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Methodological Aspects of Project Module Design Development as a Technological Component of Practice- Oriented Training of Prospective Teachers

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Abstract

Changing priorities in teacher training have necessitated a new model for prospective specialists training, taking into account the rapidly changing educational environment. In this regard, project module for prospective teachers' training is considered to be one of the most important structural components of the baccalaureate curriculum.

The study is aimed at the development of project training design as a technological component of future teachers' practice-oriented training. The main research method was the modeling method, which allowed, on the basis of abstraction, to determine the integration links between project activities and other components of the university educational.

The article provides an overview of the studies on project training genesis, summarizes the organizational and technological solutions used by universities in organizing project-based training.

In course of the study, conceptual provisions on the integration of project training with different types of educational activities on the basis of activity and reflective approaches, were determined. The authors substantiated and graphically presented the continuity of the project activity cycles of a certain type of project, developed the trajectories for integrating project into different types of educational activities, and also proposed a design for embedding a project module in the bachelors' training educational process.

The results of the study can be used in designing baccalaureate educational programs on the specialties "Education and Pedagogical Sciences", and can also be applied to other areas and profiles of the future specialists' training in higher education.

Keywords: prospective teacher, project activity, project types, project integration paths, project module design.

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Introduction

The leading trend in higher education program development is its practical orientation, which ensures the students' professional competence formation through the fulfillment of real practical tasks. In the theory and practice of higher education, various tools and technologies are provided to ensure practical orientation of future specialists' training. With all the variety of educational technologies used, the widest possibilities for combining the fundamental nature of theoretical education and professionally applied orientation in the future teachers' training, are provided by project-based training.

In domestic research, project-based training is seen as a holistic pedagogical technology (Guzeev, 2006; Klarin, 1995; Kruglova, 1999; Levites, 2017; Polat, 2010; Chechel, 2003), which main goal in future teachers' training is not only the professional competencies formation represented in the Professional Standard of a Teacher, but also the future teachers activity components formation and development.

Project-based training implementation at the university requires new organizational and pedagogical conditions and managerial solutions, which entail not only additional financial costs, but, above all, educational process restructuring and curricula design.

Thus, on the one hand, project-based training becomes an integral part of the university educational process, but on the other hand, there is not clear understanding of the procedural and organizational mechanisms for integrating project training into the process of future specialists training.

Purpose and objectives of the study

The aim of our study was to develop a future teachers project training design as a technological component of their practice-oriented training.

Literature review

Initially, "project training" in the studies of domestic and foreign authors was considered in the context of the broader concept of "design".

In international practice, design is an effective means of strategic planning. Methodological approaches to pedagogical design are revealed in the works of Zaire-Beck (1995), Kraevsky (2002), Prikot (2002), Slastenin (2002), Yakovleva (2002) and others.

In designing theory and methodology, the historical dynamics of designing as a scientific, cultural and historical phenomenon is revealed, and approaches to designing nature determination in education are defined. Design is considered in the socio-pedagogical (Genisaretsky, 2007; Merzlyakova, 1995; Prikot, 2002) and didactic (Bezrukova, 1996; Monakhov, 2016; Muravieva, 2001) aspects.

Research analysis has allowed identifying the following approaches to the phenomenology of design in education:

- design as a component of a systematic approach to education (Bezrukova, 1996; Borisova, 2010; Gershunsky, 1998; Zagvyazinsky & Atakhanov, 2005; Markov, 2017; Yakovleva, 2002),
- design as a valuable training activity (Slobodchikov, 2002; Prikot, 2002; Gladkaya, 2015; Platonova & Samokhin, 2011),
- design as a pedagogical technology (Bespalko, 1989; Bolotov, 1997; Slastenin, 2002; Slobodchikov, 2002; Polat, 2010).

The study of design as a pedagogical category led to the fact that project training stood out as an independent technology of forming students' professional competence by fulfilling real practical tasks.

