Problem-cognitive task - instrumental resource of pedagogical design in increasing the quality of university education

Tarefa problemática-cognitiva - recurso instrumental do design pedagógico no aumento da qualidade da educação universitária

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Abstract
The article reveals the phenomenon of a problem-cognitive task as an instrumental resource of pedagogical design and a mechanism for improving the quality of training future teachers for professional activities; a program of experiential learning based on the principles of a

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problem-based approach, pedagogical conditions that ensure its effectiveness, and experimental verification of the productivity of the methodology and technology for using a problem-cognitive task in the educational process of higher education. The basis of the obsession with experiential learning was the "Workshop for solving problem-cognitive tasks", which provides for the development and consolidation of future teachers' skills: to analyze the conditions and requirements of the task; draw up a plan for its solution; to structure the model of the task-problem situation; apply general logical and general subject methods, heuristic methods for solving problem-cognitive tasks; analyze and evaluate the results.


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**Resumo**

O artigo revela o fenômeno de uma tarefa cognitiva do problema como um recurso instrumental do design pedagógico e um mecanismo para melhorar a qualidade da formação de futuros professores para atividades profissionais; um programa de aprendizagem experiencial baseado nos princípios de uma abordagem baseada em problemas, condições pedagógicas que garantem sua eficácia, e verificação experimental da produtividade da metodologia e tecnologia para usar uma tarefa cognitiva do problema no processo educacional do ensino superior. A base da obsessão com a aprendizagem experiencial foi a "Oficina para resolver tarefas cognitivas-problemáticas", que prevê o desenvolvimento e a consolidação das habilidades dos futuros professores: analisar as condições e exigências da tarefa; elaborar um plano para a sua solução; estruturar o modelo da situação tarefa-problema; aplicar métodos lógicos gerais e gerais do assunto, métodos heurísticos para resolver tarefas cognitivas-problemáticas; analisar e avaliar os resultados.


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**Introduction**

The changed conditions for organizing the educational process in various types of educational institutions due to the increasing role of distance learning, increasing requirements for its content and methods complicate the nature of the activity of a modern teacher in many respects. Analysis of pedagogical practice and scientific works of scientists allows us to say
that success in the educational process largely depends on how much the teacher is able to understand the essence of the studied phenomena, facts, processes, comprehend their patterns and cause-and-effect relationships, creatively solve cognitive problems, analyze the results of educational activities, regulate the mental activity of the participants in the training and on how ready he is for evidence, logical, consistent and non-standard thinking when setting and solving educational problems, structuring the studied information in the form of problem-cognitive tasks, thereby including students in active thinking process. The preparation of future teachers for solving new educational problems also implies a new approach to its organization.

G. Ball (1990), R. Benerji (1972), D. Poya (1976), V. Repkin (1997) developed the theory of tasks and substantiated their possibilities in the development of the mental abilities of the individual. Many researchers (D. Bogoyavlensky (1969), N. Kondrashov (2019), G. Kostyuk (1973), I. Lovianova (2010), N. Slyusarenko (2012), L. Fridman (1999), etc.) prefer task approach in optimizing the educational process. In their opinion, the task approach in the conditions of training determines: the logic of presentation of educational information; structuring it in the form of a mental task; the use of various methods and means of pedagogical design, activating the mental activity of the participants in the educational process; setting tasks to determine the success of educational activities and identify errors made in the course of it; a variety of monitoring methods for gaining experience in creative cognitive activity.


Recently, much attention has been paid to the problem of task-based approach tools that provide its resource base and effectiveness in improving the quality of the educational process. The most effective learning tool is pedagogical design, which combines informational, technological, emotional-artistic, image-building, managerial and methodological resources, which are implemented through various tools, among which the problem-cognitive task plays an important role.

D. Bogoyavlensky (1969), M. Kondrashov (2019), I. Lovyanova (2006), V. Repkin (1997), N. Slyusarenko (2012) consider a cognitive task as a mechanism for implementing a task-based approach to learning. According to V. Repkin, "the task is the general and mandatory form of the material in which it can only be included in the learning process" [24, p.37]. D. Bogoyavlensky represented the structuring of educational material in the form of a
cognitive task, considering it one of the rational means of developing mental abilities in subjects of education. He believed that "any content becomes the subject of learning only when it acquires the form of a specific task for learning, which directs and stimulates learning activity" [3, p.28].

