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Developing Professional Creativity of Teachers Based on Problem Based Learning (PBL)

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ABSTRACT: The article determined the importance and problems of developing the professional creativity of teachers of professional educational institutions in professional training courses. Moreover, the article described the method of conducting practical training based on PBL, and as a result, the indicators of the evaluation criteria were given. The purpose of the article was the methodology of practical training organized on the basis of PBL to increase the professional creativity of teachers of professional education in training courses. Innovative-methodical projects were developed for improving teachers' professional creativity, and creative educational technologies and methods were used at each stage. Based on the mathematical and statistical analysis of the research, the types of personal and professional creativity of teachers were determined and the concept of professional creativity was revealed. A module aimed at enhancing the professional creativity of teachers was included in the curriculum of personnel retraining and professional development courses, and didactic support was developed with helping creative techniques and platforms which were helpful for assessing creative abilities of teachers. As a result, the professional creativity of teachers of vocational education was enhanced by 10%.

KEYWORDS: Staffs of vocational education; training courses; professional creativity; PBL; creative techniques

1. Introduction

Today, the high development of science, engineering, technology, and production automatically brought new social requirements to the forefront. Among these social requirements, the training of qualified personnel and the improvement of the system aimed at this goal were important, especially considering the society's role in driving the development of industries. The need to train qualified personnel depended on the social, economic, and cultural development of the society, including the emergence of new directions and specializations. It also necessitated consistent improvement of professional knowledge, skills, and competences of specialists in a rapidly changing era. Furthermore, there was an increased demand for specialists to be able to cope with strong competition in the labor market.

It was known that improving the qualifications of personnel and retraining them was one of the main components of the educational system of the Republic of Uzbekistan.

Currently, this system served as one of the primary sources for acquiring new information, knowledge, skills, and qualifications for pedagogues and educational system leaders. Given the crucial role of professional development and retraining in preparing pedagogues and leaders for the educational system's renewal processes, it received significant attention. The system of retraining teachers of professional education in the Republic of Uzbekistan and improving their qualifications currently consisted of 12 centers and faculties offering professional and technical skills improvement courses for teachers. However, assessing the quality of training proved challenging due to the lack of a comprehensive study on the advantages and disadvantages of the existing training and retraining system.

According to local experts, one aspect further exacerbating the vocational education system was the existence of a universal curriculum for professional development and retraining for teachers of vocational technical knowledge and teachers of special vocational subjects. The current curriculum primarily focused on improving theoretical knowledge while neglecting the development of professional and practical skills. These circumstances highlighted the need for a comprehensive study within the professional education system to understand the situation regarding professional development and retraining. Specifically, the existing training system failed to meet the needs of teachers, the content of training courses and methods used were outdated, variable curricula had not been developed, and the capacity of professors and teachers in training institutions did not meet the requirements. Furthermore, there was a lack of established mechanisms for remote training using modern information and communication technologies, impeding the systematic improvement of teachers' knowledge and skills.

Several scientific studies were conducted in the republic with the aim of developing the professional competences of vocational education teachers. In the encyclopedia of Britannica said that, pedagogical proficiency of teacher’s of the vocational education enhanced through their experiences which hold year by year [1]. Marilyn Cochran-Smith studies focused on comparing how teacher educators are educated in four different countries – the U.S., New Zealand, Israel, and Norway – and how their education reflects the historical, geopolitical, and policy contexts of each country. The article argues that international perspectives on the education of teachers and teacher educators are important for understanding the values and priorities of different nations regarding equity and quality in education [2]. Zeer and Popova's article titled "Obstacles Affecting the Level of Creativity of a Teacher" addressed psychological obstacles in pedagogical activities and problems related to teacher creativity [3]. Cochran, Marilyn & Grudnoff and others discussed the changing views of teacher professionalism in teacher education programmes in different contexts and the relationship between teaching and research. The article examines how teacher professionalism is influenced by various factors such as policy, culture, curriculum, assessment, and collaboration. The article also explores the challenges and opportunities for developing research-informed and research-engaged teacher education. Moreover, Leite, Carlinda & Sousa-Pereira and others gave statistical data about analyzing the research profile and conditions of teacher educators in Portugal. It is based on a survey applied to a sample of 1,024 teacher educators from 14 higher education institutions that offer initial teacher education programs. The results show that most teacher educators have a doctoral degree and a permanent position, but they also face some challenges regarding their research activities, such as lack of time, funding, and institutional support [4–8]. Currently, obstacles affecting the professional development of teachers in professional educational institutions are still considered urgent problems. Pedagogical

