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RESEARCH ARTICLE

Improving the Pedagogical System of Training Future Preschool Education Specialists Based on Meta-Learning Technologies

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Abstract

This article examines the improvement of the pedagogical system of training future preschool education specialists based on meta-learning technologies. The relevance of the study is determined by the growing need to prepare preschool teachers who are able not only to master professional knowledge, but also to regulate their own learning, analyze educational situations, independently select effective strategies and continuously develop their professional competence. Meta-learning technologies are interpreted as a set of pedagogical tools, methods and digital resources that develop students' ability to learn how to learn, plan their learning activities, monitor progress, reflect on results and transfer acquired knowledge to new professional situations. In preschool teacher education, this approach is especially important because future specialists must be able to work with young children in a flexible, creative and developmentally appropriate manner. The article analyzes the theoretical foundations of meta-learning, its connection with self-regulated learning, reflective competence, digital pedagogy and competency-based education. The research is based on theoretical analysis, comparison, generalization and pedagogical modeling. The results show that the integration of meta-learning technologies into the pedagogical system of training future preschool education specialists improves students' motivation, independent learning skills, reflective thinking, digital competence and readiness for professional activity. The article concludes that meta-learning technologies should be considered an important condition for modernizing preschool teacher education.

KEYWORDS

Meta-learning technologies, preschool education, future specialists, pedagogical system, self-regulated learning, reflective competence, digital pedagogy, professional training, competency-based approach, independent learning.

INTRODUCTION

The modernization of preschool education requires the preparation of specialists who are capable of responding to the changing needs of children, families and society. A preschool teacher is not only a person who organizes care and educational activities, but also a professional who supports the child's cognitive, emotional, social, speech and creative development. Therefore, the training of future preschool education specialists should be aimed at forming professional competence, pedagogical flexibility, creativity, communication culture, diagnostic thinking and the ability to organize a developmental educational environment.

In the conditions of rapid transformation of education, traditional teaching approaches are no longer sufficient for the full preparation of future preschool teachers. Students should

not only receive ready-made knowledge, but also learn how to acquire, process, evaluate and apply knowledge independently. This requirement brings the problem of meta-learning to the center of pedagogical research. Meta-learning can be understood as learning about one's own learning. It includes the ability to understand personal learning strategies, plan educational activity, control cognitive processes, evaluate results and make corrections when necessary. In other words, meta-learning develops the student's awareness of how learning takes place and how it can be improved.

For future preschool education specialists, meta-learning technologies are of particular importance. Preschool education is a field in which the teacher constantly faces diverse pedagogical situations. Children differ in their developmental level, temperament, interests, speech abilities, family background and social experience. In order to work effectively with them, the teacher must be able to observe, analyze, choose methods, reflect on results and adapt pedagogical actions. These qualities cannot be formed only through reproductive learning. They require a pedagogical system that stimulates independence, reflection and conscious self-development.

The relevance of the topic is also related to the increasing role of digital technologies in higher education. Electronic platforms, digital portfolios, interactive tasks, online resources, video analysis, learning analytics and virtual communication environments create new opportunities for organizing students' learning activities. However, technology itself does not guarantee educational quality. Its effectiveness depends on whether it helps students understand their learning process, develop professional thinking and strengthen pedagogical competence. Therefore, meta-learning technologies should be used not as separate technical tools, but as an integrated part of the pedagogical system of professional training.

The purpose of this article is to analyze the improvement of the pedagogical system of training future preschool education specialists based on meta-learning technologies. The article aims to reveal the theoretical foundations of meta-learning, determine its pedagogical possibilities in preschool teacher education, describe the structural components of the improved system and identify the expected educational results.

The research is based on theoretical and analytical methods. The methodological basis of the article includes the study of scientific literature on meta-learning, self-regulated learning, reflective pedagogy, preschool teacher education, competency-based education and digital learning technologies. The research relies on several interconnected approaches: the competency-based approach, the activity-based approach, the reflective approach and the technological approach.

The competency-based approach makes it possible to consider the training of future preschool education specialists as a process of forming professional, methodological, communicative, digital and reflective competencies. The activity-based approach emphasizes that competence is developed not only through the acquisition of information, but also through active participation in educational tasks, problem solving, project activity and pedagogical practice. The reflective approach is important because meta-learning is directly connected with the student's ability to analyze personal learning experience, understand difficulties and determine ways of improvement. The technological approach helps to identify the role of digital tools and educational platforms in organizing meta-learning activities.

The main methods used in the study are theoretical analysis, comparison, generalization and pedagogical modeling. Theoretical analysis was used to clarify the concepts of meta-learning, meta-learning technologies, pedagogical system and professional training of preschool education specialists. Comparison made it possible to distinguish traditional and meta-learning-based models of teacher training. Generalization helped identify the pedagogical conditions necessary for introducing meta-learning technologies. Pedagogical modeling was used to describe the structure of an improved system for training future preschool education specialists.

The theoretical analysis shows that the improvement of the pedagogical system of training future preschool education specialists based on meta-learning technologies should be carried out as a holistic process. This system should include goal-oriented, content-based, methodological, technological, reflective and evaluative components. Each component performs a specific function, but their effectiveness appears only when they are interconnected.

The goal-oriented component is aimed at forming a future preschool education specialist who is able to learn independently, think reflectively, use digital resources, analyze pedagogical situations and improve professional activity

continuously. In this case, the goal of education is not limited to the transmission of subject knowledge. It includes the development of the student's ability to manage personal learning and professional growth.