However, there is clearly not enough scientific work that reveals the features and prospects for using the problem-cognitive task as an important instrumental resource of pedagogical design in the professionalization of the educational process and the development of the ability of future teachers to rationally use their creative potential in pedagogical activities. In the organization of the educational process, the emphasis is placed on the assimilation of a certain amount of subject knowledge, but its procedural side is underestimated, the mastery of rational methods of mental activity and the development of students' abilities in understanding abstract-logical concepts and patterns of the studied phenomena, modeling conditions for the manifestation of creativity, initiative, non-standard actions to achieve the intended result. The theoretical substantiation of the main characteristics, content, structure and resource capabilities of a problem-cognitive task is an important pedagogical problem that requires its immediate solution.

**Methodology**

In the study, we proceeded from the assumption that the problem-cognitive task contains great resources in the development of professional capabilities, the creative potential of the individual as an important instrumental resource for improving the quality of the educational process. The purpose of the study is the theoretical substantiation and approbation of the problem-cognitive task as an important instrumental resource of pedagogical design in ensuring the quality of training of pedagogical personnel.

The main objectives of the study: 1) development of an experiential learning program based on the principles of the task approach; 2) identifying the conditions that ensure the effectiveness of the problem-cognitive task in teaching as a developing resource for the creative capabilities of future teachers; 3) experimental verification of the productivity of the methodology and technology built on the principles of a task-based approach to learning. The object of the study is the preparation of future teachers for professional activities, and the subject is the theoretical substantiation of the possibilities of a problem-cognitive task in teaching as a developing resource of pedagogical design.
The purpose and objectives of the study were achieved using a set of methods: theoretical (analysis, synthesis, systematization of philosophical, psychological, pedagogical and methodological research) to study the state of the problem, theoretical substantiation of its relevance, structure and content of an experimental model for preparing future specialists for productive pedagogical activity; empirical (questionnaires, testing, essays, observations, modeling of event-role situations) and pedagogical experiment in order to identify the effectiveness of an experiential learning program based on the principles of a task approach; statistical - for processing empirical data, summarizing and verifying the reliability of the results of experimental learning.

The experimental and control groups were selected from among groups with average indicators (the difference between the arithmetic average scores received by students for completing control tasks and taking into account the standard deviation σ1 and σ2) according to the formula:

$$ t = \frac{D}{D\sigma} = \frac{x_1 - x_2}{\sqrt{\frac{\sigma_1^2}{N_1} + \frac{\sigma_2^2}{N_2}}} $$

Where:

N1, N2 – the number of students in the CG and the EG. They were used to determine the level of significance of the difference in arithmetic means: D = x1 – x2. Based on the results of control work, the arithmetic mean (x) and standard deviation (σ) were calculated. The representativeness of the results of the study was tested using the χ2-criterion method (M. Grabar, K. Krasnyanskaya, 1977; E. Sidorenko, 2003).

Participants in the study – students 1-4 courses (340 people.) And teachers (20 people) Bogdan Khmelnitsky Cherkasy National University, Cherkasy, Ukraine, Kryvyi Rih State Pedagogical University, Kryvyi Rih, Ukraine, Kherson State Pedagogical University, Kherson, Ukraine.

**Results**

The new paradigm of education provides not so much mastering the program knowledge of academic subjects, but rather the preparation of a creative person who has constructive knowledge, the ability to operate with them in solving educational problems and...
practical actions in achieving the planned result, creativity, creative potential, readiness for non-standard activities [22, p. 477].

Improving the quality of professional training of future teachers in the conditions of university education requires additional resources, the rational use of the internal reserves of the educational institution, the rational use of pedagogical design as an ensemble of tools to achieve predictable results. The effectiveness of the resource of pedagogical design in improving the quality of preparing students for pedagogical activity involves the modernization of educational tools that affect the formation of the personality, the formation of its spiritual and intellectual world, emotional and aesthetic attitudes, cultural landmarks and creativity. The ensemble of various educational means of pedagogical design has the necessary tools for quality learning. In the set of these tools, an important role is played by the problem-cognitive task in modeling the conditions for successful self-expression, self-affirmation, self-realization in life and professional activities of future teachers. We find confirmation of this in the works of L. Vygotsky (1991) and A. Leontiev (1975), who believed that for a person, those phenomena that cause associative links with the already known and help to see new facets in the subject being studied are of the greatest interest. approach, a mechanism for creating cognitive situations in which information is acquired by solving problematic tasks.

