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IMPROVING THE METHODOLOGY FOR DEVELOPING DESIGN COMPETENCE OF FUTURE TEACHERS IN A DIGITAL LEARNING ENVIRONMENT

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ABOUT ARTICLE

Key words: digital learning environment, future teacher, design competence, PBL, Design Thinking, didactic support, creative approach.

Received: 05.08.26

Accepted: 06.08.26

Published: 07.08.26

Abstract: This article addresses the issues of improving the methodology for developing the design competence of future teachers under the conditions of a digital learning environment. Relying on the conceptual synthesis of traditional teaching methods and innovative approaches, the pedagogical opportunities for involving future teachers in project activities are substantiated. The study provides information on the integration of Project-Based Learning (PBL) and Design Thinking technologies.

Introduction. Design competence is a set of skills of future teachers that includes analysing a problem, developing solutions, planning, using resources effectively, working collaboratively and evaluating results. By developing this competence, future teachers are provided with opportunities for independent thinking, a creative approach, critical analysis and participation in practical activities.

Today, higher pedagogical educational institutions mainly continue to use traditional teaching methods. This approach primarily includes lecture-based instruction, standardised curricula and assessment through examinations [3].

“Under the conditions of modern pedagogical paradigms, a number of methodological limitations of the traditional education model are becoming apparent. In particular, the transmission of knowledge in a transmissional (one-way transfer) manner reduces students’

cognitive activity and limits the possibility of transforming theoretical knowledge into professional-practical activity. Nevertheless, without denying the basic function of traditional education in forming fundamental knowledge, synthesising it with innovative and digital approaches is an optimal strategy for increasing the effectiveness of education.

Consistent involvement of future teachers in project activity (Project-Based Learning) is an important pedagogical condition for forming their 21st-century professional competences and developing the skills of applying theoretical knowledge in practice.”

The formation of design competences on the basis of traditional forms of education conducted in higher pedagogical educational institutions has its own specific features. As is known, in the traditional form of education the teacher occupies a central position. Knowledge is mainly delivered to future teachers through lecture sessions or textbooks and subject resources. Although there have been many attempts to develop design competence within this traditional form, achieving high effectiveness is somewhat difficult. This is because future teachers in this process mainly acquire theoretical knowledge about design activity. That is, future teachers theoretically master the planning of a project, but their opportunity to independently implement it in real life or in professional activity remains limited. However, the use of the traditional form of education in developing design competence also has its own advantages. For example, future teachers systematically and accurately acquire knowledge, and the stages of the project process and practical actions are studied. At the same time, when this form is used, the process of independent thinking among future teachers remains outside attention, and their creativity and inventiveness are not clearly observed. Therefore, in today’s modern digital learning environment it is advisable to develop the design competence of future teachers without abandoning traditional forms of education, but in connection with modern teaching forms. Modern forms of education are mainly approaches that place students or pupils at the centre and are directed towards active, independent action. Proceeding from the aim of the research work, we attempted to develop the design competences of future teachers using Project-Based Learning (PBL), STEAM, Design Thinking, Portfolio methods and Bloom’s taxonomy. These methods help future teachers to understand real problems and to find solutions to them in a collective manner.

“In modern pedagogical science and practice, Project-Based Learning (PBL) is recognised as an effective technology for modelling the professional-practical activity of future teachers. The PBL technology ensures that learners participate as active subjects in the process of creating practical and digital projects.

According to researchers J. Markula and M. Aksela [4], in a project-based learning environment students, united in small groups, systematically analyse real pedagogical and methodological problems and carry out the task of developing their optimal solutions (in the form of an educational product). This serves to develop important professional competences of future teachers such as collaborative work, critical and creative thinking.”

Thus, in project-based learning future teachers have the opportunity to understand problems and to conduct small research studies in order to find solutions to them. In addition, the integration of subjects is required when solving a problem. As a result, future teachers become accustomed to critically and analytically evaluating problems and finding scientific solutions, and an opportunity is created for the early identification of the talents and abilities of future teachers.

In project-based learning the teacher assumes not only the role of a lecturer, but also that of a facilitator. That is, in this process future teachers creatively acquire knowledge, enter into dialogic relations with the teacher, and during the lesson the teacher becomes a guiding mentor who encourages them on the basis of reflection and discussion.

Methodology. In project-based learning an increase in the motivation of future teachers (i.e., students) towards studying and acquiring knowledge is observed. In addition, they become active participants in the educational process; teamwork skills are formed, and as a result of applying the theoretical knowledge they have acquired in practice, their self-confidence gradually increases.