activities often encounter significant psychological conflicts, such as high dynamism and problematic situations within the pedagogical process. These conflicts have an impact on the quality of education.

2. Materials and Methods

Creativity is a concept that encompasses innovation and novelty. In 2019, scientists from Alliant International University in San Francisco, USA, conducted a training program called "Creativity in Education" to assess the logical-creative thinking abilities of mathematics, physics, computer science, and humanities teachers in California schools during the educational process. The training included the creation of an online platform for teachers, which provided subject materials and step-by-step test tasks. The training tasks were designed to span one week and aimed to develop innovative-methodical projects. The primary focus was on the logical analysis of given materials based on creative abilities and the development of the ability to organize lessons using a project-based approach [9]. The use of professional creativity has gained significance in various approaches. These include reflective processes in creative activity [10–16], creative actions [17], innovative ability [18, 19], preparation for innovative processes and problems of personal and professional development [20], and the development of creative professionalism of state employees based on acmeological technologies [21].

Table 1. Descriptive characteristics of pedagogic personnel of professional educational institutions by types of personal creativity.

Types of creativity	Content - essence	Professional creativity of teachers of professional educational institution
Emotional creativity	Creates a creative atmosphere in the auditorium, conducts classes based on a cultural-educational approach, ensures personal-emotional stability.	Professional education meets the needs of intellectual, cultural and spiritual development of students based on the development of their creativity and develops their creative activity.
Social creativity	Able to adapt to the social environment, develop communication skills, continuously apply motivational-evaluative components depending on the abilities of learners.	Introduces modern specialties and professions in accordance with the requirements of the labor market; He developed the skills to have professional creativity in relation to his specialty; Prepares personnel with creative abilities capable of effective participation in the processes of further reforming the country's economy
Individual creativity	Develops pedagogical skills; Conducts training based on professional and personal characteristics.	Prepares creative personnel who have the qualifications to create and participate in innovative educational projects, innovative-methodical projects related to the field; Along with education, it provides students with the necessary knowledge to start an entrepreneurial activity and provides methodical support for the organization of their own business.
Intellectual creativity	Sees professional problems; Identifies the causes of the problem; Offers original and optimal solutions to problems.	Prepares personnel who will creatively approach the problems that arise in their future professional activities; Based on the development of intellectual abilities in the student, it forms the skills of adaptability to changes in society.

In accordance with Resolution No. 466 of the Cabinet of Ministers of the Republic of Uzbekistan, which aligns with the goals and tasks of professional education, descriptive characteristics of pedagogical personnel in professional educational institutions are presented according to the types of professional creativity (Table 1). Accordingly, we believed that the professional creativity of teachers in professional educational institutions was developed through the incorporation of modules in professional training courses. This development had a positive impact on the professional educational environment and contributed to the creation of a creative educational atmosphere.

