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DEVELOPING CREATIVE AND CRITICAL THINKING AND PEDAGOGICAL AUTONOMY OF PRE-SERVICE TEACHERS THROUGH COLLABORATIVE THINKING WITH ARTIFICIAL INTELLIGENCE

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ABSTRACT. This thesis examines the development of creative and critical thinking and pedagogical autonomy among pre-service teachers through collaborative thinking with artificial intelligence. It explores the use of AI not as a source of ready-made answers, but as a tool for stimulating analysis, generating alternative solutions, and supporting independent pedagogical decision-making.

Keywords: artificial intelligence, pre-service teachers, creative thinking, critical thinking, pedagogical autonomy, collaborative thinking, educational technologies.

ANNOTATSIYA. Mazkur tezisda sun’iy intellekt bilan hamkorlikda fikrlash asosida bo‘lajak pedagoglarning ijodiy va tanqidiy tafakkuri hamda pedagogik mustaqilligini rivojlantirish masalasi yoritiladi. Sun’iy intellektdan ta’lim jarayonida tayyor javob manbai sifatida emas, balki fikrlashni rag‘batlantiruvchi vosita sifatida foydalanish imkoniyatlari tahlil qilinadi. Shuningdek, AI bilan hamkorlikda muammoli vaziyatlarni tahlil qilish, muqobil yechimlarni ishlab chiqish va mustaqil pedagogik qarorlar qabul qilishning ahamiyati asoslanadi.

Kalit so‘zlar: sun’iy intellekt, bo‘lajak pedagoglar, ijodiy tafakkur, tanqidiy tafakkur, pedagogik mustaqillik, hamkorlikda fikrlash, ta’lim texnologiyalari.

АННОТАЦИЯ.В тезисе рассматривается развитие творческого и критического мышления, а также педагогической самостоятельности будущих педагогов на основе совместного мышления с искусственным интеллектом. Анализируются возможности использования ИИ не как источника готовых ответов, а как инструмента, стимулирующего мышление, анализ, поиск альтернативных решений и принятие самостоятельных педагогических решений.

Ключевые слова: искусственный интеллект, будущие педагоги, творческое мышление, критическое мышление, педагогическая самостоятельность, совместное мышление, образовательные технологии.

Introduction.Artificial intelligence is increasingly becoming an integral component of contemporary educational environments. Generative AI systems can support learners in generating ideas, explaining complex concepts, creating educational materials, analyzing information, and exploring alternative solutions to pedagogical problems. These developments have significant implications for teacher education because future teachers will be expected not only to use AI-based technologies but also to evaluate their educational value, limitations, and ethical implications. The integration of AI into teacher education should therefore be considered from a broader perspective than technological competence alone. A professionally prepared teacher needs the ability to question information, evaluate evidence, identify alternative perspectives, develop original solutions, and make independent pedagogical decisions. These abilities are closely associated with creative and critical thinking as well as pedagogical autonomy. In this context, AI-human collaboration can be understood as a form of collaborative thinking in which artificial intelligence provides ideas, questions, examples, alternative interpretations, or feedback, while the learner remains responsible for analysis, evaluation, decision-making, and reflection. Such an approach changes the role of AI

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from a simple information provider to a cognitive support tool within a learner-centered educational process.

The purpose of this study is to examine the pedagogical potential of AI-supported collaborative thinking for developing the creative and critical thinking and pedagogical autonomy of pre-service teachers.

Theoretical Framework. Creative thinking involves the ability to generate original ideas, identify alternative approaches, and develop innovative solutions to complex problems. Critical thinking, in turn, involves the analysis and evaluation of information, evidence, arguments, assumptions, and possible solutions. In teacher education, both forms of thinking are essential because classroom situations are rarely completely predictable and often require context-sensitive professional decisions.

Pedagogical autonomy refers to a teacher's capacity to independently plan, justify, implement, evaluate, and modify pedagogical actions. It does not imply isolation from external resources. Rather, an autonomous teacher is capable of using available resources selectively and responsibly while maintaining professional responsibility for educational decisions.

