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TECHNOLOGIES IN THE IMPLEMENTATION OF PARADIGM OF THE FUTURE TEACHER TRAINING

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Abstract

The article presents the use of information and communication technologies in organizing the methodological training of a future teacher to develop his or her readiness for project activities. The design paradigm in the student's methodological preparation is implemented from the position of competency-based, personality-oriented and subject-activity approaches. Readiness for project activities includes the ability to identify information resources, to search for data and establish meaningful relationships between them, to develop a methodological project plot, to isolate and describe the situation, to analyze the situation structurally, to identify and justify alternative solutions with an assessment of each of them, to formulate results and conclusions from the decision-making process. This readiness is assessed by the results of the future teacher's implementation of a methodological project at the information planning, practical and reflective-evaluative stages. The main research methods are the project method, the survey method and questionnaires. The implementation of the project method using network services in the training of the future teacher of mathematics and computer science is presented. The following capabilities of services in the implementation of methodological projects are indicated: the choice of Internet resources for solving problems, the expansion of the space and training resources, the development of interdisciplinary relationships. In the readiness structure, personal, theoretical and practical components are highlighted.

1. Introduction

An integrated approach to designing methodological training of a future teacher is associated with the content and change of educational activity organizational forms. The methodological basis for the process of the subject forming, communicative and methodological competencies, as a certain system of meaningful orientations, knowledge, skills and experience, lies in competency-based, personality-oriented and subject-activity approaches. The Declaration of the UNESCO World Conference on Higher Education states that priority is given to learning how to gain knowledge (Ilinsky, 2012). Informatization of education actualizes the recourse of teachers to the interactive methodology of problem-based learning, which is presented as a part of the project method. The project paradigm is widely implemented in higher education (Knoll, 1997). The student has considerable opportunities for self-realization and self-organization in the project preparation activities. This activity is based on a certain system of knowledge, skills, special personal qualities and is aimed at the student's independently solving professional tasks to form his willingness to navigate in the internal, external and virtual worlds. Future teachers must be prepared to organize and manage the project work of their students, and, accordingly, high demands are made on their methodological training.

The structure of readiness for professional activity, in its essence, is multicomponent. Thus, Alexandrova (2014) includes the following components in this structure: motivational (positive attitude to the profession and other persistent motives); orientation (knowledge and understanding of the features and conditions of professional activity); operational (possession of methods and techniques of professional activity); strong-willed (self-control and ability to manage activities); evaluative (self-assessment of professional activity and compliance of the process of solving professional problems with optimal labor standards). Voropaeva (2014) distinguishes motivational-value, cognitive and operational-activity components. The first component is associated with a positive attitude to professional activities, the need to successfully solve professional problems and desire to achieve success. The second deals with understanding professional tasks, an assessment of their significance, knowledge of how to solve them and an idea of possible changes in the working environment. The third is associated with personal abilities and features of mental activity that are adequate to the requirements of the profession. And in the collective work (Ivenskikh, Sorokoumova, & Suvorova, 2018) they interpret the teacher's readiness for activity in the social and household orientation of students through such interconnected components as personal, cognitive, and active ones.

Despite some differences in understanding the concept of "readiness for professional activity", we see developing opportunities for project activities in working with students. For example, we speak here about stimulating interest in project activities, broadening horizons, and developing practical skills. Students' readiness for project activities is a complex structure that can be represented by motivational, cognitive, operational, reflective and personal components (Verkhoturova, 2010).

Summarizing the positions of researchers, we distinguish three components in the readiness structure that are especially significant for the implementation of the future teacher project activities: personal readiness (interest in the profession, moral-volitional, professionally significant and social qualities), theoretical readiness (possession of general cultural, general scientific, special and psychological - pedagogical knowledge) and practical readiness (possession of skills for the implementation of professional

functions and activities). Readiness for project activities, being an integral part of the teacher's professional competence, is determined by a combination of motives, knowledge and ways to independently create new projects. Of great importance, along with the result, there are the content, direction and implementation of student work (Soloviev & Stepanyan, 2009). The project work involves creating a bank of ideas and analyzing the results of the project, including an ideal or real product. This product must have an objective novelty.