The issues related to the development of project activities are highlighted in numerous works of domestic and foreign scientists in the field of philosophy, pedagogy, psychology - Bespalko (1989), Bordovskoy (2010), Gershunsky (1998), Zagvyazinsky & Atakhanov (2005), Slastenin (2002), Khutorskoy (2010) and others.

The following aspects of theoretical understanding of the “project training” phenomenon can be distinguished:

- the functions of project training and its role in vocational training (Raven, 2002; Meyers, 2014; Polat, 2010; Selevko, 1998);
- definition and nature of project training (Streltsov, 2005; Slobodchikov, 2002; Guzeev, 2006; Klarin, 1995; Levites, 2017; Polat, 2010; Chechel, 2003),
- project training characteristics (Gazman, 1995; Slobodchikov, 2002; Polat, 2010; Klarin, 1995),
- features of project activities as a means of organizing educational environment (Reznik, 2004; Nikitina, 2013; Beh, 2011),

- organizational and pedagogical conditions for project activities as a didactic system component for future specialists training (Akhmetova, 2005; Borisova, 2010; Bugakova, 2001; Monakhov, 2016; Polat, 2010; Nuriev & Starygina, 2012),
- characteristics of project activity product results (Sergeev, 2003),
- project training management.

The foreign authors such as Meyers (2014) and Lutkovsky (2003) noted the positive aspects of using this method to implement the competency-based approach in higher education. Modern domestic researchers, for example, Guzeev (2006), Klarin (1989), Kruglova (1999), Levites (2017), Polat (2010), Chechel (2003) emphasize the importance and effectiveness of project-based training to provide students with a comprehensive mastery of methodological knowledge and self-education skills. This technology can be used as a mean of developing students' abilities, research and social skills.

Thus, project activity at the present stage is considered as an integrative tool, which let interconnect the target, substantive, procedural and technological components of the university educational process.

Accumulating educational, cognitive, professional, labor, research activities, project training allows building effective educational communications to reach the goal.

At the first stage:

- some important characteristics of project training as a form of prospective students' training were highlighted (Gazman, 1995),
- the typologies of students' projects were presented,
- the characteristics of the product results of the students' project activities were determined (Sergeev (2003);
- the conditions for students' project competence development are determined and the map of project activity competencies is defined to carry out project management.

The study analysis has led to the following conclusion:

Despite the fact that theoretical understanding of project training nature as a mean of vocational training has recently acquired significant relevance and the degree of scientific development of this problem is quite

high, the technological aspects of university project training implementation, the issues regarding the features of project activities use in the educational practice of future teachers' training still need further research.

We have identified a number of problem issues related to project training integration into the university educational process:

- the ways to technologically ensure, on the one hand, educational programs' practical orientation, and on the other hand, the achievement of educational results related to future teachers training,
- how to make a student projects portfolio,
- the ways to involve students in project activities,
- how to ensure meaningful continuity of project activities with other types of educational activities.

Methodology

Research methods

In the research the following methods were used: conceptual and terminological system analysis, hypothesis generation, forecasting. The main research method was the modeling method, which allowed, on the basis of abstraction, to determine the integration links between project activities and other components of the university educational process.

Research experimental base

The research experimental base was Cherepovets State University. The design of project training integration into the educational process was carried out from 2017 to 2019. The design object was the educational program 44.03.01 Pedagogical Education (Preschool education).

Project stages

The study was carried out in three stages.

At the first stage, theoretical analysis of the existing methodological approaches in philosophical, psychological and pedagogical scientific literature, of the dissertations on the related problems, was carried out; the goal and research methods were determined.

At the second stage, the analysis of the university testing practices of the project training was made.

Due to the fact that the introduction of project training involves a multifaceted restructuring of the educational process, and the use of different mechanisms of involving teachers and students in project activities, we paid special attention to the organizational and technological changes that were carried out at the universities during the implementation of project training.

Table 1 presents the analysis of the educational process organizational transformations during the transition to project-based training.