When organizing experiential learning, we proceeded from the fact that an important structural element of it is a problem-cognitive task, in the process of solving which the student's position is characterized by cognitive activity, independence, originality of judgments and non-standard actions in the educational process. The productivity of the task approach to the professional training of future teachers is determined by the concretization of the essence, typology, role and conditions for the effectiveness of the problem-cognitive task as an important instrumental resource of pedagogical design.

The analysis of scientific literature allows us to speak about the diversity of points of view in determining the essence of the concept of "task". The task is considered as a method, a problem, a task situation. O. Zaitseva argues that a task is an information system in which structural elements and contradictory relationships are not coordinated, causing the need to transform the system into a new one to eliminate inconsistencies and contradictions [9, p.4]. V. Glushkov (1971) believed that a task is a situation, the actions of a certain system that determine the way out of this situation [33, p.66]. N. Tulkibaeva (2000) considers a task as a system that contains a task subsystem and a subsystem that provides its solution, interacting with each other [30, p.15]. G. Ball (1990) believes that one should speak of a task situation as
a set of objects that can be structured in the form of a task, but in such a representation that was not there before [1, p.33].

We come out of the fact that the problem-cognitive task as a resource tool of pedagogical design is a form of structuring educational information, with the help of which a problem situation is modeled, the goal, tasks, conditions and requirements of cognitive activity are set, active participation in the solution of which provides a system of knowledge, skills, skills, non-standard actions and development of creative abilities of future teachers.

The problem-cognitive task is an important means of activating the cognitive activity of the participants in the educational process, since it: specifies the signs of concepts, facts, processes; reveals the flexibility of thinking and awareness of subject knowledge; involves planning, organization of cognitive activity and ways of its implementation; requires new knowledge, different techniques and methods of their application; associated with the assessment and proof of the correctness of judgments, conclusions, results; stimulates the acquisition of the ability to anticipate the expected result. Moreover, the productivity of the educational process is determined by the use of not a single task, but an integral system of problem-cognitive tasks, that is, a combination of their different types and types that interact with each other and ensure the success of students' cognitive activity, the achievement of predicted results. The organization of professional training in the conditions of the university should be aimed at developing the skills of future teachers to structure the educational material in the form of a system of problem-cognitive tasks, to see the semantic barriers that arise in the process of cognitive activity, to rationally manage the educational and cognitive actions of the participants in the educational process, to improve their non-standard action and creativity. A problem-cognitive task involves the use of a set of rational mental actions, general logical operations, heuristic techniques and methods, new knowledge for a productive way out of a problem-cognitive situation.

Mastering by future teachers the skills of rational mental actions, heuristic techniques and methods, reflection and ways of regulating mental activity with the resource capabilities of problem-cognitive tasks is effective if certain requirements are met: using a system of various problem-cognitive tasks; their focus on achieving close and distant cognitive prospects; mastering the system of heuristic techniques and methods of cognitive activity; designing heuristic techniques and methods as a direct product of professional training.

An order to test the productivity of the problem-cognitive task as an instrumental resource of pedagogical design, an experiential learning program was developed and tested in
practice, the basis of which was a pedagogical experiment that combined the ascertaining, forming and diagnostic stages in its structure.

At the stage of the ascertaining experiment, the analysis of the classes attended showed that the educational information of the lectures does not contain problematic tasks; in practical classes, tasks are mainly of an algorithmic nature; It is clearly not enough in the content of the lessons of tasks of a non-standard, creative plan, active forms and information and communication technologies are not used, the result of which is a low level of cognitive activity of students, a lack of cognitive interest in an independent non-standard solution of problem-cognitive tasks. According to the results of the survey, 58.8% of teachers use heuristic methods for solving educational problems, 28.5% do not systematically, 21.3% do not. When ranking the functions of problem-cognitive tasks in teaching, teachers arranged them in the following order: developmental (34%), cognitive (31%), control and evaluation (20%), motivational (10%) and educational (5%).