Project technology combines individual, steam, group, collective and distance forms of organization of students' activities. With the development of the Internet such services are in demand, which are aimed at making the use of information as efficient and comfortable as possible (Belyakova & Zakharova, 2019). Several stages are distinguished in the structure of project activities, and the student must be both professionally and psychologically prepared for their implementation. Readiness to project activities is an important sign of a teacher's professional qualifications (Ryibina & Popova, 2014).

Forming the future teacher's readiness for innovation and project activities is the basis of his or her methodological training. In the work (Dorofeev, Chirkina, Gagloev, & Savina, 2018) the authors give the invariants of methodological training and show that they correspond to cognitive, socio-humanitarian, operational-activity, research and methodological orientations. Solving professional tasks in the project paradigm independently, the student acquires his own system of semantic orientations, knowledge, skills and experience. Project activities using network services are characterized by an intensive communication process of knowledge sharing. It is distinguished by a high motivation for self-development and comprehension of the new, as well as individual responsibility in team work. The potential of modern Internet technologies in the implementation of student-centered learning is quite high. For example, through the use of Internet services, group and collective activities are organized to jointly search and store information, use photo materials, create media materials, edit text documents, spreadsheets, presentations, maps and diagrams.

Digital technologies are being intensively introduced into the education system, and a science-based approach to their application is needed (Blinov & Sergeyev, 2018). Only that teacher can actively use the capabilities of digital smart-didactics in education who has mastered project activities, knows and applies information and communication technologies.

2. Problem Statement

It is necessary to master the action methods aimed at the use of information and communication technologies in project activities for the methodological preparation of the student. The problem is to identify the conditions for the implementation of the project paradigm in the methodological preparation of a future teacher for the active mastery of the skills to use network services at all stages of the project activity and the formation of their willingness to organize and manage students' research and creative projects.

3. Research Questions

The subject of the study is the formation of the readiness of a future mathematics and computer science teacher to apply information and communication technologies in project and methodological

activities. Using network resources in the student's methodological training system contributes to the development of ICT competency and the formation of personal and professional qualities, which significantly increases the level of his or her interest in organizing project activities with students.

4. Purpose of the Study

The purpose of the article is to present the use of network resources in the organization of project activities in the methodological preparation of a future teacher. The implementation of the project paradigm in students training involves the development of project activities stages using information and communication technologies and obtaining the result in the form of a methodological product that can be introduced into the educational process in school.

5. Research Methods

The study focuses on the practical component of a future teacher's readiness for project activities. The practical component is the degree of mastery of skills in the use of information and communication technologies in the educational process in school. The future teacher should be able to justify the problem and topic of the project activity, draw up a program of search work, being familiar with the methods of implementing the project activity, as well as the diagnostics and methods of tracking its results.

To determine the level of mastery of a practical component, we use project tasks which main function is to concentrate the capabilities of information and communication technologies for implementing methodological ideas in a project solution. Here is an example of one of the directions of the methodological project: "In the context of informatization of education, the issue of the effective use of information and communication technologies in organizing educational work with students is relevant. Suggest your arguments on what innovative forms of educational activities with the use of information and communication technologies are possible for students of different ages."

The organization of project activities depends on the level of motivation, students' interest, the level of professional skills formation, as well as on the content of the material and time constraints in the development of the project (Polat, 2006, p. 43). The methodological project is implemented in three main stages:

– information-planning stage – studying the situation, setting the goal of the project, developing the plot, searching for the necessary data and establishing meaningful relationships between them;

– practical stage – identifying and describing the situation, conducting structural analysis of the situation, determining solution options with an assessment of each of them, implementing and verifying the solution;

– reflective-evaluative stage – cognitive analysis of actions, substantiation of the solution, identifying an alternative solution, formulating the result and conclusions from the decision process.

Let us dwell on the capabilities of network services, which occupy a special place in solving the problems of each stage of project activity. At the information-planning stage, it is supposed to determine the topic of the project and ensure the readiness of a future teacher for project activities. When students have an idea of the subject area of research, they can get acquainted with the researches available in educational practice (eg, social and creative projects, materials from online libraries). It is more valuable

here to organize their discussion not only to get acquainted with a variety of materials, but to compare hidden nuances and emerging problems when conducting your own research.