Table 1. Analysis of the organizational changes in the university educational process during the implementation of project training

Kinds of changes	Characteristic features of changes
Institutional changes	Modernization of the educational model, integration of project training into the learning process which involve all students
Changes in the educational process organization	Implementation of project training in selected specialties
Managerial change	New departments in charge of project activities New structural units that implement project training
Educational technology changes	Further training, training and retraining of curators, the introduction of new educational formats and credits
Personnel changes	Inviting practicing specialists, teachers
Communication changes	New information channels, project sites and portals

A comparative analysis of technological solutions for the implementation of project training used in domestic universities is presented in table 2.

Table 2. Characteristics of technological solutions for the implementation of project training

University	Characteristics of technological solutions for the implementation of project training
National Research University Higher School of Economics Moscow Polytechnic University	<ul style="list-style-type: none"> - The project is defined as a special type of educational activity, limited in time and focused on the final product; - 4 types of projects have been identified (by mandatory implementation, by the main activity, by the number of participants, by the customer); <ul style="list-style-type: none"> - Role positions are specified when initiating a project; - Definite mechanisms for managing project activities; - Design and training laboratories as the organizational means of implementing project training; - Definite indicators of the project activity effectiveness. - Project training is a means of integrating theoretical training and specialized economical and professional sectors; - The implementation of project training is regulated by the implementation of the project full life cycle and a mandatory practical solution;
Far Eastern Federal University	<ul style="list-style-type: none"> - The institutional mechanism of project activities has been determined in the format of the CPA “Center for Project Activities”, which carries out planning-launch-monitoring-control of students' project activities; - The functionality of curators carrying out educational support of the students in the process of project activities, has been determined. - The project activity is focused on creating the prerequisites for technological startups; - Centers for project activities are the organizational coordinators of project activities implementation (accumulation of project proposals - coordination of project teams activities - a synthesis of the best practices of project solutions - supervision of startups); - Specified criteria for determining the project.
Nizhny Tagil Technological Institute	<ul style="list-style-type: none"> - Project activity is considered as a collective activity of students, teachers, customers and an expert group, focused on obtaining a unique product and forming a promising scientific and technical basis for future professional activities; - Theoretical training is focused on achieving educational results as an integration basis of project activities; <ul style="list-style-type: none"> - Priority areas of project activities have been identified; - A model for managing project activities has been designed.

Institute of Computer Technologies and Information Safety, Southern Federal University	<ul style="list-style-type: none"> - Project activity is considered as an independent activity of students in small groups; <li style="padding-left: 40px;">- Practical orientation of the product result; - Institutional mechanisms for the implementation of project activities are identified; - Project presentation is seen as a tool for determining the level of formed competencies and skills.
Lobachevsky State University of Nizhni Novgorod - National Research University	<ul style="list-style-type: none"> - New organizational format - All-Russia School "Technology + Business"; <li style="padding-left: 40px;">- The target landmark of project training is to obtain not only practice-oriented knowledge, but also the formation of "meta-knowledge" (knowledge to obtain knowledge); <li style="padding-left: 40px;">- Project result - "Prototype" as a model of any object or activity.

The conducted practice-oriented analysis made it possible to single out a wide range of organizational and technological approaches to the implementation of project training at the university. However, despite the multidimensionality of the results, it should be noted that there is no definite correlation between project training and different types of educational activities. More often, one or two vector connections are traced in the curricula. For example, "theoretical training is the design activity of students", or "practice is the design activity of students".

The educational result of future teachers' training is professional competence, which is regarded as a complex integrative education that accumulates various levels of mastering the profession: from a sufficient level of performing labor functions and actions indicated in the Professional Standard of a Teacher to future competencies adapted to the professional environment characteristics and specifics of professional tasks.

In this regard, we propose to change the approach to embedding project training in the educational process and consider the principle of integrating project activities into other types of educational activities as the main principle.

The content of the third stage (2018-2019) was the design of the project training integration into the process of future teachers' training.

The main ideas for integrating project-based training into the educational process were as follows:

1) Continuity of the professional competence formation is ensured by the interconnection of different project types - educational, technological and innovative ones - integrated into the project module.