Based on the results of the survey, the level of students' knowledge of general logical methods of solving problems was calculated (low - 0 points, average - 1 point, sufficient - 2 points, high - 3 points) using the formula:

\[ Z_i = \frac{n_{i0} \cdot 0 + n_{i1} \cdot 1 + n_{i2} \cdot 2 + n_{i3} \cdot 3}{N} \]

Where:

\[ n_{i0}, n_{i1}, n_{i2}, n_{i3} \] - the number of received marks, respectively, of a low, medium, sufficient and high level of proficiency in the general logical method; \( N \) is the total number of grades received.

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>Sufficient</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>17.2 % (89 students)</td>
<td>51.9 % (291 students)</td>
<td>26.7 % (147 students)</td>
<td>4.2 % (23 students)</td>
</tr>
</tbody>
</table>

Table 1: Levels of students’ ability to solve educational tasks
Source: Authors

The obtained data testify to the predominance of low and medium levels of formation among students who are able to solve problem-cognitive tasks (low - 17.2%, medium - 51.9%). Setting students to solve reproductive and algorithmic problems over problematic, original, creative ones, as a result - the average level of cognitive interest in solving problem-cognitive problems and lack of formation of methods of rational mental actions and logical operations. At the stage of the ascertaining experiment, the relationship between the formation
of the ability to solve problem-cognitive tasks and the level of their cognitive activity was revealed (Table 2).

<table>
<thead>
<tr>
<th>Low</th>
<th>Medium</th>
<th>Sufficient</th>
<th>high</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.9 % (104 students)</td>
<td>46.6 % (262 students)</td>
<td>28.2 % (155 students)</td>
<td>5.3 % (29 students)</td>
</tr>
</tbody>
</table>

Table 2: Levels of students’ activity in the process of cognitive activity
Source: Authors

The low level of activity (19.9%) is characterized by students' superficial awareness of the role of problem-cognitive tasks in professional development; weak development of rational methods of mental activity, creative thinking, cognitive motives. The average level of activity (46.6%) is characterized by the formal use of general logical operations and rational methods of mental activity, weak manifestation of non-standard thinking, difficulties in solving problem situations. Sufficient level of activity (28.2%) is distinguished by stable cognitive interest in solving problem-cognitive tasks, abstract-logical thinking, productivity of cognitive activity, ability to perform non-standard actions, however, heuristic thinking is not sufficiently developed, students experience difficulties during creative and research activities. A high level of activity (5.3%) is characterized by a high level of professional training; stable cognitive interest and a positive attitude towards solving problem-cognitive problems using non-standard methods, a heuristic type of thinking, independence of actions; ability to critical analysis and objective assessment of actions, self-confidence and readiness for creative and research activities.

The results of diagnostics at the stage of the ascertaining experiment confirmed the necessity of the formative stage of the pedagogical experiment. On the basis of control reasons, control (CG - 92 students) and experimental (EG - 88 students) groups were formed. In the control group, training was conducted according to the traditional method, in the experimental group - according to the author's method.

When developing the program of experiential training, we assumed that the process of professional training of future teachers is dynamic and unique, which requires not formal, but productive resources for the organization of the cognitive activity of its participants, capable of ensuring creativity, independence, cognitive activity and reflexivity. Such a resource is pedagogical design - a set of tools that positively affect the productivity of professional training of future specialists. N. Belokonnaya, T. Dovga, A. Klim-Klymashevskaya, L. Kondrashova, N. Kondrashov, N. Chuvasova (2022) believe that "an ensemble of instrumental means of pedagogical design harmonizes the intellect and emotions of students, forms interest in learning and emotionally a positive perception of the surrounding reality, which gives the
right to non-standard actions, freedom of choice, success and confidence in one’s own capabilities and abilities” [22, p.479]. Among the instrumental means of pedagogical design, a significant role in the development of creative abilities and rational mental actions is given to problem-cognitive tasks.