In the Russian Internet segment among the open electronic libraries there stands out the scientific electronic library CyberLeninka (cyberleninka.ru), built on the Open Science paradigm. Its main tasks are the popularization of science and scientific activity, public control over the quality of scientific publications, open access to scientific results, building a knowledge infrastructure and developing interdisciplinary research. Work with sources is especially important at the stage of formulating the topic and describing the problem field of project activities. Students use the found sources when designing a methodological project. Access to archive.org archive and its web service The Wayback Machine is relevant. The website visitor captures the contents of the web page with its address and can see how this or that page looked before, even if it no longer exists. Simple and convenient tools for analyzing the popularity of search queries are the services of Yandex and Google (Wordstat and Trends). They, for example, can determine the popularity of the topic.

The task of the teacher is to strengthen students' motivation in choosing promising thematic areas in the implementation of the methodological project. The relevance of the topic is discussed and its name is adjusted. The relevance of the project is considered in the social, theoretical and practical aspects. After clarifying the formulated topic, students are encouraged to turn to an analysis of information sources. The information-planning stage ends with a collective discussion of the problem and dividing it into parts. In accordance with their interests, students choose microthemes. The terms of work on the project are indicated. In group and paired projects, the monitoring of its implementation is carried out by the collective planning function in the service https://habr.com/en/post/276873/, similar to todoist.com. The web service allows you to track the timing of the work stages. Its main purpose is task management, creation and tracking of collective projects with the possibility of commenting, indicating priority tasks and those responsible for their implementation. The value of the service for students lies in the orientation in completed and upcoming tasks. And for the teacher it lies in tracking the stages of the project and commenting on the timing of the project verification.

At the practical stage, analysis, processing, structuring and generalization of information resources are carried out. It is important to correctly distribute the time of work on the project, which can be short-term, medium-term and long-term. In a short-term project, the teacher's control is minimal. In projects of medium duration and, especially, long-term ones aimed at solving voluminous research tasks, more control is required from the teacher over the progress of their implementation. Activities between the teacher and students are synchronized by means of online platforms for teamwork with files. It is implemented by file hosting services (Yandex Disk, Google Drive) and collaboration services (Google Docs, Microsoft OneDrive). Significant opportunities are provided by the LMS Moodle distance learning platform, which allows you to create collective glossaries, sites and wikis.

At the reflexive-evaluative stage, students comprehend the received data and prepare a presentation of the work results in the form of abstracts and oral report, drawings and graphs. Presentations are made using the resources of the SlideShare website (slideshare.net) or the Google Slides service, which is part of Google Docs. Network services tools allow you to: import and remotely create presentations online; store materials in a virtual file manager; upload and demonstrate presentations. Great opportunities for joint

creation and publication of presentations lie at the PowerPoint network service. Future teachers turn to the library of templates and stock materials (https://badanovag.blogspot.com/p/web-20.html). To create short advertising videos, they go to the Supa-Online video constructor. If you intend to set up a project for general viewing on the network, then site builders are useful, which allow you to create pages and place them on a free hosting. Thus, the Wix constructor (wix.com) has sufficient functionality and a simple interface. It should be noted that the presentation of the results of project activities on a web page contributes to the development of the IT competence of its authors.

In project activities using network services, the subjects of interaction are separated by space, therefore reflection plays a special role. Self-esteem is also significant – it is the individual's ability to monitor and critically analyze one's own activity. Reflection and self-esteem, as personality traits, indicate the student as the subject of project activity (Schedrovitskiy, 2007). Traditionally, reflection in making projects is carried out at the final stage, but in projects using information and communication technologies it is necessary at each stage. Internet services reduce the time for receiving feedback from project participants and contribute to the operational analysis and synthesis of the information received (Barinova, Zakirova, Akhmetova, & Lysogorova,2018). Reflection is organized in various forms. One of the forms is a questionnaire, when participants analyze ways and means of completing tasks, assess readiness for solving a problem and new ways of acting. The questionnaire contains the following questions-tasks:

– How do you see the problem field in the joint network activities during the implementation of the project?

– your suggestions on the use of network services in the implementation of the methodological project;

– identify the ideas that may be the basis for creating a working model of an educational project;

– formulate important, from your point of view, tasks of the project activity;

– What network services are significant in presenting the results of project activities?

– suggest how to better assess the role of each participant in the development of a group project;

– indicate the visualization tools that are especially important at the planning and development stages of the project;

– make your suggestions on the optimal use of information and communication technologies in the organization of project activities of students.