3. Results and Discussion

The "Development of Professional Creativity and Pedagogical Competence" module was included in the curriculum of teacher training and professional development courses. The main objective of this module was to foster the professional creativity of pedagogues, enabling them to anticipate, identify, and develop original solutions to pedagogical problems. Additionally, the module aimed to encourage the creation and application of innovative methodological projects. The module had several specific purposes. It aimed to provide an explanation of the pedagogical, psychological, and philosophical nature of creativity, innovation, and creativity in the listeners. It sought to determine the place and role of teachers in pedagogical activities and shed light on professional creativity, its methods, types, and means of development. Moreover, the module aimed to develop professional creativity within the educational environment by teaching creative educational technologies and methods. The module spanned 14 hours, with 6 hours dedicated to theoretical training, 6 hours for practical training, and 2 hours allocated for independent study (Table 2).

Table 2. Determination of the module “Professional creativity and Pedagogical Competence” an example one theme.

Theme	Credit	Brief definition	Type of the lecture	Knowledge	Skill	Competence
The place and role of the concepts of creativity, creativity, innovation in the pedagogical activity of teachers of professional education	2	The essence and analysis of the concepts of creativity, creativity and innovation, as well as determining the place and role in education. Types of creativity.	Place-Based lecture	Teachers will have knowledge about the essence of the concepts of creativity-creativity-innovation	Creativity and innovation, interrelated and different aspects of creativity, they will have skills in their application in pedagogical activities	They apply the concepts of creativity, innovation, and creativity in pedagogical practice and organize classes in a creative environment.

During our research, we discovered that training conducted with a specific innovative plan, particularly when the type of innovative-methodological project aligns with the domain knowledge of trainees in advanced training courses, proves to be more effective compared to other types of education, including traditional approaches. In a survey conducted by the TNTP organization on "Project-Based Learning," approximately 10,000 teachers participated. They engaged in a master class where they discussed problems related to project-based education and developed innovative strategies to identify and solve these issues based on their experiences. The research indicates that in project-based education, teachers generate numerous ideas using innovative educational methods and tools. This involves the analysis of

innovative approaches such as problematic-heuristic and creative methods, which are integrated into a cohesive system known as an innovative-methodological project.

In our professional education teacher training courses, we utilized innovative-methodological projects to organize the practical training within the "Professional Creativity and Pedagogical Competence" module. These projects follow an 80-minute step-by-step system aimed at finding solutions to problems encountered in the educational process of professional education teachers. The projects consider the pedagogue's work experience (professionalism, professional skills), creative competencies (infographic creativity, methodical creativity, ICT creativity), and professional creativity (emotional creativity, individual creativity, intellectual creativity) as interconnected components within a continuous structure. The creation of innovative methodological projects is based on three principles:

Table 3. Innovative methodological projects are created based on three principles.

No	Principles	Content
I.	Motivation	In professional education courses, motivations for educational activities, psychological state, and professional competences of a teacher of professional education are studied, in which the teacher's needs for professional development are studied.
II.	Methodological	The pedagogical professionalism of teachers (professional skills, professional technique, teaching methodology) is paid attention to and developed in the section of training course modules.
III.	Pedagogical	Understand the place of the selected method (methodology) in the pedagogical system; formation of the ability to determine goals, tasks and create didactic materials specific to this.

The above-mentioned principles create the structure of the innovative-methodical project. This requires the creation of an innovation map, innovation plans and the development of innovation activities (Table 3). Below we present the stages of the innovative-methodical project aimed at developing the professional creativity of teachers of professional education.