Problem-cognitive tasks in the content of professional training ensure progress from reproductive to reproductive-creative and creative solution of educational problems within the chosen professional sphere. They make it possible to get rid of narrow-subject content presented to students of professional training, subject stereotypes that take place in university practice. When structuring the educational material, we proceeded from the fact that "all stages of the professional development of a teacher's personality are characterized by their own type of tasks (cognitive, communicative, professional-moral, value-meaning, etc.) and specific methods of solving them" [14, p.91]. The goal of the problem-cognitive task is to teach a methodical solution to educational problems and situations of a professional plan that constantly arise in the process of cognition, to develop creative personality traits that ensure rationality and productivity of mental activity.

The content of the experimental program included: the course "Theoretical Foundations of Rational Mental Activity", "Practice on Solving Problem-Cognitive Tasks", "Training for the Development of Students' Creative Abilities". The content of the lesson was aimed at structuring educational information in the form of problem-cognitive tasks, mastering the skills of modeling and solving them, and developing students' creative abilities. The basis of the educational situation is the method of modeling professional situations, the use of such tasks, the implementation of which, due to the solution of the problem of professional orientation in students, stimulates professional interest, updates existing pedagogical knowledge, forms skills of pedagogical analysis and generalization, develops pedagogical abilities and professional attitudes [12; p.13]. Problem-cognitive tasks transform new knowledge into an element of practice, stimulate students' active actions. But the productivity of the tasks is determined by their variety, systematicity and correspondence to the content of the curriculum, if: the tasks allow students to see the essential signs of the studied phenomena and processes; provide planning, organization of cognitive activity based on choice or search for optimal ways of achieving results; presuppose the use of new knowledge, non-standard methods of their application, require evaluation of their own cognitive actions.
During the practicum classes, students mastered various problem-solving technologies, the basis of which were heuristic methods of solving problem-cognitive problems (Table 3).

<table>
<thead>
<tr>
<th>Method name</th>
<th>Method characteristic</th>
</tr>
</thead>
<tbody>
<tr>
<td>brainstorm</td>
<td>Solving a problem-cognitive task in the collective generation of ideas by stimulating creative activity</td>
</tr>
<tr>
<td>heuristic questions</td>
<td>setting key questions for obtaining and structuring information in the process of solving a problem</td>
</tr>
<tr>
<td>multidimensional matrices</td>
<td>method of system analysis of new connections and updates that are revealed in the process of matrix analysis of the problem</td>
</tr>
<tr>
<td>free associations</td>
<td>Using free associative links to generate new creative ideas for solving a given problem</td>
</tr>
<tr>
<td>inversions</td>
<td>a method of dialectical thinking, focused on the search for new directions, the scene of the nature of the consideration of obdert and its properties to the opposite</td>
</tr>
<tr>
<td>empathy</td>
<td>method of identifying a person with the object of study, attributing his own feelings, emotions and abilities to him</td>
</tr>
<tr>
<td>synectics</td>
<td>generation of ideas by a permanent group of people under the guidance of trained specialists, criticism of new ideas is acceptable</td>
</tr>
<tr>
<td>organized strategies</td>
<td>method of purposeful use of strategies: functional-target analysis, analysis of contradictions, overcoming obstacles, use of information, search for ideas, value judgments, decision making</td>
</tr>
</tbody>
</table>

Table 3: Heuristic methods for solving problem-cognitive problems
Source: Authors

Task technologies provide the effect of novelty; activation of rational mental actions; selection of alternative solutions; substantiation of one's own position; discussion of the obtained results. The application of task technologies implies compliance with the following requirements: the problematic nature of educational information; professional and pedagogical orientation of the simulated cognitive situations; the presence of a set of role-playing attributes and creative means; use of teaching materials; implementation of the principle of role perspective; ensuring a relaxed atmosphere of communication, cooperation and co-creation in the system of interaction "teacher - students".

