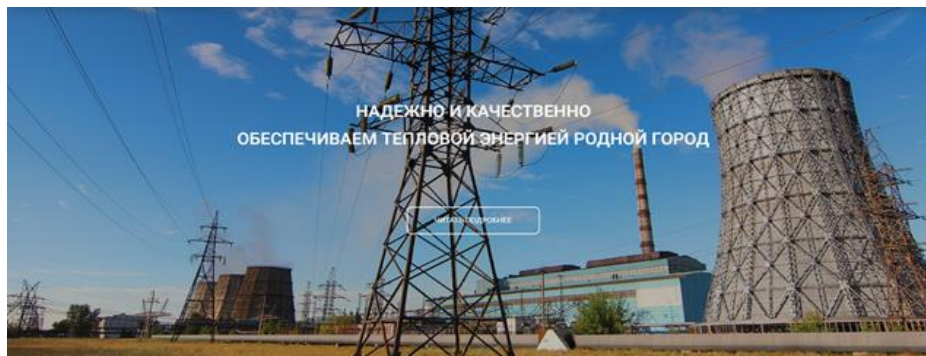


Figure 1. Welcome screen

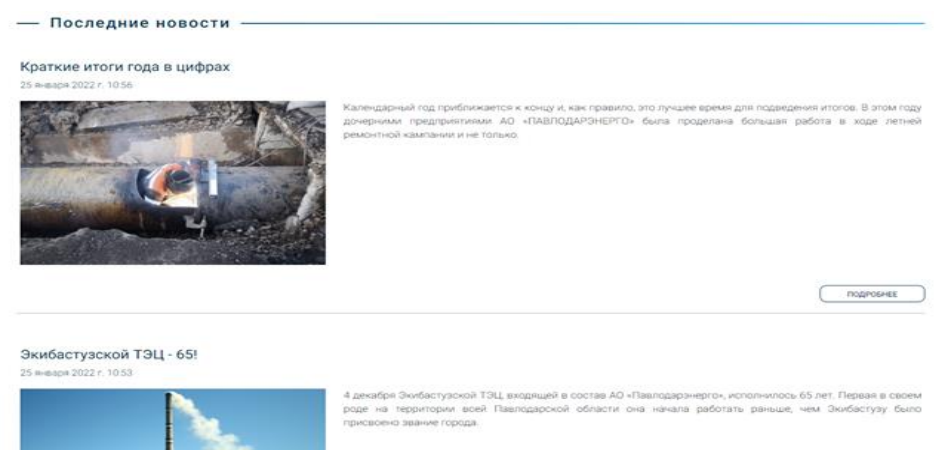


Figure 2. Selecting the latest news on the home page

The news is generated in a loop, where template elements are assigned values from the database table. Logging in to the system is carried out by the login and password issued by the site administrator. To log into the system, find the "Login to the system" link at the bottom of the site. The user must click on the link and go to the authorization form. Authorization form is shown in Figure 3. On the authorization form you need to fill in the required fields and click "Login".

Figure 3. Authorization form

The main screen of the admin panel for the administrator LLP "PHN" is shown in Figure 4.

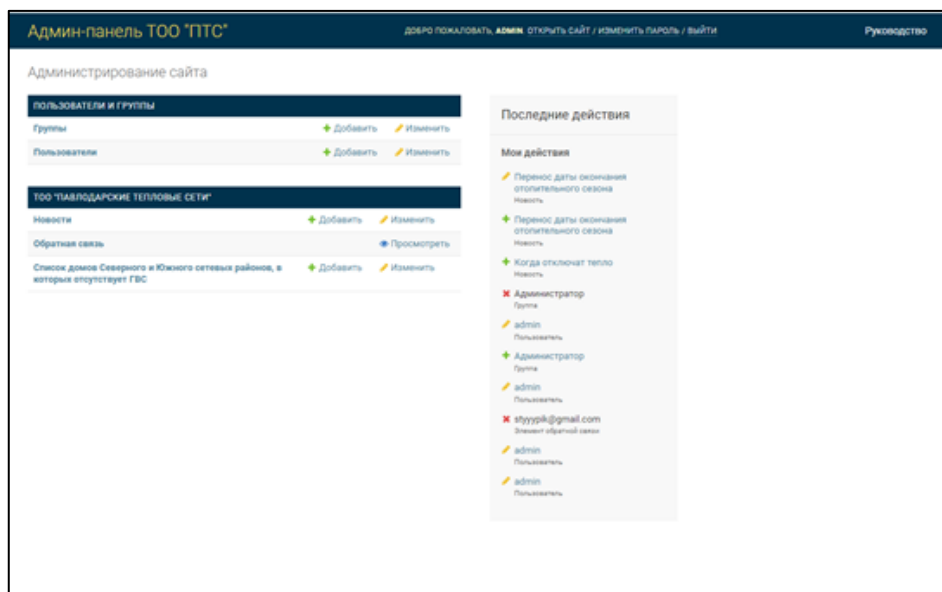


Figure 4. Main screen of the admin panel

The admin panel provides functionality for the administrator to create new users and groups, as well as to work with information in such blocks as "News", "Feedback", "List of houses in the Northern and Southern network districts without hot water supply" and "Pages", and for the dispatcher to work with the block "List of houses in the Northern and Southern network districts without hot water supply".