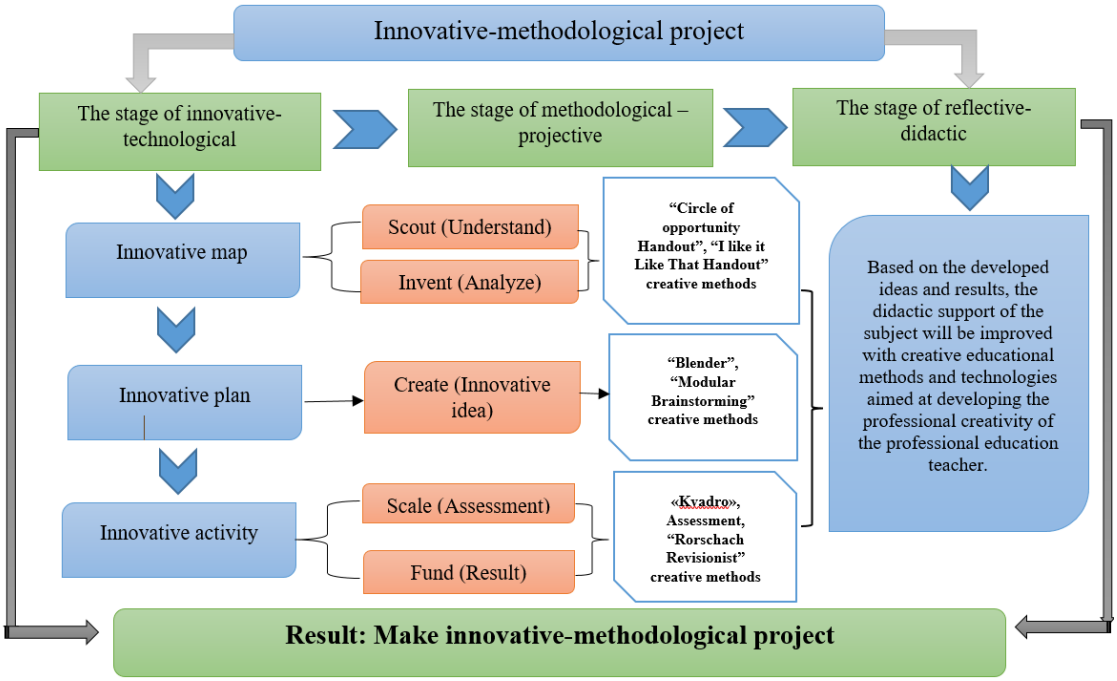

Figure 1. The stages of innovative-methodological project.

The innovation map served as the primary structural framework for the innovative-methodological project. We created a level development map based on specific criteria, aligned with the requirements for developing the professional creativity of teachers in professional educational institutions. In our research, drawing from Kiselova and Zueva's levels of creativity, we identified three distinct levels that aimed to foster the professional creativity of teachers in professional educational institutions: elementary, middle, and high [8]. Moreover, we highlighted the stages, levels, and pedagogical (methodical)-organizational conditions that contribute to the development of professional creativity. This allowed us to understand the significance of creative educational methods and technologies in enhancing the professional creativity of teachers in professional educational institutions, and the practical implications of pedagogical activities in creating innovative pedagogical projects. To validate the effectiveness of the developed methodology, a pedagogical experiment was conducted from January to December 2022. A total of 387 students enrolled in retraining and advanced training courses participated in the experiment.

The experiment involved conducting all classes using the developed methodology of creative learning within experimental groups. A comparison was made with groups where teaching followed the traditional method. Teachers of the same qualification category delivered instruction in both the experimental and control groups. The control groups comprised 32 students, while the experimental groups consisted of 31 students. To assess the effectiveness of the developed provisions regarding the utilization of professional creativity among teachers in professional educational institutions within advanced training courses, we employed an indicator reflecting the dynamics of changes in their knowledge and professional and methodological competencies. The ratings assigned were as follows: 5 - high, 4 - medium, 3 - low, 2 - zero. The results of Table 4 and the range of relative frequencies (Fig. 2) demonstrate that the degree of preparedness among teachers in the experimental and control groups was comparable.

Table 4. Statistical data of the experimental and control groups prior to the experiment.