2) The structure of the project module includes:

- "supporting" disciplines, ensuring project competencies formation,
- disciplines that form research competencies and basic professional qualities (critical thinking, creativity, initiative and independence),
- electives that allow the student to get additional competencies necessary for the implementation of the project in accordance with the specifics of its content.

3) Project activities are built on the basis of the didactic principle "from simple to complex":

- at the first stage, project topics are determined by the current personal and initial professional experience of students,
- the development of theoretical disciplines and involvement into professional practice allow students to gain experience and carry out a problem analysis of the theory and practice of education, which becomes the basis of technological design,
- at the last stage, students implement innovative projects, the topics of which can be proposed by the educational organization.

4) Project portfolio is formed taking into account the professional interests of students, at the request of employers' representatives or other stakeholders. Practice results also become material for reflection, providing a project theme definition and its substantive focus.

5) When developing the curriculum model design, the integrative relationship between the content of specialized disciplines and different types of practices that are designed as parallel processes, but related by content to each other, is taken into account.

6) Students' involvement in project activities includes the implementation of several trajectories, regulated by a certain sequence and combining different types of educational activities in accordance with the project type, namely: "theoretical study - practice -educational project", "practice - theoretical study - elective - technological project - practice", "practice - elective - innovative project - practice".

Results

1. In accordance with the purpose of the study, special emphasis was made on the analysis of the student projects typology. Based on the features and content of professional pedagogical activity, we offer an author typology of student projects, namely: educational, technological and innovative. These types of projects are combined into a project module, the content of which should include “supporting disciplines”, ensuring the formation of students’ project competencies and their basic professional qualities (critical thinking, creativity, initiative and independence).

In course of the study, the structure and content of the educational program project module of preschool teacher training were developed and tested (44.03.01 Pedagogical Education, Preschool Education):

- educational, technological and innovative projects (topic examples of the projects are given below);
- disciplines supporting project activities: “Technology of Project Activities”, “Project in the professional sphere”;
- the discipline that forms the research competencies and the basic professional qualities of “Innovation in Education”,
- electives.

The topics examples of different types of student projects:

Topics of educational projects: “Modeling of the effective space of interaction between an educational organization and a family”, “Modeling of preschool educational organization playing space”,

Approximate topics of technological projects: “Designing an interactive educational space of a preschool educational organization”, “Development of the research competencies of preschool children in the process of project activities”.

Approximate topics of innovative projects: “Designing correctional and developing routes of psychological and pedagogical support for preschool children based on the profile of emotional distress”, “Individualization of psychological and pedagogical support of preschoolers in preparation for school study”.

2. The authors carried out the design of the project module embedding in the baccalaureate educational process (for example, specialty 44.03.01 Pedagogical Education, Preschool Education), developed on the basis of the theoretical provisions presented above.

The continuity of the project activity cycles of a specific project type is achieved by going through certain stages of each trajectory. It should be noted that each trajectory is characterized by a special sequence of students' involvement in different types of educational activities.

The first trajectory: "theoretical study - practice - training project."

Theoretical study includes mastering the discipline "Technology of project activity", in which students study the concept of project activity and the project life cycle, have team building training, learn about the practice of project activities of previous courses. The educational result is the formation of the initial level of project competencies.

The next stage in this trajectory is educational practice, during which students accumulate initial professional experience, try to identify problem areas of professional activity, which can become the basis for initiating the project.

The result of this trajectory is an educational project that accumulates students' theoretical knowledge of project activities and practical application of this knowledge in project activities. The first educational projects involve a combination of reproductive (elementary, simple, typical) professional actions and creative approaches to solving typical problems. For example, the task "development of preschool children's elementary mathematical ideas" is typical in the professional activity of a teacher, and the problem "the use of interactive tools, including information technology, to develop preschool children's elementary mathematical ideas" may be the basis of project activities.

The second trajectory: "practice - theoretical study - elective - technological project - practice."