Assessment of the methodological project is carried out in accordance with the criteria that determine the abilities of the future teacher to:

– formulate the research problem;

– indicate the purpose of the project activity;

– identify the topic and clearly express the main idea of the project;

– set goals and analyze the pedagogical process (phenomenon);

– carry out the selection of the content of the project;

– apply information and communication technologies in the implementation of the project content;

– predict the expected result to obtain during the implementation of the project;

– plan possible forms of implementation of the methodological project.

By carrying out methodological projects the student accumulates his/her own experience of integrating information and communication technologies into future pedagogical activity, and his/her position, accordingly, becomes as subjective as possible (Bourque & Bourdon, 2017, p. 475).

The questionnaire reveals a willingness to apply information and communication technologies in project activities. The low level of readiness of a future teacher is manifested in an unstable interest in the discipline being studied, a lack of understanding of the subject, professional and social significance of the study. A high level of readiness is manifested in the confident knowledge of the methods of project activity, creative activity, independence and initiative. The results of the questionnaire are taken into account by the teacher in planning further work on the formation of student readiness for the implementation of project activities using network services.

6. Findings

During the project, students create collaborative online documents, wiki-articles, and electronic educational resources. Using Internet services, they look for answers to problematic questions and try themselves as leaders and organizers of project activities.

At the stage of preparation and planning of project activities, various questions are considered and discussed: What is the target audience of the electronic educational resource? What is the content of the training application (electronic resource)? How is it advisable to structure an electronic educational resource? What services and applications are most effective for the implementation of the project? What are the distinctive features of the content?

At the initial stage of the project activity, the interests and experience of students are revealed. It is necessary to define the purpose of the study and the means to achieve it as accurately as possible. Evaluation criteria are discussed. Areas of responsibility are identified; the timing scale is being worked out; web services are planned to use; the choice of programming systems and project implementation tools are coordinated. Future teachers find information and build a mental map. Figure 01 shows a fragment of the project on the topic "Geometry in Faces":
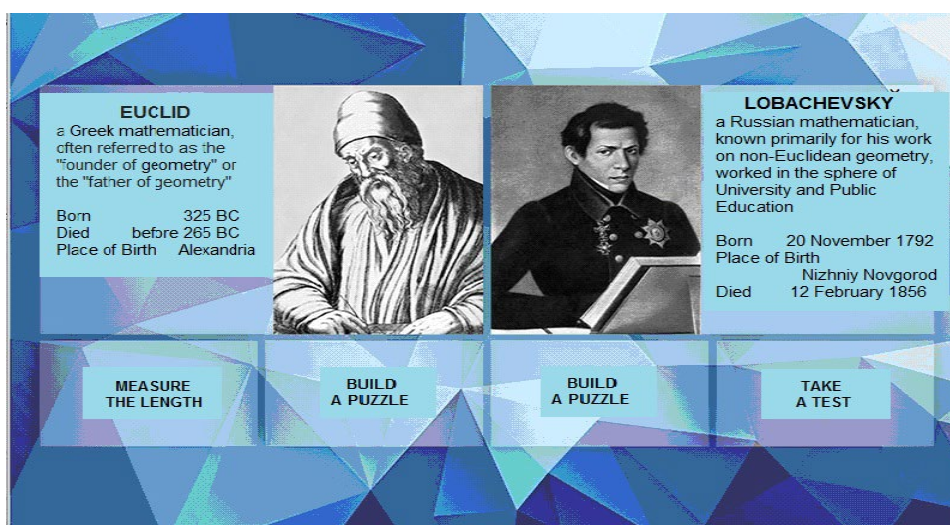