The implementation of the pilot program was staged. In the course of the study, three stages of mastering the experience of solving problem-cognitive tasks were identified: preparatory, formative and final, the productivity of which was determined by the observance of pedagogical conditions: professional orientation of students' self-awareness; modeling didactic goals in a task form; the inclusion of students in problem-cognitive activities, the availability of a methodological resource of pedagogical design. We believed that pedagogical design serves as the most important instrumental resource for improving the quality of professional training of future teachers, alternative ways of solving problem-cognitive problems, identifying the general and specific in the objects and processes being studied, which positively affects educational achievements and the level of students' readiness for non-
standard cognitive activity. Its effectiveness is due to the conditions of interaction of the most important components:

- digitalization of education through the use of task technologies;
- personal orientation of teaching aids, problematic and semantic content of educational material, translation of knowledge-values into personal meaning, into active pedagogical abilities;
- implementation of a methodological resource as a set of methodological materials, recommendations that provide a favorable innovative climate, an atmosphere of creativity and non-standard activities;
- harmonization of intellectual and emotional resources of pedagogical design, optimizing the process of rational mental activity;
- freedom of choice of ways and means of creative solution of problem-cognitive tasks in the formation of their own professional and personal "I" of future teachers;
- competent management of the use of tools to enhance the cognitive activity of participants in the educational process.

Each problem-cognitive task modeled in the educational process must meet the requirements of pedagogical design, only under this condition can we talk about its productivity in the professional development of future teachers.

The program of the formative stage of the pedagogical experiment, while observing the totality of pedagogical conditions, ensured a positive dynamics of educational achievements and the quality of students’ knowledge (Table 4).

<table>
<thead>
<tr>
<th>Levels</th>
<th>Control Group</th>
<th></th>
<th>Experimental group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Student</td>
<td>%</td>
<td>Student</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>10,87</td>
<td>6</td>
<td>5,68</td>
</tr>
<tr>
<td>medium</td>
<td>50</td>
<td>53,26</td>
<td>28</td>
<td>30,69</td>
</tr>
<tr>
<td>sufficient</td>
<td>26</td>
<td>27,17</td>
<td>44</td>
<td>48,86</td>
</tr>
<tr>
<td>High</td>
<td>9</td>
<td>8,70</td>
<td>14</td>
<td>14,77</td>
</tr>
</tbody>
</table>

Table 4: Levels of knowledge quality of students of the control and experimental groups
Source: Authors

After the completion of the experimental training, a significant difference was revealed between the levels of knowledge quality of the students of the experimental group and the control group. If in the control group sufficient and high levels of knowledge quality were shown by 27.17% and 8.70%, respectively, then in the experimental group the results are much higher - 48.86% and 14.77%.
The data of the diagnostic stage of the pedagogical experiment showed a positive dynamics in the levels of cognitive activity, the formation of skills for solving problem-cognitive problems and the creative abilities of students who took part in the training according to the author's program (Table 5).

<table>
<thead>
<tr>
<th>Levels</th>
<th>Student activity</th>
<th>Formation of skills to solve problems</th>
<th>Manifestations of mental students' abilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CG</td>
<td>EG</td>
<td>CG</td>
</tr>
<tr>
<td>Low</td>
<td>13.04</td>
<td>5.68</td>
<td>9.78</td>
</tr>
<tr>
<td>Medium</td>
<td>45.65</td>
<td>26.14</td>
<td>40.22</td>
</tr>
<tr>
<td>Sufficient</td>
<td>33.70</td>
<td>48.86</td>
<td>43.48</td>
</tr>
<tr>
<td>High</td>
<td>7.61</td>
<td>19.32</td>
<td>6.52</td>
</tr>
</tbody>
</table>

Table 5: Data of the diagnostic slice at the end of the experiment of the results of the control and experimental groups (data in %)
Source: Authors

From Table 4 shows that the student of the control group showed an insufficient level of activity in the process of solving problem-cognitive tasks. This situation can be explained by the formal assimilation of educational material, the predominance of reproductive activities, the lack of cognitive interest in the use of task technologies in the development of creative abilities.

The organization of professional training based on the task-based approach and the use of problem-cognitive tasks as an important resource toolkit of pedagogical design intensified the mental activity of students, stimulated the acquisition of experience in the use of task technologies, the presence of positive motivation, sustainable cognitive interests and needs for non-standard solution of educational problems and achievement of planned results.