Professional practice, which involves the manifestation of an active professional position on the basis of quasi-professional activity, contributes to the formation of students' professional experience in solving various types of professional tasks.

Theoretical study of the discipline "Innovations in professional activity" allows students to consider the field of professional activity as a constantly changing and developing system.

Prospective teachers, within the framework of this trajectory, form professional interests that can be

supplemented and supported through elective courses, which the students choose themselves, based on the subject of their own project activity.

All this allows to turn to a technological project, in which students not only use knowledge in practical activities, but are also able to modify and transform theoretical and initial professional experience, offer their own topics of projects and options for their implementation. The product result obtained within the framework of this trajectory should be realized in course of professional practice.

The third trajectory: "practice - elective - innovative project - practice".

Involvement in practical activity through the implementation of various types of pedagogical activities, forms an individual profile of students' educational and professional activity.

Additional elective courses allow to form a subjective position not only in project activities, but also in the general professional competence of future teachers.

An innovative project implemented by students, is characterized by a high level of student activity independence, and involves the fulfillment of different roles in project activities (establishing interaction with the customer, organizing the work of the project team, promoting the product result). An innovative project can become the basis for a graduate bachelor's thesis, also collective one. In this regard, undergraduate practice will act as a product space of an innovative project.

The design of project module embedding in the educational process of bachelors' training and its trajectory is presented in Fig. 1

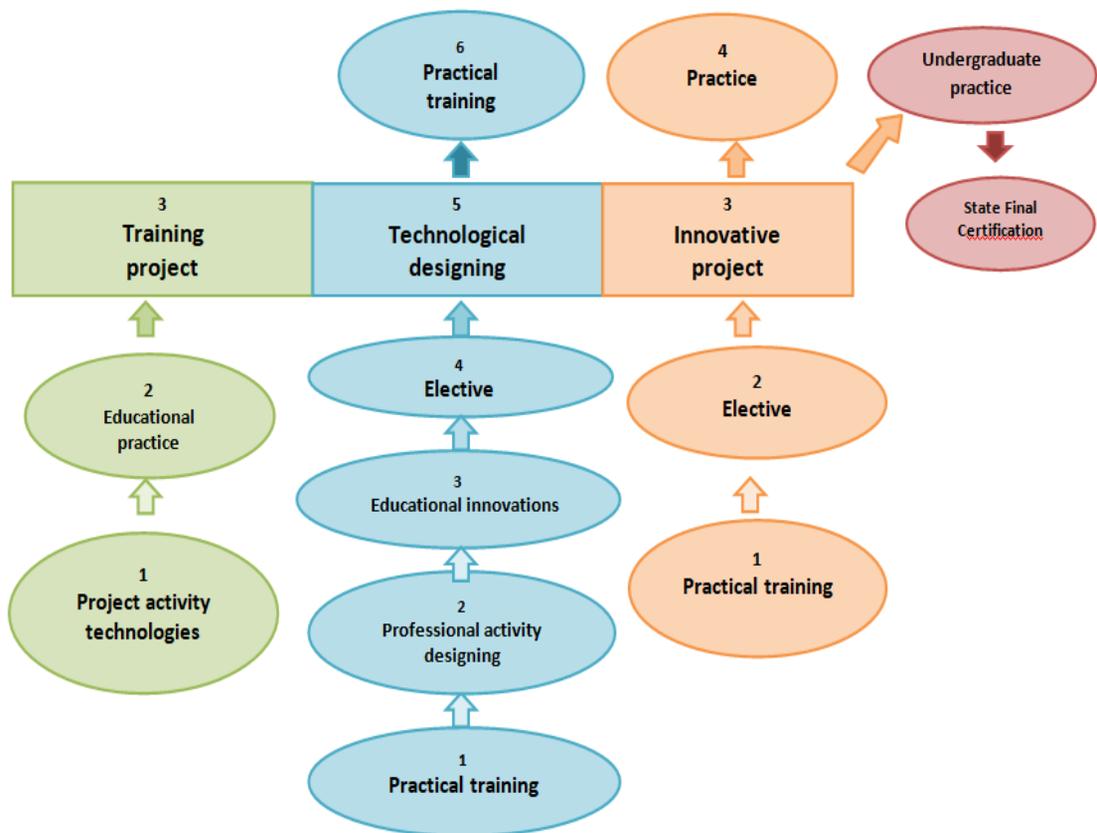


Fig. 1. The design of embedding various types of projects in the university educational process

3. Another research result was a curriculum model design based on the integration of the project module into different types of educational activities.