The functionality of the "News" block allows you to add, edit and delete entries from the table. Filtering by such fields as: "Publication", "Creation time", "Modification time". Hierarchy by dates is performed by the "Creation time" field. Checking the "Publication" field adds news to the site, if there is no such a checkmark, the news will not be displayed on the site. To add news, click on the "Add news" button. Go to editing by clicking on the field "ID" or "Title". Such actions as "Delete selected news", "Mark selected news as unpublished" and "Mark selected news as published" are provided.

The functionality of the Feedback block allows you to read messages from users. Filtering by such fields as: "Read", "Message type", "Date". The hierarchy by date is carried out by the field "Date". The checkbox in the "Read" field allows you to mark the messages that have already been read. The deletion process is performed by pressing the "Delete" button and "Yes, sure" to confirm the intentions. The following actions are provided: "Delete selected Feedback", "Mark selected messages as unpublished" and "Mark selected messages as published".

The functionality of the "DHCP list" block allows you to add, edit and delete table entries. Filtering by such fields as: "Network area", "Cause of no DHW", "Date of disconnection" and "Approximate date of elimination". Hierarchy by date is carried out by the field "Date of shutdown". For the fields "Approximate date of elimination" and "Reason" you can edit without necessarily viewing the record. To add, click on the "Add item to the list" button. You can go to editing by clicking on the "ID" field. Checking the field "Publish" performs the addition of the element to the site, if there is no such a checkbox the element will not be displayed on the site. There are such actions as "Delete selected List of houses in the Northern and Southern network areas with no DHW", "Mark selected items as unpublished", "Mark selected items as published" and "Export to Excel (.xls)". Data filtering is provided for each block.

The "Pages" block has the same functionality for editing and allows you to change the data on the pages of the site.

During the study, students had some questions for the instructor as a mentor. The main questions concerned the choice of sources as a basis for independent study and the choice of website development technology.

The authors conducted a survey among students enrolled in the educational program "Computer Engineering and Software". The data was collected online using a google form. The online survey made it possible to conduct a comparative analysis and visual interpretation of the data obtained for analysis. To determine the effectiveness of the project method for teaching the discipline "Web-technologies", a questionnaire was developed, which was offered to students at the beginning, middle and end of the experimental period. The survey was conducted anonymously for the purpose of impartiality of respondents. The students were divided into two groups. One group studied the discipline of "Web-technologies" using the traditional method, the other using the project method. At the initial stage of the study, the average level of knowledge of students in the control group was 65.3%, and in the experimental group – 63.4%. As a result of the experiment, the level of knowledge of students in the experimental group increased by 17.5%, and in the control group by 9%. This indicates the effectiveness of the project method in teaching students of IT specialties.

The implementation of the methodology created during the study for teaching the "Web-technology" course resulted in eight out of 14 students selecting website development as their topic for their diploma projects. During the defense of these projects, three students received a "good" grade, while five students earned an "excellent" grade. Two students provided feedback from businesses that their work is located on the enterprise server and are in the testing phase, as is considered the actual implementation of the developed software product.

In the process of implementing the above method, students gain professional skills, which will allow future professionals to decide on the field of future profession. If the trainee is interested in the field of work, he/she will choose this direction and will work in it purposefully.

As for the scientific significance of the research results, it is possible to emphasize the ability of students to expand their knowledge in a certain field, to provide new practical, sometimes non-standard approaches and solutions. An important aspect of scientific significance is the promotion of the development of project management methodology. The results obtained can be important for the scientific community and education, helping to improve processes, increase efficiency and create new technologies or methods.

## **Conclusions**

After conducting the study, a methodology was developed and tested for practice-oriented education, focusing on the project method, in training future specialists in the field of information technology. This method emphasizes practical skills and enables students to become more independent, creative, and effective problem solvers. Results from the experiment showed that the project-based approach was effective in developing competencies and skills in students, thereby preparing them better for their future careers as IT specialists. The findings of this study have practical and scientific significance and can be utilized in educational activities for training IT professionals.

This study emphasizes the importance of project-based learning in higher education, especially in the field of information technology. The results of the study show the need for graduates to have not only theoretical knowledge but also practical skills, creativity and problem-solving abilities. The authors discuss the implementation of their project-based methodology for teaching the Web-Technology course and the positive results they observed in student learning and project development. Project-based learning can be seen as an effective approach to bridging the gap between theoretical knowledge and practical application as it allows students to engage in real-world problem solving and gain practical experience and encourages students to think critically, take initiative and make decisions independently. This can lead to improved problem-solving skills and the ability to adapt to different situations, which are essential qualities in a professional environment.

Project-based learning can help students acquire practical skills, work on real-world projects and develop software products that have practical applications. The study examined the challenges that



students may face during project-based learning, such as time management, teamwork, and overcoming uncertainties. The study found benefits for students such as increased motivation, deeper understanding of concepts, and improved problem-solving abilities.

Project-based learning can be applied to disciplines other than IT. The results of the study may be applicable in exploring in more depth whether the approach is equally effective in different fields and considering the potential adaptations required for different subjects.

The role of the instructor in project-based learning is as a mentor, guide and facilitator to support students throughout their project. The study showed the importance of providing timely feedback and encouragement to students.

Overall, it can be concluded that this approach better prepares students for the labor market and aligns with the demands of an ever-changing professional landscape. The study provides valuable information about the potential of project-based learning in higher education institutions, especially in the field of information technology.

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