Figure 01. Screenshot of "Geometry in Faces" web-application page

The project contains interactive elements through which students dynamically track their learning outcomes on a topic. Future teachers have developed such interactive simulators as "Measure Length", "Build a Puzzle" and "Take the Test" for one of the sections of the Geometry in Faces application dedicated to Euclid and Lobachevsky. The "Measure Length" simulator allows you to develop the skills of students to use the ruler in a variety of practical situations and to transfer one unit of measurement to another. After completing the tasks, the simulator assesses the result of work on a four-point scale (excellent, good, satisfactory, unsatisfactory). The assessment is displayed on the screen, and the student has the opportunity to complete the work or move on to completing other tasks. Fig. 02 shows the interactive simulator of the Geometry in Faces web application developed by students to test students' measuring skills:
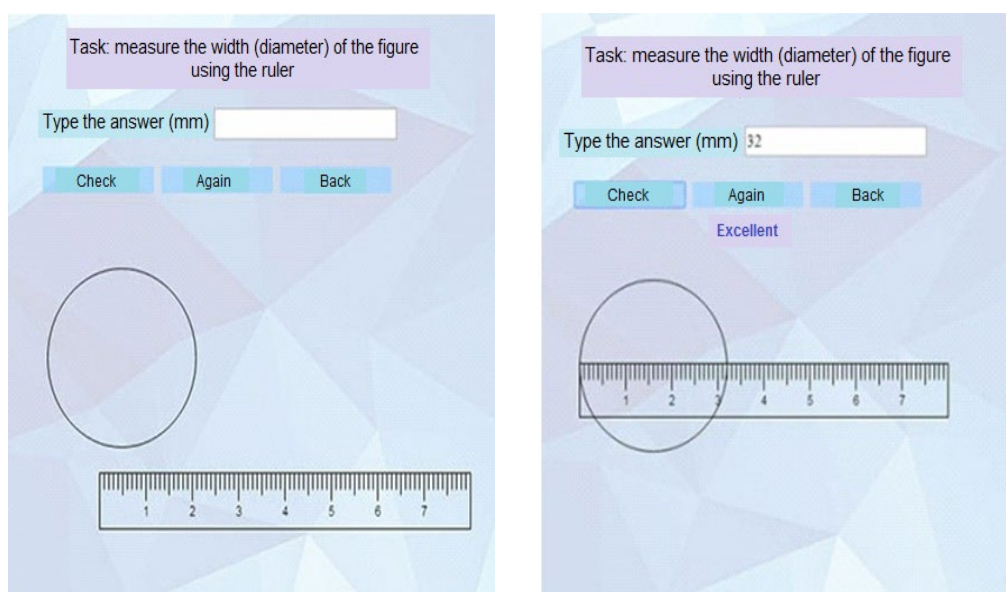

Figure 02. Interactive simulator of the web-application for testing student skills (before and after filling-in)

The teacher supervises the work of students, advising them on emerging issues if necessary. After project completion future teachers carry out its defense. They demonstrate the results of their research, take part in the discussion with fellow students. The teacher evaluates the depth of the study, the consistency of the presentation, the creative approach and the ability to speak well to the audience and to defend their own point of view, to participate in the discussion, to ask questions. Students analyze the success of their work in the project. Then they conduct the final questionnaire which allows teacher to find out the students' readiness to be the authors of other projects and organizers of students' project activities.

The answers to the questionnaire showed that most of the students are ready to organize project activities using network services. Future teachers note that there were no conflicts on controversial issues. They understand the terminology, are familiar with the requirements for the organization of project activities and are able to differentiate the roles of participants. From their answers we revealed difficulties associated with the organization and implementation of project activities. The directions of methodological assistance to overcome them are determined. The most difficult part for students was the research part of the project activity. This is due to the insufficient level of formation of skills to systematize and analyze a large amount of information.

A positive result in the project, as future teachers note, is observed when the team is well coordinated, everyone understands their functions and is involved in solving the problem. Students adequately evaluate the effectiveness of the use of information and communication technologies in a methodological project, the level of their competence and personal and professional qualities. They demonstrate readiness to conduct a reflective analysis via network services and, in particular, point out the shortcomings and causes of malfunctions. The best projects are recommended for continuation as a part of research activities and for participation in competitions of students' works. Thus, the project "Geometry in Faces", presented above, won a prize in the IV International Competition "Lobachevsky and the 21st Century" (Belyakova & Zakharova, 2019, p. 80).

7. Conclusion

The capabilities of network services in the organization of project activities are described. Future teachers, participating in methodological projects, learn the team work style, manage activities and refine their own educational route. The problems that students most encounter during the implementation of projects using information and communication technologies are the insufficient level of formation of skills to systematize and analyze a large amount of information, the lack of experience in creative solutions to problems of educational practice.

The possibilities of Internet services in the creation of methodological projects were revealed: expanding the space and training resources, developing interdisciplinary relationships, choosing network resources to solve a specific problem, establishing contacts with partners. Thus, project methods in the methodological preparation of a future teacher contribute to the introduction of smart didactics in accordance with modern requirements for school education.

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