The curriculum model shown in Fig. 2, demonstrates not only the relation of different types of educational activities, but the integration of the educational program modules:

- general professional
- professional
- project
- final certification.

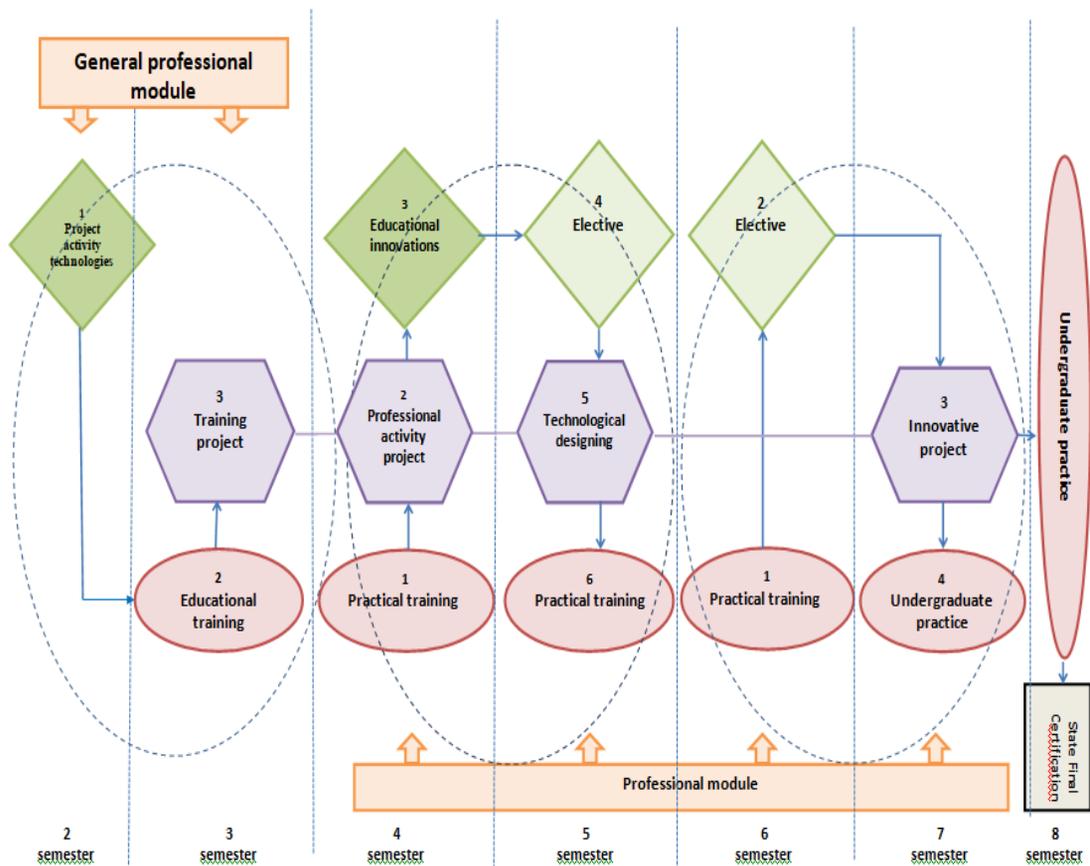


Fig. 2. Curriculum model design based on the integration of the project module into different types of educational activities

Discussions

The presented curriculum design model is currently being tested at the specialty 44.00.00 “Education and Pedagogical Sciences”. The question is debatable: "Is it possible to use this model in the curricula design for other specialties, including technical and humanitarian ones?"