**Discussion**

The problem of finding ways, methods, rational means of training pedagogical personnel has always been and remains relevant today. The search for additional resources to improve the quality of training of future teachers in the conditions of university education has not lost its relevance today. Our consideration of the resource capabilities of a problem-cognitive task as an important tool of pedagogical design in improving the quality of training future teachers for creative professional activity confirmed our assumption about their productivity, which was confirmed in the studies of other authors.

In the works of G. Kostyuk (1973), the learning task is considered as a source of cognitive activity of the individual, the content of actions aimed at searching for the unknown
through making connections with the known. A. Leontiev (1975) believed that a task is a set of goals and conditions set in it, which leads to a positive result in cognition. N. Tulkibaeva (2000) and A. Usova (2001) confirmed the productivity of the learning task as a means of mastering knowledge and acquiring the skills and abilities of cognitive activity by trainees. O. Savchenko (1982) proved that with the help of tasks of various types (comparison, analogy, highlighting the main thing; generalization, concretization, identification and explanation of cause-and-effect relationships, the formation of judgments, self-assessment, etc.), methods of rational mental activity are fixed , which ensure the productivity and success of cognitive activity [25, p.84).

V. Bykov (2019), K. Kraus (2017), L. Osadcha (2022), L. Shevchenko (2020) and other educational tasks are associated with the digitalization of education. In their opinion, digital learning tools, electronic resources, digital design system increase the effectiveness of educational tasks in preparing future specialists for non-standard professional activities.

N. Kondrashov (2015), A. Kucheryavy (2013), E. Mashbits (1987) note the importance of the managerial aspect of using the internal reserves of the educational process based on the task approach. At the same time, not by themselves, the means of pedagogical design (didactic, methodical and computer) arbitrarily and spontaneously affect the quality of students' professional training. The effectiveness of the tools is determined by the methodological literacy and the degree of preparedness of the teacher to manage the educational process, a set of certain managerial procedures, such as the process of planning and using electronic materials, new information and task technologies, methodological and didactic support for the productivity of solving problem-cognitive tasks [p.22].

D. Morton and I. Colbert-Getz (2017) focused on their aesthetic aspect when modeling learning situations as a pedagogical design tool that affects the quality of learning. In their opinion, this aspect enriches the possibilities of forms, the aesthetics of interactive objects and the critical processes of designing the educational process, understanding how concepts, ideologies, materials, image qualities of a person and creative processes achieve consistency in obtaining the planned result. J. Meyer, P. Nightingale, D. Caruso (2000), considering learning tasks as pedagogical design tools, experimentally proved their positive impact on the development of emotional intelligence, optimal thinking and problem solving.

E. Shmakov (2007) explained the shortcomings of the educational process by the fact that “a low level of cognitive development makes it difficult to master the laws, facts and methods of private science. The application of the acquired knowledge to solve practical problems is complicated by the lack of logical thinking and logical operations. Mechanisms
that contribute to the assimilation of educational information are present in the educational process spontaneously” [35, p.65]. In his opinion, the improvement of this knowledge and the ways of acquiring it provides a person with “… the greatest success in subsequent activities” [35, p. 66], which implies the need to use additional resources and means to ensure a positive dynamics in the quality of student training. Oh, J, Kim, SJ, Kim, S, Kang, Kan, J, Bartlett, R. (2019) improving the quality of training of specialists is associated with the use of resource opportunities in instructional design. Xu, P, Chen, Y, Nie, W, Wang, Y, Song, (2019) experimentally confirmed the possibilities of pedagogical design in improving the quality of training future specialists for professional activities.

An analysis of the theoretical and practical research of scientists confirms our conclusions about the effectiveness of problem-cognitive tasks in improving the quality of students' professional training. It has been established that the productivity of problem-cognitive tasks in education is real if they model situations of a professional orientation, reflect the specifics of mental activity, involve solving problems of a professional orientation, stimulate professional interest, form the skills of pedagogical analysis and generalization, develop pedagogical abilities and professional attitudes. future teachers for creative activity.

