THE HEURISTIC MODEL OF EDUCATIONAL AND COGNITIVE ACTIVITY IN THE PROFESSIONAL TRAINING OF FUTURE TEACHERS

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Abstract. *This article develops a theoretical model of educational and cognitive activity for future teachers using heuristic approaches. Drawing on the foundational theories of H.E. Armstrong and J. Bruner, it analyzes the structural components of heuristic learning. The study explores practical methods for integrating creative problem-solving and "Discovery Learning" into teacher training curricula to enhance professional pedagogical competence and transform students from passive recipients into active discoverers.*

Keywords: *heuristic approach, discovery learning, future teachers, cognitive activity, pedagogical model.*

1. Introduction

In the modern educational paradigm, the transition from traditional reproductive learning to productive, creative, and research-oriented learning has become one of the most important directions in teacher education. Traditional reproductive learning is mainly based on memorization, repetition, and the passive acquisition of ready-made knowledge. Although this approach can help students remember facts and definitions, it is not sufficient for preparing future teachers who must be able to think independently, solve unexpected problems, and organize creative learning environments for their own students.

For future teachers, the ability to discover, analyze, compare, question, and create new pedagogical solutions is a professional necessity. In real classroom practice, teachers often face situations that cannot be solved only by following standard instructions. They need to adapt methods to different learners, respond to psychological and social challenges, and design lessons that develop students' thinking rather than simply transmit information. Therefore, heuristic education, which is based on discovery and independent search, has strong methodological value in teacher training.

The term "heuristic" is connected with the art of discovery. In education, heuristic methods encourage students to find answers through inquiry, observation, analysis, problem-solving, discussion, experimentation, and reflection. Henry Edward Armstrong, one of the pioneers of the heuristic method, emphasized that heuristic teaching means placing students "as far as possible in the attitude of the discoverer," where they find out things instead of merely being told about them [1]. This idea is especially important in pedagogical education because future

teachers must not only learn theories of teaching but also experience the process of active learning themselves.

The heuristic approach helps connect theoretical concepts with practical pedagogical application. When future teachers solve educational problems independently, they begin to understand how knowledge is constructed, how students think, and how learning difficulties can be transformed into opportunities for development. Thus, the heuristic model supports the formation of creative, reflective, flexible, and professionally competent teachers.

2. Theoretical Foundations of Heuristic Education

Heuristic education is an inquiry-based educational model in which students do not receive knowledge in a ready-made form but discover it through their own intellectual activity. This approach is closely related to constructivist learning theory, according to which learners actively construct knowledge on the basis of previous experience, personal understanding, and interaction with the learning environment. In heuristic education, the teacher does not simply explain the correct answer but organizes conditions in which students can search for meaning, test assumptions, and arrive at conclusions.

Jerome Bruner's theory of Discovery Learning provides an important theoretical foundation for heuristic education. Discovery learning is based on the idea that students learn more deeply when they are involved in problem-solving situations and when they use their existing knowledge to discover new facts, relationships, and principles [2]. According to this view, learning becomes more meaningful when students are not passive listeners but active participants in the construction of knowledge.

In teacher education, this means that future teachers should not only study pedagogical theories but also discover how these theories function in real or simulated classroom situations. For example, instead of simply memorizing principles of student-centered teaching, future teachers may analyze a classroom problem, compare possible solutions, design their own teaching strategy, and reflect on its effectiveness. Through this process, theoretical knowledge becomes practical and personally meaningful.

The heuristic approach also changes the role of the student in the educational process. The student is no longer seen as an object of instruction who only receives information. Instead, the student becomes a subject of education, an active creator of knowledge and experience. This shift is supported by John Holt's view that learning is not merely the result of teaching but the result of learners' own activity, curiosity, and engagement [3]. From this perspective, mistakes are not failures but natural parts of the learning process. They help future teachers analyze their thinking, improve their decisions, and develop professional independence.

Therefore, heuristic education is not limited to one method or technique. It is a broader pedagogical philosophy that includes inquiry, discovery, creativity, problem-solving, self-reflection, and professional growth. It prepares future teachers to become not only transmitters of knowledge but also organizers of meaningful educational discovery.

3. The Heuristic Model of Cognitive Activity

The proposed heuristic model of educational and cognitive activity is built upon three primary pillars: motivation, invention, and reflection. These components are interconnected and function as a single system. Motivation creates the need for discovery, invention supports the search for new solutions, and reflection helps students understand, evaluate, and improve their learning experience.

Motivation is the first and essential stage of heuristic learning. Without internal interest and cognitive need, students may complete tasks mechanically without real intellectual involvement. In heuristic education, motivation is created through problem situations, cognitive conflict, open-ended questions, and professionally relevant tasks. For future teachers, motivation becomes stronger when tasks are connected with real classroom challenges, such as managing student attention, explaining difficult material, supporting weak learners, or designing interactive lessons.