Statistical data	Experience group				Control group			
Indicators	5	4	3	2	5	4	3	2
Number of students	5	21	3	2	6	17	9	0
Total number of students	31				32			
Sample means	3,94				3,91			
Sample variances	0,51				0,46			

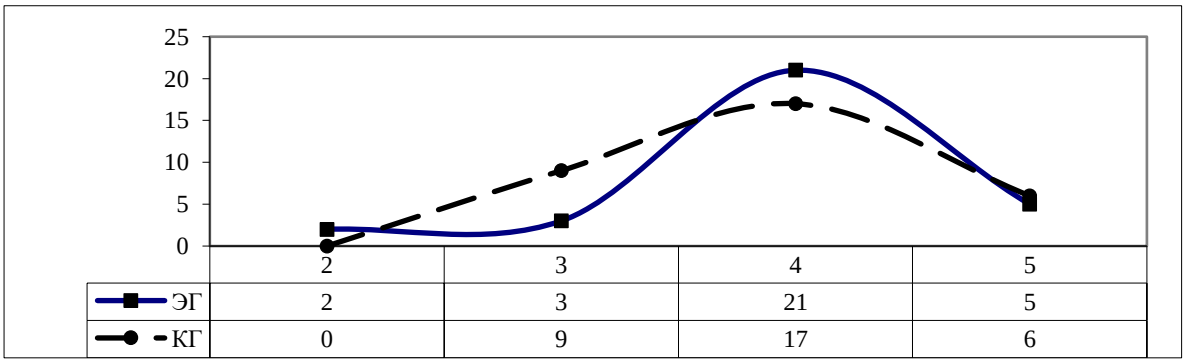

Figure 2. Relative frequency polygons.

At the end of the advanced training period, cross-sections of test tasks were carried out in the experimental and control groups. The questions of the test tasks are presented in Table 5.

Table 5. Questions of verification tasks.

No	Questions	The content of the indicators of the evaluation criterion			
		High (5)	**Middle (4)**	**Low (3)**	**Null (2)**
1	What is meant by creative learning? How do the components of the methodological system for teaching informatics (MES) change when using creative learning? Give examples.	Gives a clear definition. Shows the change in all components of the MEMS. Gives examples for each.	Gives a clear definition. Shows the change in the MEMS components. Gives examples of most of them.	Does not provide a clear definition. Shows the change in some of the MEMS components. Gives examples of some of them.	Does not provide a clear definition. Does not show the change of the MEMS components. Doesn't give examples.
2	Give options for using technologies such as Padlet, Edmodo, Edpuzzle, etc. in the educational process.	Gives more than 5 original examples.	Gives 3-5 examples, including 2-3 original ones.	Gives 1-2 standard examples.	Doesn't give examples
3	You need to create a multimedia project or a thematic forum. Which platform will you choose. Justify your answer.	Based on the analysis of the task and options for electronic platforms, he gives several criteria to justify his choice.	Based on the analysis of the task and options for electronic platforms, he gives his decision	Based on the options for electronic platforms, he gives his decision	Doesn't give an answer

The results of the verification work of the experimental and control groups were processed on the basis of Student's criterion (Table 2).

Table 2. Statistical data of the experimental and control groups after the experiment.

Data	**Experience group**				**Control group**			
Indicators	**5**	**4**	**3**	**2**	**5**	**4**	**3**	**2**
The number of students	**13**	**12**	**3**	**3**	**4**	**12**	**14**	**2**
N				31				32
Chosen middle				4,13				3,56
Coefficient								1,16
Sample variances				0,89				0.62
T follows								2.59
Confidence interval				3,8≤4,13≤4,46				3,29≤3,70≤3,84

The results of the table show that the increase in the level of professional competencies of informatics teachers in the experimental group is 16% higher in relation to the control group, which is a consequence of the introduction of creative learning methods into the system of advanced training of teaching staff.

Conclusions

The module "Professional Creativity and Pedagogical Competence" is of great importance in the development of professional creativity of teachers of a professional educational institution in advanced training courses, which gives the conclusion that the task of creating innovative-methodical projects based on creative methods and technologies and forming the skills of teachers to work in them has been fulfilled. As a result of the development of professional creativity, the teachers' ability to predict pedagogical problems and provide them with original solutions develops.

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Competing Interest

We have no conflicts of interest to disclose.

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