Thus, project-based learning is an approach that aims to develop deep knowledge, skills, abilities and competences in future teachers. In this process future teachers work on a project in order to find answers to problematic situations or problematic questions that have arisen or may arise in their professional activity. Unlike traditional lesson forms, in PBL the learner works at the centre and constantly acts actively, being able to apply theoretical knowledge in practice.

In project-based learning it is advisable to pay attention to the fact that any project is implemented around a problem that is relevant for future teachers. For example: “What should the professional profile (professiogramme) of a modern pedagogue be like?” This question is extremely relevant for the present period, when education is developing at a rapid pace.

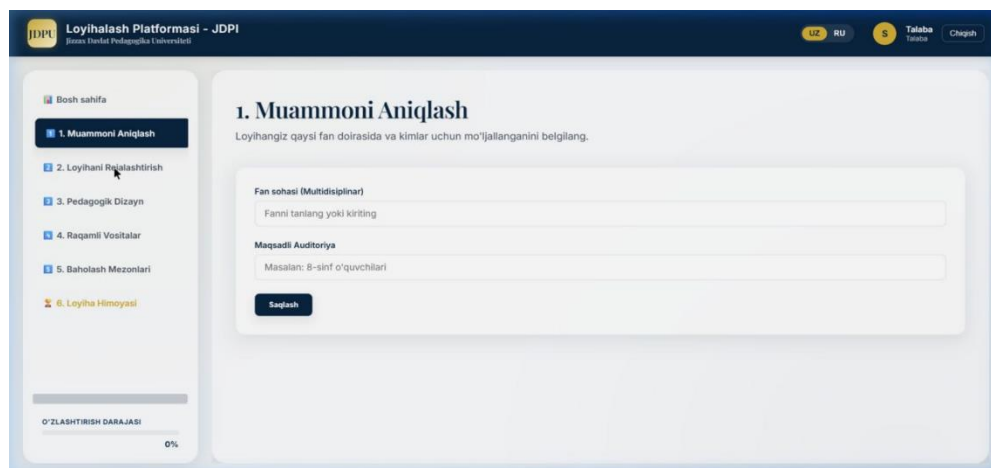


Figure 1.

In this process future teachers conduct independent research, exchange ideas with one another (respecting and listening to each other's opinions), identify the problem, plan and implement the project after finding a solution. As a result of implementing project-based learning, future teachers develop critical thinking, teamwork skills, communicative qualities, organisational abilities and research skills. For this reason, a "PROJECT PLATFORM" has been developed by us, on which each student can participate with his or her own project work:

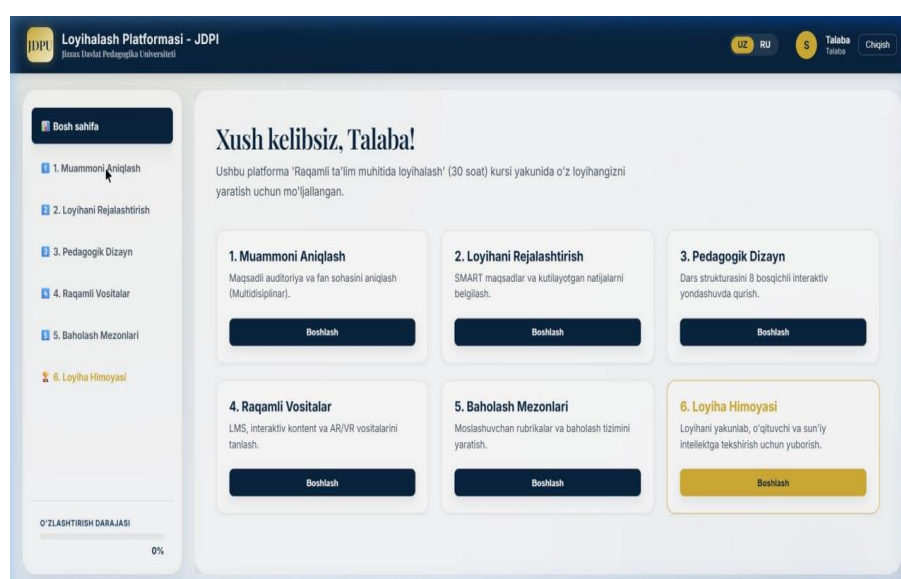
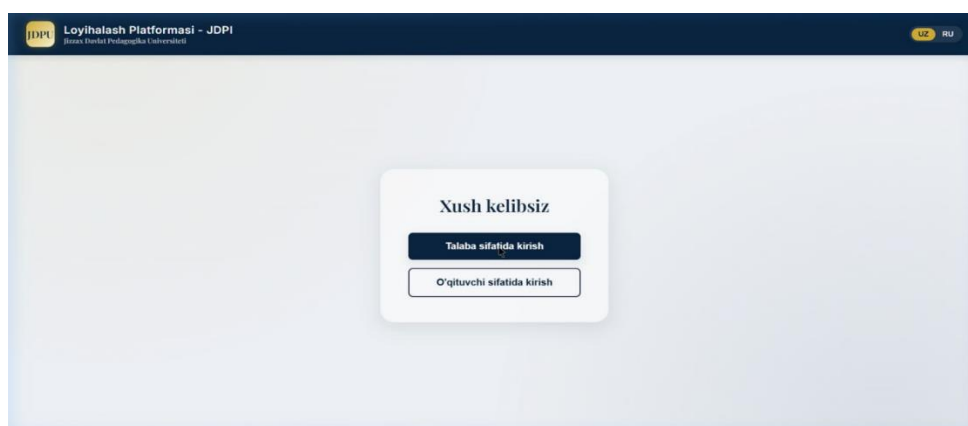
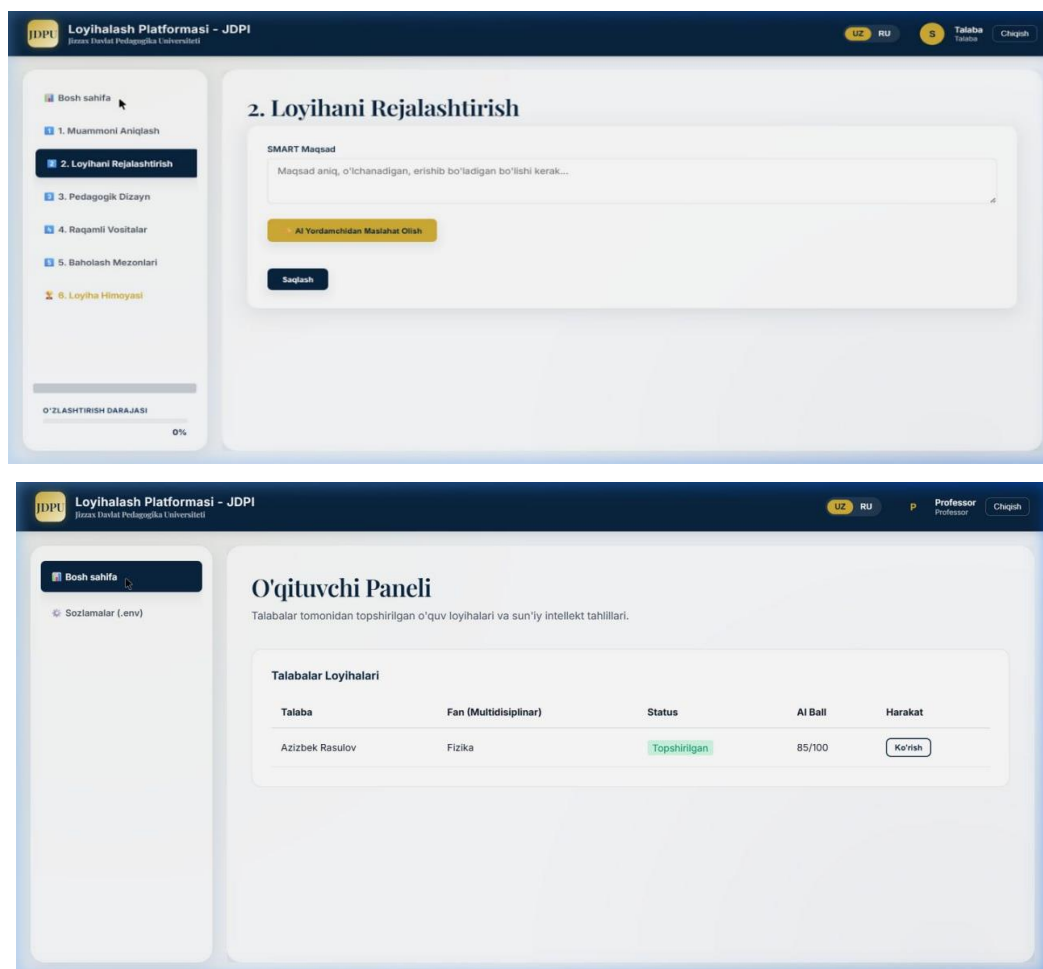


Figure 2

The advantages of project-based learning consist in the fact that, since the projects are linked to problems of professional activity, they help students to apply the theoretical knowledge they have acquired in practice. As a result, future teachers approach the further enhancement of their knowledge more responsibly. In addition, it effectively prepares future teachers for professional activity and creates an interesting educational environment rich in creativity and motivation. It also ensures interdisciplinary integration.

**Figure 3.**

In the education system of the USA the design thinking method is widely used to develop students' creative abilities. For example, the d.school programme of Stanford University teaches solving creative problems through design thinking [5].