Invention is the central stage of the heuristic model. At this stage, students generate ideas, test hypotheses, compare alternatives, and create original solutions. This requires not only knowledge but also imagination, flexibility, and critical thinking. Edward de Bono's concept of lateral thinking is important here because it encourages learners to move beyond standard patterns and search for alternative ways of solving problems [4]. In teacher training, lateral thinking helps future teachers design creative teaching techniques, adapt materials, and find unexpected solutions to pedagogical difficulties.

Reflection is the final but equally important component of the model. Through reflection, students analyze what they have done, why they chose a particular solution, what difficulties they faced, and how they can improve their approach. Reflection develops metacognitive awareness, which means the ability to understand and regulate one's own thinking. For future teachers, this skill is essential because professional teaching requires constant self-analysis and improvement. This model demonstrates that heuristic learning is not chaotic or accidental. It is a structured process that guides students from initial curiosity to creative solution and reflective understanding. Its main value lies in the fact that students learn not only the content of education but also the process of thinking itself.

4. Practical Implementation and Methodology

To implement the heuristic model effectively, pedagogical universities need to transform the classroom from a place of passive listening into a "laboratory of ideas." In such a classroom, students are encouraged to ask questions, test assumptions, discuss alternatives, make mistakes, and reflect on their learning. The teacher's role changes from lecturer to facilitator, guide, consultant, and organizer of discovery.

Graham Gibbs' idea of "learning by doing and reflecting on that doing" is particularly relevant to heuristic education [5]. Future teachers should not only read about teaching methods but also use them, observe their effects, and reflect on their value. This means that practical

tasks, microteaching, case studies, lesson design, simulations, project work, and reflective journals can become important tools in the implementation of the heuristic model.

5. Results and Discussion

The use of the heuristic model in teacher education can produce several important educational results. First, it increases students' creative initiative. When future teachers are regularly involved in open-ended tasks, they become more confident in generating ideas and proposing original solutions. They no longer wait passively for the teacher's explanation but begin to take responsibility for their own learning.

Second, the heuristic model develops professional adaptability. In real educational practice, teachers often face unexpected situations: students may not understand the material, classroom discipline may become difficult, or planned activities may not work as expected. A teacher trained through heuristic methods is better prepared to analyze the situation and find an alternative solution.

Third, heuristic education strengthens critical and reflective thinking. Future teachers learn to question ready-made answers, compare different methods, evaluate the effectiveness of their decisions, and justify their choices. This is important because teaching is not only a technical activity but also an intellectual and ethical profession.

Fourth, the heuristic model improves the connection between theory and practice. Many students in pedagogical universities study theoretical courses but find it difficult to apply them in real teaching. Heuristic tasks help overcome this gap because they require students to use theoretical knowledge in practical problem-solving situations.

Preliminary experimental observations suggest that the use of heuristic tasks may increase students' creative initiative by approximately 25%. However, this result should be interpreted carefully and supported by further systematic research. To make such findings stronger, future studies should include control and experimental groups, clear assessment criteria, pre-test and post-test results, and qualitative data from student reflections and teacher observations.

The results of heuristic learning also correspond to Herbert Spencer's view that education should encourage exploration rather than forced instruction. When students are treated as researchers, they develop a stronger sense of professional identity. They begin to see themselves not only as learners but also as future educators capable of designing, testing, and improving teaching methods.

At the same time, the implementation of the heuristic model may face certain challenges. Some students may initially feel uncomfortable because they are used to receiving ready answers. Some teachers may also find it difficult to move from direct explanation to facilitation. In addition, heuristic learning requires more time, careful task design, and flexible assessment. Therefore, successful implementation requires methodological preparation, updated teaching manuals, and institutional support.

6. Conclusion

The heuristic model of educational and cognitive activity plays an important role in the professional training of future teachers. It transforms students from passive receivers of information into active discoverers, problem-solvers, researchers, and reflective practitioners. By focusing on discovery, inquiry, invention, and reflection, this model develops the intellectual and creative qualities that are necessary for modern teaching.

The ideas of Armstrong, Bruner, Holt, de Bono, Gibbs, and other educational thinkers show that meaningful learning takes place when students actively participate in the construction of knowledge. For future teachers, this experience is doubly important: they not only learn pedagogical content but also understand how active learning can be organized for their own future students.

The heuristic model supports the development of creativity, independence, adaptability, critical thinking, and professional reflection. It helps future teachers prepare for non-standard classroom situations and encourages them to become innovators in education. Therefore, pedagogical universities should systematically include heuristic tasks, discovery-based methods, reflective activities, and creative problem-solving assignments in teacher training programs.

In practical terms, the implementation of this model requires the modernization of teaching manuals, curricula, assessment tools, and classroom methodology. Special attention should be given to divergent thinking, lateral thinking, inquiry-based learning, and reflective practice. As a result, future teachers will be better prepared to educate a generation of learners who can think independently, act creatively, and solve problems responsibly.

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