The practical significance of the author's program was experimentally confirmed, which combined in its content the course "Theoretical foundations of rational mental activity", "Workshop for solving problem-cognitive tasks", "Training for the development of creative abilities of students", methods for conducting them, using various forms of organizing classroom classes (seminar- conversation, seminar-dialogue, seminar-training, defense of creative projects, seminar-competition, etc.) in the content of which a significant role was assigned to problem-cognitive tasks in order to develop positive educational motivation, structure educational information in the form of mental tasks, and enhance the cognitive activity of students through imitation, discussions, dialogue, problematic conversations, etc.

The active participation of students in solving problem-cognitive tasks of a professional orientation provides an opportunity to independently analyze the studied phenomena, processes, concepts, establish connections between them, realize the logic and sequence of rational mental actions, comparing previously studied material with new information, using new knowledge to achieve predictable results. A task approach to the organization of preparation for creative activity and the mastery of task technologies serve as the basis for acquiring future experience by teachers in non-standard professional activities.

In our study, the theoretical provisions developed and experimentally verified, confirmed by the authors of studies of previous years, allow us to say that problem-cognitive
tasks as pedagogical design tools are an important resource for improving the quality of improving the professional training of future teachers, as they provide: a) conscious assimilation of educational material and its reproduction on the basis of understanding the essence of concepts, phenomena, processes, their relationship; consideration of the studied as a system, a holistic education; b) explanation, analysis of empirical and scientific facts, their interpretation in terms of science, identification of interrelated elements, operations, control of the thought process from setting a didactic goal to achieving it and obtaining a predictable result; c) development of one's own professional views, values of attitudes and style of creative activity; d) the acquisition of rational mental actions, practical, professional skills to inform, communicate, diagnose, evaluate; e) fixing the subject of analysis in actions, in the course of mastering analytical skills through solving a system of problem-cognitive tasks.

When using a system of problem-cognitive tasks in the educational process, it is necessary to preserve the parameters of pedagogical design (integrity, interaction of structural elements, consistency, creativity) as a set of resources that ensure the quality of professional training of future teachers. When modeling this system, it is necessary to take into account: the goal and objectives, the unity of methodological, didactic foundations, methods, techniques, forms and means of teaching, ethical orientation, artistic and emotional expressiveness of means.

The purpose of the teacher's actions in modeling problem-cognitive tasks in the educational process is focused on: creating a model of resource capabilities of pedagogical design; reliance on the mechanisms of creative actions of students; structuring educational information as a tool for solving practical problems; choice of role-playing technologies; development of psychological, pedagogical and methodological support for rational mental activity; development of a system to stimulate the positive motivation of learning and the need for a non-standard solution of problem-cognitive tasks [12, p.30].

Analysis of the results of student activities allows us to say that problem-cognitive tasks provide students with the opportunity to express their point of view, to show originality, independence, creativity of judgments, to realize their creative potential in problem-communicative situations, to act outside the box and make non-standard decisions, to be responsible for their actions and their consequences.

The collected data on the results of the final cut indicate that, mastering the methodology for solving problem-cognitive tasks, future teachers enrich their creative potential, consolidate rational methods and techniques of mental activity, form a readiness for active actions in non-standard situations and the use of original ways to get out of them.
Problem-cognitive tasks as a resource tool of pedagogical design turn learning into a self-organized system in which the subject-subject relations of the teacher and students, transferring them to the mode of "self-organization and self-government" of their own cognitive activity, structuring educational information as a process of solving mental problems activate the position of participants in the educational process. process, develop their mental abilities, contain conditions for self-realization of future teachers in the professional field of activity, which serves as a resource for improving the quality of university education.

**Conclusions**

The use of problem-cognitive tasks in the educational process as an instrumental resource of pedagogical design has a positive effect on the development of students' mental abilities, mastering rational methods of mental activity, readiness to act in non-standard situations and use original ways to achieve educational goals. The program of experiential learning based on the task approach is focused on the creation of new knowledge, the acquisition of experience in creative professional activity and the development of creative abilities of future teachers.

Our study has not resolved all the issues of finding the optimal means to ensure positive dynamics in the quality of training modern teachers for creative pedagogical activity. The following aspects of the problem require further theoretical substantiation: the study of the productivity of the tools of the technology for monitoring the educational achievements of students; the possibilities of pedagogical design in improving the effectiveness of online learning; creation of a system of problem-cognitive tasks in the courses of academic disciplines.

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