The Design Thinking method provides future teachers with the opportunity for creative and critical thinking, understanding a problem and finding a solution. The design thinking methodology is considered one of the effective methodological approaches for developing pedagogical design competences in future teachers.

This method is an approach aimed at solving a problem and is based on a deep understanding of the problem, identifying needs and creating innovative solutions. We shall also examine the tasks carried out at these stages on the basis of a table:

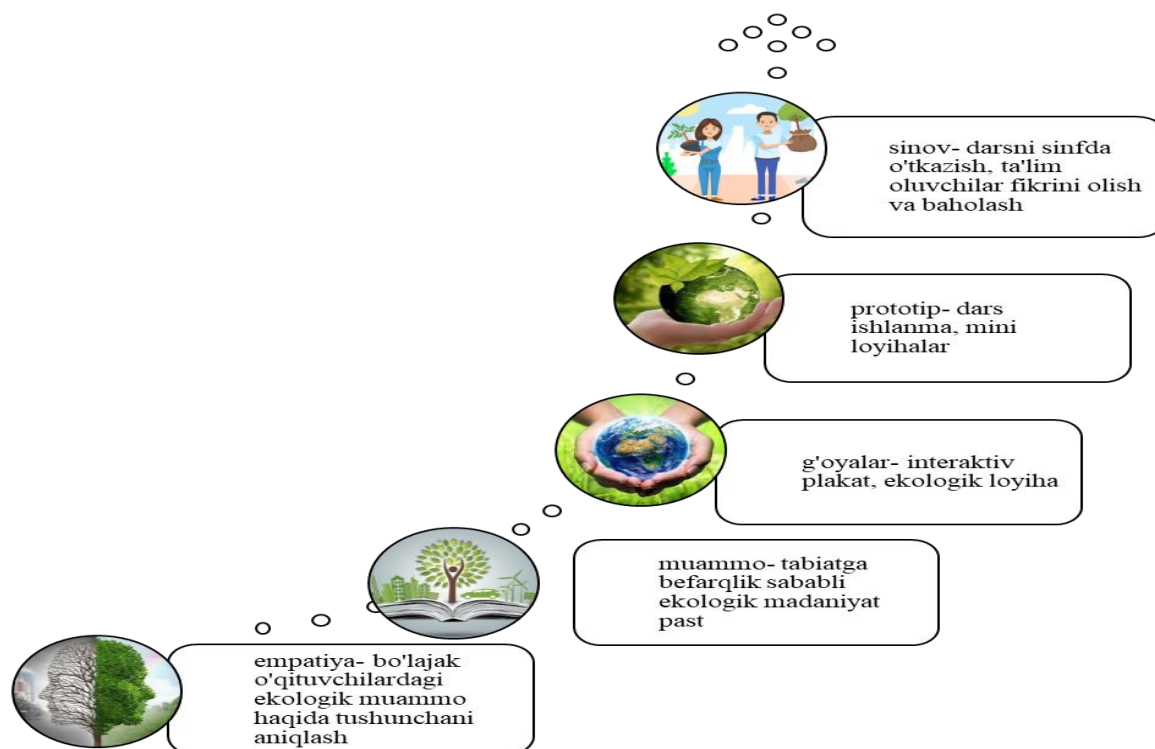


Figure 4. Design Thinking method

We shall present the stages of this method as follows: empathy, problem definition, ideation, prototyping, and testing. In our research work we focused on developing the design competences of future teachers at these stages. At the empathy stage future teachers analyse the needs and problems of pupils. At this stage it is also effective to use such scientific research methods of pedagogy as observation, interview and questionnaire. At the problem-definition stage specific educational problems are identified. For example, these may be difficulties in learning, lack of motivation among pupils, or problems arising in the application of teaching methods. At the ideation stage several variants of solutions to the problem are proposed. In these solutions it is necessary to pay attention to interdisciplinary integration. At the prototyping stage the ideas are given a practical form. For example, these may be an educational module, a visual presentation, a teaching aid or a lesson plan. At the final stage — testing — the created practical work is tried out in the classroom or through simulation, the results are analysed and suggestions for improvement are developed.

Results and discussion. Proceeding from the above ideas, the design thinking method serves teachers by creating opportunities to understand the needs of pupils, to structure a

lesson on the basis of creativity and a plan, to create innovative educational tools, and to analyse and improve their own abilities (Table 1).