AI-supported collaborative thinking can potentially strengthen these competencies when learning activities are designed around active human participation. For example, instead of asking an AI system to produce a complete lesson plan, a pre-service teacher can first develop an independent plan, request several alternative approaches from AI, compare the alternatives, identify their strengths and weaknesses, and then revise the original plan based on professional reasoning.

Such an approach creates a sequence of cognitive operations:

- Independent idea
- AI-generated alternatives
- Critical evaluation
- Comparison
- Pedagogical decision
- Reflection.

This sequence places human reasoning at the center of the learning process.

Methodology. The study is based on a conceptual and pedagogical analysis of AI-supported learning approaches applicable to pre-service teacher education. The proposed instructional framework consists of five interconnected stages.

First, students independently analyze a pedagogical problem and formulate an initial solution. This stage is important because it establishes an individual cognitive position before interaction with AI.

Second, students use an AI system to generate alternative explanations, strategies, examples, or possible solutions. The objective is not to obtain a final answer but to expand the range of available perspectives.

Third, students critically evaluate AI-generated outputs according to predefined criteria, including relevance, accuracy, pedagogical appropriateness, contextual suitability, potential bias, and ethical considerations.Fourth, students formulate their own pedagogical decision by comparing the AI-generated alternatives with their initial ideas and professional knowledge.

Finally, students engage in reflective analysis by explaining why they accepted, modified, or rejected particular AI-generated suggestions.

This framework can be implemented through case studies, lesson-planning activities, problem-based learning, microteaching, reflective journals, and scenario-based pedagogical tasks.

Results and Discussion. The proposed approach indicates several potential benefits for the development of future teachers.

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First, AI-supported brainstorming can increase the diversity of ideas available to students. When students compare their own solutions with AI-generated alternatives, they may encounter perspectives that they had not previously considered. This can create favorable conditions for divergent thinking and creative problem solving.

Second, the requirement to evaluate AI-generated information can strengthen critical thinking. AI systems may produce incomplete, inaccurate, contextually inappropriate, or overly generalized information. Therefore, students must learn to verify claims, identify assumptions, compare sources, and determine whether a proposed solution is pedagogically justified.

Third, AI-supported collaborative thinking can contribute to pedagogical autonomy when students remain responsible for the final decision. The central principle is that AI may provide suggestions, but it should not replace the professional judgment of the future teacher. The student must be able to explain the rationale behind the final pedagogical choice.

Fourth, reflective interaction with AI can strengthen metacognitive awareness. By comparing their initial ideas with AI-generated alternatives, students can identify weaknesses in their own reasoning, reconsider assumptions, and develop more systematic approaches to problem solving.

However, the educational benefits of AI collaboration depend significantly on the instructional design. If students simply copy AI-generated answers, the technology may reduce rather than develop independent thinking. Consequently, teacher educators should design tasks that require students to justify decisions, verify information, provide evidence, identify limitations, and produce original pedagogical solutions.

The proposed model therefore emphasizes the principle of "AI as a thinking partner, not a decision-maker." This principle preserves the central role of human agency in teacher education while allowing future teachers to benefit from the cognitive possibilities offered by artificial intelligence.

Conclusion. AI-supported collaborative thinking represents a promising direction for the development of pre-service teachers' creative and critical thinking and pedagogical autonomy. The educational value of AI does not primarily lie in its ability to generate ready-made answers but in its potential to stimulate comparison, questioning, reflection, alternative thinking, and professional decision-making.

For teacher education, AI should therefore be integrated into learning activities that require students to independently formulate problems, critically evaluate AI-generated outputs, compare alternative solutions, make justified pedagogical decisions, and reflect on their reasoning.

The integration of such activities can contribute to the preparation of teachers who are not only technologically competent but also capable of independent professional judgment. Future empirical research should examine the effectiveness of AI-supported collaborative thinking through experimental and longitudinal studies and identify appropriate assessment instruments for measuring changes in creative thinking, critical thinking, and pedagogical autonomy among pre-service teachers.

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