In addition, the proposed typology of projects (educational, technological, innovative) is related to the content and characteristics of the teacher training. For other training spheres, other types of projects may be used.

At the same time, the conceptual provisions on the integration of project training with different types of educational activities and the continuity of different types of projects, the basic foundations of the activity and reflective approaches can be considered as priority when designing the integration of project training in the university educational process.

Conclusion

The article presents a theoretical base for the project-based education, a research review on the project-based education genesis. The authors analyzed the implementation practices of project training in domestic universities, summarized the organizational and technological solutions used by the universities in organizing project training.

In course of the study, conceptual provisions on the integration of project training into different types of educational activities on the basis of activity and reflective approaches that were the basis for the curriculum model design development were identified. The authors substantiated and graphically presented the continuity of the project activity cycles, developed the trajectories of project activities integration into different types of educational activities, as well as a curriculum model design based on its integration into different types of learning activities.

The results of the study can be used in the educational program design for the bachelors' students of "Education and Pedagogical Sciences" specialty, and can also be applied to other areas and profiles of future specialists training in higher education.

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References

- Akhmetova, M. N. (2005). *Pedagogical design in vocational training*. Novosibirsk: Nauka.
- Bezrukova, V. S. (1996). *Pedagogy. Projective pedagogy*. Yekaterinburg: Delovaya kniga.
- Bespalko, V. P. (1989). *Components of pedagogical technology*. Moscow: Pedagogika.
- Beh, L. V. (2011). *Project in gymnasium educational system*. Rostov on Don: ROIPK i PRO.

- Bolotov, V. A., Isaev, E. I., Slobodchikov, V. A., & Shaidenko, N. A. (1997). Designing of Professional Pedagogical Education. *Pedagogika -Pedagogy*, 4, 66-72.
- Bordovskoy, N. V. (2010). *Modern educational technologies: study guide*. Moscow: KNORUS.
- Borisova, N. V. (2010). *Educational technologies as an object of pedagogical choice in the context of the competency-based approach implementation*. Moscow: Issledovatelski centr problem kachestva podgotovki specialistov.
- Bugakova, N. Yu. (2001). *The development of technical university students' design activities (for example, disciplines of the engineering specialties)*. Kaliningrad: Balt. gos. akad. Ribopromislovgo flota.
- Chechel, I. D. (2003). Research projects in school practice. *Praktika administrativnoi raboti v shkole - The practice of administrative work at school*, 6, 18-26.
- Gazman, O. S. (1995). From authoritarian education to the pedagogy of freedom. *Novie cennosti obrazovania. Nauchno-metodicheskaya seriya - New values of education. Scientific and methodological series*, 2, 16-45.
- Genisaretsky, O. I. (2007). *Design activities and design culture*. Krasnojrsk: RIOSFU.
- Gershunsky, B. S. (1998). *Education philosophy of the 21st Century: In Search of a practical-oriented educational concept*. Moscow: Sovershenstvo.
- Gladkaya, I. V., Glubokova, E. N., Pisareva, S. A., Piskunova E. V., Tryapitsyna, A. P. Gogoberidze, A. G., & Golovina, I. V. (2015). Models and modules for preschool education baccalaureate. *Psihologicheskaya nauka i obrazovani - Psychological science and education*, 20(5), 99-107.
- Guzeev, V. V. (2006). *Effective educational technologies*. Moscow: NII shkolnih tehnologi.
- Khutorskoy, A. V. (2010). *Pedagogical innovation: a textbook for students of higher educational institutions*. Moscow: Izdatelski centr «Academy».
- Klarin, M. V. (1995). *Innovations in world pedagogy: learning through research, games and discussions. (Analysis of foreign experience)*. Riga: NPC «Eksperiment».
- Kraevsky, V. V. (2002). *General fundamentals of pedagogy*. Moscow: Volgograd, peremena.