Types of competence	Method of development through Design Thinking
Project planning	Through problem definition and ideation
Creation of educational materials	At the prototype stage
Analysis of the needs of future teachers	At the empathy stage
Creative problem solving	Through brainstorming
Testing and improvement	At the testing stage
Self-assessment and reflection	At the end of the process

“Project Design” method. This method serves to ensure the collection and research of information on a topic being studied by future teachers individually, in a group or as a team within a clearly defined period of time. The use of the project design method in the educational process helps to develop in future teachers the skills of planning, decision-making, implementing activity, re-checking data, drawing conclusions based on available information, and evaluating results. When applying this method, future teachers must be able to create new projects on the topic. The structure of the project design method can be interpreted as follows:

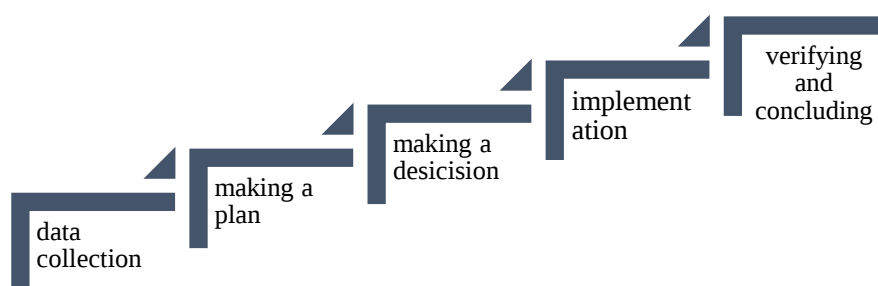


Figure 5. Project Design method

“Ajil” (practical team creative projects) technology. This technology helps to develop creativity in future teachers, to develop teamwork skills and to form knowledge about the forms of team project work. It is advisable to apply this technology after a conversation on the topic “Organisation of team creative work” or a blitz-game on the topic “I am the organiser of team work” has been conducted in the educational process. When applying the method, work is carried out in the following order:

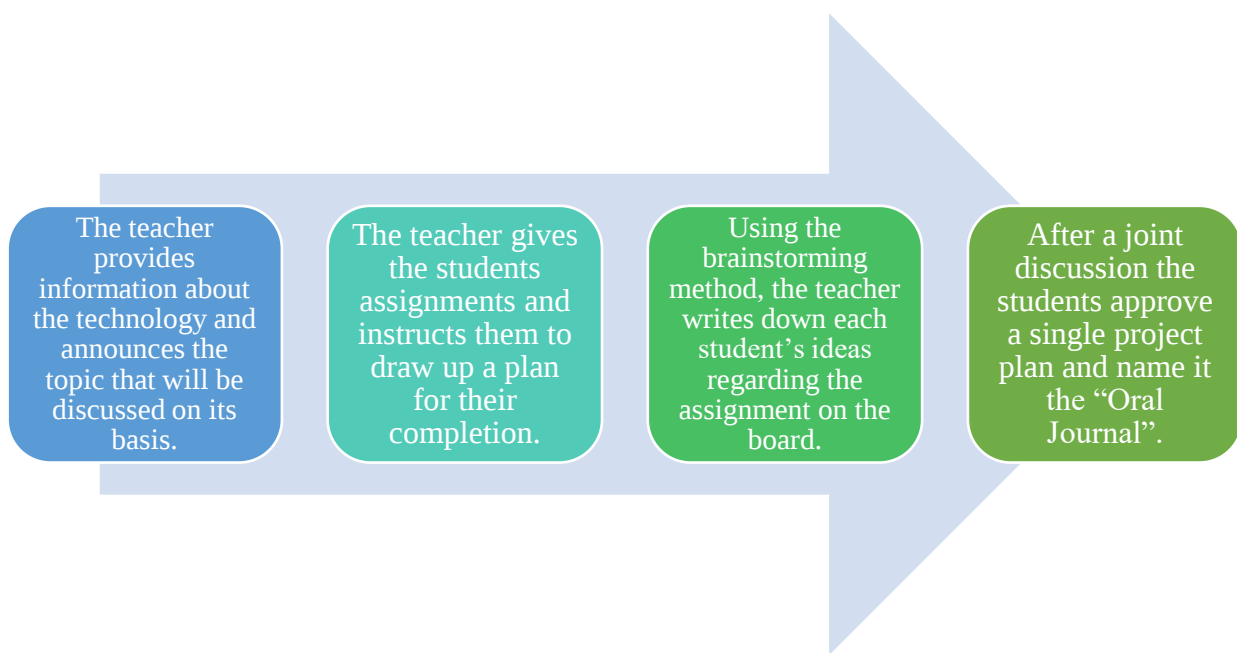


Figure 6. “Ajil” (practical team creative projects) technology

After that future teachers work in small groups. Let us examine the sequence of this process:

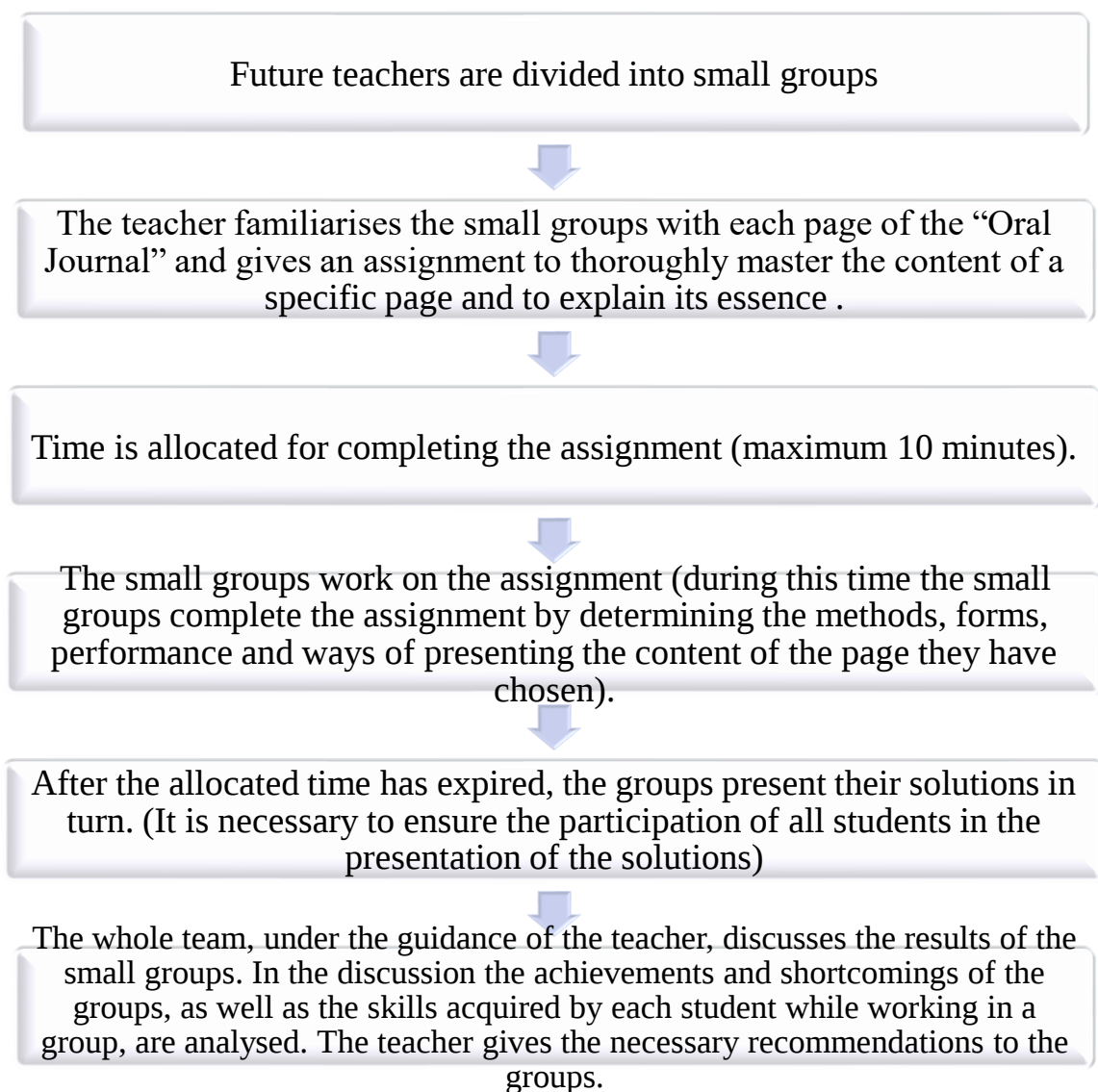


Figure 7. Project-Based Method

When creating projects, the essence of the proposed process should be expressed through concise and clear ideas, supported by visual representations. The didactic potential of the method is reflected in the following:

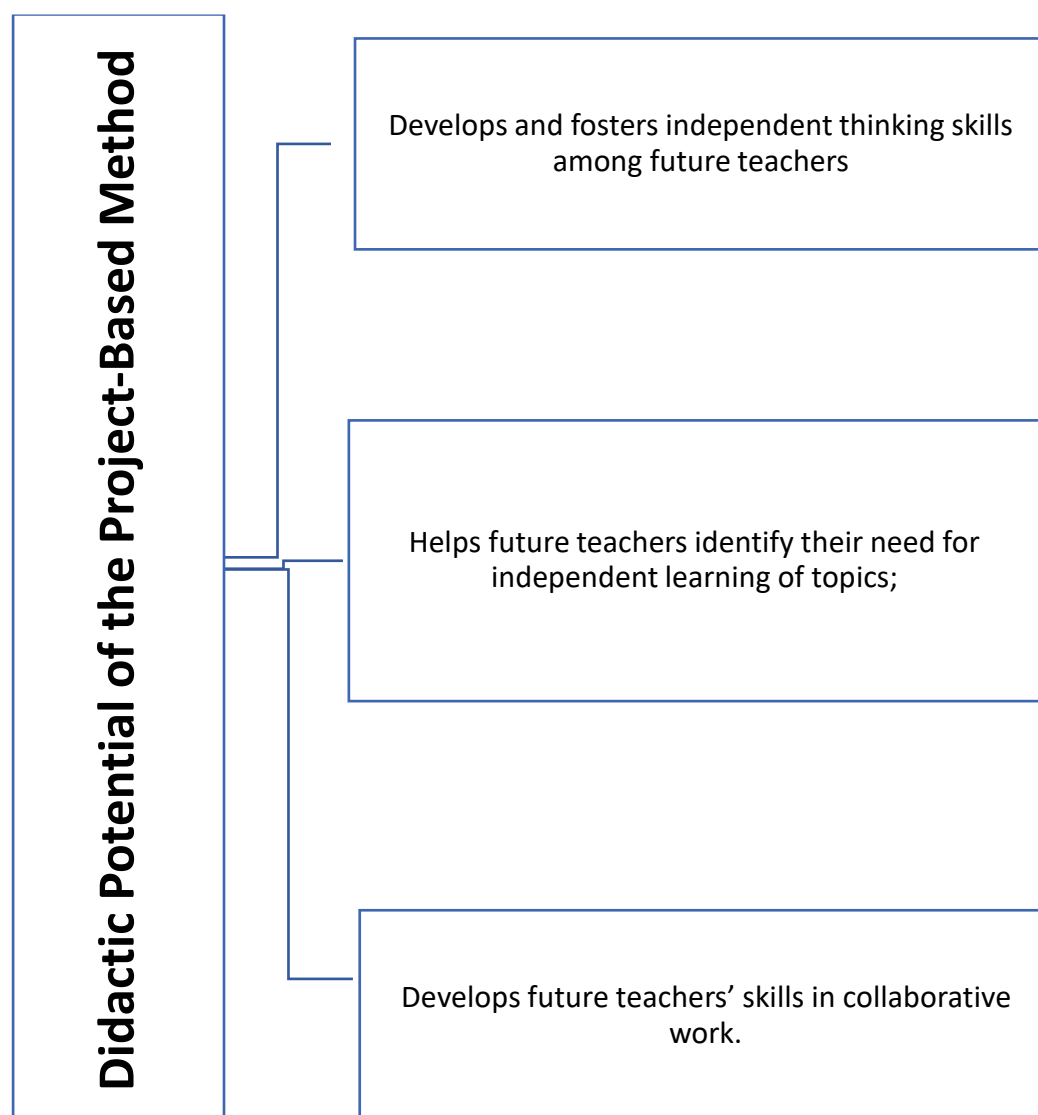


Figure 8. Didactic Potential of the Project-Based Method

We conducted a study on the use of several methods for developing project-design competencies among prospective teachers. All the methods we examined directly contribute to the development of prospective teachers' project-design competencies. Furthermore, during the process of preparing prospective teachers for project activities, studying a problem in a simple, comprehensive, and detailed manner contributes to the effective implementation of the project developed. For this purpose, we consider the "Positive, Negative, Interesting" (PNI) method.

"Positive, Negative, Interesting" (PNI) Method. The method serves to enrich prospective teachers' understanding and broaden their thinking by encouraging them to draw conclusions

based on a thorough examination of several aspects of a given situation. In the educational process, the use of the PNI method is effective in developing students' skills and abilities to pay attention to all aspects of a particular reality, event, or process; evaluate its negative aspects; and identify and explore its interesting features. In this process, particular attention is given to considering all the positive aspects of the existing situation. Conclusions about the situation being studied and decisions regarding it can be made only after the situation has been thoroughly examined.

This method is effective not only for acquiring knowledge in academic subjects but also for solving problem-based situations and preparing project work. Its use has a positive impact on the effectiveness of prospective teachers' thinking.