- Kruglova, O. S. (1999). Project Learning Technology. *Zavuch - Head teacher*, 6, 90-94.
- Levites, D. G. (2017). *Pedagogical technologies*. Moscow: NICH INFARMA.
- Lutkovsky, V. M. (2003). *Project Method Series "Modern technologies of university education"; Issue 2*. Minsk: Respublikanskii institut visshoi shkoli Belorusskogo gosudarstvennogo universiteta.
- Markova, S. M. (2017). *Design of pedagogical systems and their implementation in a regional professional system*. Moscow: FLINTA; Nizhny Novgorod: Izd-vo Mininskogo un-ta.
- Meyers, S (2014). *Effective use of C ++. 35 new recommendations for improving your programs and projects*. Moscow: DMK Press.
- Merzlyakova, M. G. (1995). The development of the creative potential of teachers in the process of designing a personality-oriented education system in higher education (on the example of a multidisciplinary lyceum) (Doctoral dissertation, Herzen State Pedagogical University of Russia, Saint-Petersburg). Retrieved from https://rusneb.ru/catalog/000199_000009_000151981/
- Monakhov, V. M. (2016). Methodological recommendations for a teacher on the design of the main educational program in computer science in accordance with the requirements of the Federal State Educational Standard of the second generation. *Informatika I obrazovanie - Computer science and education*, 10(279), 9-17.
- Muravieva, G. E. (2001). *Design of educational technologies*. Ivanovo.
- Nikitina, I. V. (2013). *Designing a tool "Methodological instructions for term paper"*. Orenburg: Orenburgskii gosudarstvennii universitet.
- Nuriev, N. K., & Starygina, S. D. (2012). Designing a smart system to support "double diploma" training. *Vestnik Kazanskogo gosudarstvennogo tekhnicheskogo universiteta - Bulletin of Kazan state technical University*, 19, 253-257.
- Platonova, A. S., & Samokhin, A. V. (2011). Designing an information system for monitoring and evaluating students' educational activities: architecture, model, and database structure. *Informacionnie sistemi I tehnologii - Information systems and technologies*, 3 (65), 13-21.
- Polat, E. S. (2010). *Project Method: History and Theory*. Moscow: izd.chentr «Akademia».

- Prikot, O. G (2002). Pedagogical design as a working tool of the school methodological support. *Methodist - Methodist*, 2, 25-30.
- Raven, J. (2002). *Competence in modern society: identification, development and implementation*. Moscow: Kogito-Centr.
- Reznik, T. P. (2004). *Project activity as a means of forming the unity of individuality and collectivism of pedagogical university students: On the material of foreign language teaching* (Doctoral dissertation, Volgograd State Socio-Pedagogical University, Volgograd). Retrieved from https://rusneb.ru/catalog/000199_000009_002662956/
- Selevko, G. K. (1998). *Modern educational technology. Tutorial*. Moscow: Narodnoe obrazovanie.
- Sergeev, I. S. (2003). *How to organize students' project activities. Practical guide for teachers of educational institutions*. Moscow: ARKTI.
- Slastenin, V. A. (2002). *Manual for students of higher pedagogical educational institutions*. Moscow: izd.chentr «Akademia».
- Slobodchikov, V. K. (2002). "Design" - a scientific word. What is its practical meaning? *Direktor shkoli - Head of school*, 6, 5-18.
- Streltsov, V. (2005). Design is a methodical and pedagogical technology of the future. *Uchitel - The teacher*, 1, 36-39.
- Yakovleva, N. O. (2002). *Theoretical and methodological foundations of pedagogical design*. Moscow: Izd-vo ATiSO.
- Zagvyazinsky, V. I., & Atakhanov, R. (2005). *Methodology and methods of psychological and pedagogical research*. Moscow: Izdatelstvo "Academy".
- Zaire-Beck, E. S. (1995). *Theoretical foundations of teaching pedagogical design* (Doctoral dissertation, Herzen State Pedagogical University of Russia, Saint-Petersburg). Retrieved from https://rusneb.ru/catalog/000199_000009_000123090/