The PNI method can simultaneously be considered a method for studying and assessing the activities of prospective teachers. Its application scheme is as follows:

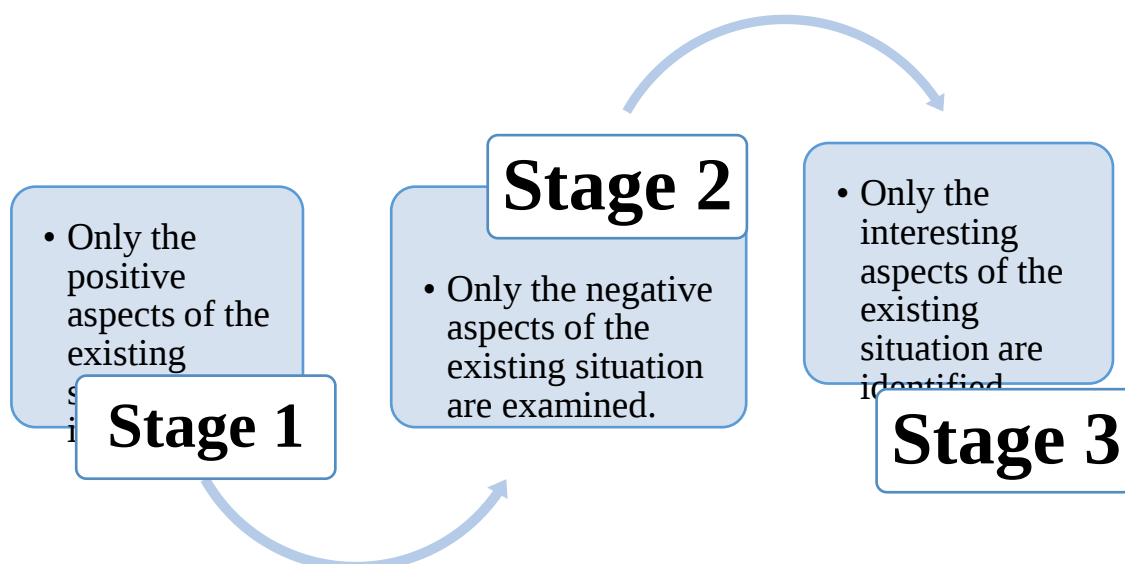


Figure 9. “Positive, Negative, Interesting” (PNI) Method

“Portfolio Method”

This method is an assessment approach in education in which prospective teachers compile a collection of their work to demonstrate their learning and development. It is a collection of work that demonstrates prospective teachers' learning progress and achievements over time.

The use of the portfolio method is particularly important for developing prospective teachers' project-design competencies in a digital learning environment. This method helps prospective teachers assess and improve their project-design skills through digital tools. The portfolio method provides prospective teachers with opportunities to document their projects, engage in self-assessment, and pursue continuous development, which aligns with the

requirements of digital education.

This approach promotes teachers' professional development because digital portfolios enable them to present their work visually, reflect on their performance, and make improvements. In addition, e-portfolios strengthen interaction and collaboration between students and teachers in the educational process and help develop project-design competencies in real time.

Conclusion

The following advantages of this method can be identified:

- Encourages self-assessment – prospective teachers analyze their projects in a digital environment and identify areas for improvement;
- Supports professional development – prospective teachers' digital skills, including their project-design abilities, are systematically assessed and improved through digital portfolios;
- Ensures integration with digital technologies – creating portfolios through Google Sites or other platforms adapts the project-design process to a digital environment.

Thus, in our research, it is important to systematically use the following methods to improve the methodology for developing project-design competencies among prospective teachers. These methods are based on project-based learning, gamification, and interactive methods.

Method	Description	Application	Advantages
Project-Based Learning (PBL)	Prospective teachers work on real-life projects.	Group projects should be organized on digital platforms such as Moodle, Canva, and Trello. In addition, using this method, prospective teachers can create interactive modules for a virtual classroom.	Develops practical skills and increases motivation.
Gamification	The use of game elements such as points, badges, and levels.	Applications such as Kahoot or Quizlet can be used to clarify project-design tasks. For example, a point-based system can be introduced when evaluating project designs.	Increases engagement and strengthens interest.
Cloud Technologies and	Tools such as Google Drive and	Prospective teachers collaboratively develop	Enhances collaboration and

Multimedia Resources	Microsoft Teams.	projects in the cloud and can incorporate videos and animations. For example, prospective teachers can create a digital book or a digital lesson plan.	provides easy access to resources.
Critical Thinking and 4C Competencies (critical thinking, collaboration, communication, creativity)	Critical analysis can be integrated into the learning process.	When used in project discussion forums in a digital environment, prospective teachers evaluate each other's projects.	Develops a range of comprehensive skills.
Digital Assessment Methods	Online tests and portfolios.	Students present their projects through an e-portfolio (e.g., Google Sites), and automated assessment can be used.	Ensures objectivity and makes it easier to monitor progress.

A **step-by-step approach** is considered important when applying these methods. First, it is necessary to provide a theoretical foundation by organizing lectures on the digital learning environment and project-design competencies. It is also important to organize practical tasks, discuss the results, and focus on further improvement.

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