The content-based component requires the renewal of educational content. The curriculum should include not only theoretical knowledge about preschool pedagogy, child psychology, methodology of educational activities and developmental programs, but also tasks that develop meta-cognitive and reflective skills. Students should study how to plan their learning, how to choose learning strategies, how to evaluate their own progress and how to use feedback constructively. In addition, the content should be connected with real situations from preschool practice, because meta-learning becomes meaningful when students can apply it to professional problems.

The methodological component includes active and interactive methods that stimulate independent learning and reflection. Problem-based learning, case analysis, project-based learning, portfolio technology, peer assessment, self-assessment, pedagogical reflection diaries and microteaching can be effectively used in this process. For example, when students analyze a case about a child with communication difficulties, they do not only search for a pedagogical solution; they also reflect on how they approached the problem, which information they used, which strategy was effective and what should be improved. This turns learning into a conscious and self-regulated process.

The technological component includes digital tools that support meta-learning. Learning management systems, electronic portfolios, interactive platforms, video lessons, digital tests, reflective blogs, online discussions and multimedia resources can help students plan, monitor and evaluate learning. A digital portfolio is especially useful because it allows students to collect their works, observe their progress, compare earlier and later results and present evidence of professional growth. Video analysis can also be effective in preschool teacher training. Students may watch fragments of pedagogical situations, analyze teacher-child interaction and reflect on possible alternatives.

The reflective component is the core of the meta-learning-based pedagogical system. Reflection allows students to understand the meaning of their learning activity. In the process of reflection, future preschool teachers learn to ask themselves what they have learned, why a certain method was effective, what difficulties they experienced, how they can improve and how the acquired knowledge can be used in work with children. Reflection should be organized systematically, not accidentally. It may be included after lectures, practical classes, independent work, projects and pedagogical practice.

The evaluative component also needs improvement. Traditional assessment often measures only the final result, while meta-learning requires attention to the process of learning. Therefore, assessment should include self-assessment, peer assessment, teacher feedback, portfolio analysis and reflective reports. Such assessment helps students become responsible for their learning and understand the criteria of professional development.

The results of the theoretical analysis indicate that the introduction of meta-learning technologies can improve several important aspects of future preschool teachers' training. First, it increases students' learning motivation because they become active participants in the educational process. Second, it develops independent learning skills, which are necessary for continuous professional development. Third, it forms reflective competence, which is essential for analyzing pedagogical practice. Fourth, it strengthens digital competence because students learn to use technologies for meaningful educational purposes. Fifth, it improves professional readiness because students connect theoretical knowledge with practical situations.

The improvement of the pedagogical system of training future preschool education specialists based on meta-learning technologies requires a change in the logic of the educational process. In the traditional model, the teacher often acts as the main source of knowledge, while students receive, reproduce and demonstrate this knowledge. In the meta-learning model, the teacher becomes an organizer, consultant and facilitator of learning. Students are encouraged to plan, search, analyze, reflect and correct their actions. This does not reduce the teacher's role; on the contrary, it makes it more complex and methodologically significant.

Meta-learning technologies are especially important in preschool teacher education because work with young children requires flexibility and sensitivity. A preschool teacher must be able to notice small changes in children's behavior, understand developmental needs, adapt methods and create emotionally safe conditions. These abilities depend not only on theoretical preparation, but also on reflective and analytical thinking. A student who has developed meta-learning skills

can more easily understand why a certain pedagogical action was successful or unsuccessful and how it can be improved.

One of the main pedagogical conditions for introducing meta-learning technologies is the creation of a reflective educational environment. Such an environment should encourage students to express their thoughts, ask questions, analyze mistakes and search for alternative solutions. If students are afraid of making mistakes, reflection becomes superficial. Therefore, the educational atmosphere should be supportive and developmental. Mistakes should be treated not as failure, but as material for learning.

Another important condition is the systematic organization of independent work. Independent work should not be limited to preparing summaries or memorizing information. It should include analytical, creative and practical tasks. For example, students may prepare a reflective analysis of a preschool educational situation, design a developmental activity for children, compare different pedagogical methods or create digital didactic materials. Such assignments develop both professional competence and meta-learning skills.

The integration of digital technologies should be purposeful. Digital tools should not be used only for visual attractiveness or technical novelty. They should help students understand learning goals, monitor progress, receive feedback and reflect on results. For instance, an electronic portfolio can show the development of the student's pedagogical thinking over time. Online forums can support discussion and peer learning. Digital quizzes can provide immediate feedback. Video recordings can help students analyze communication, gestures, tone of voice and interaction with children.

Project-based learning is also effective in developing meta-learning. When students work on a project, they plan actions, distribute time, search for information, solve problems, evaluate intermediate results and present outcomes. In preschool teacher education, projects may be devoted to developing speech activities, organizing play-based learning, creating inclusive environments, designing didactic games or preparing digital resources for parents. The project process naturally requires meta-learning because students must constantly regulate their work and reflect on its effectiveness.

The role of feedback is particularly important. Feedback should not only indicate mistakes, but also guide students toward improvement. Effective feedback answers the questions of what has been achieved, what needs improvement and how improvement can be made. In a meta-learning system, feedback should be dialogic. Students should not only receive comments from the teacher, but also analyze them, respond to them and use them for further development.

The development of reflective competence should be connected with pedagogical practice. During practice, students encounter real children, real communication and real educational challenges. If practice is accompanied by reflection diaries, group discussions, mentor feedback and self-analysis, it becomes a powerful tool for professional development. Students learn to connect theory with practice and understand their own pedagogical style.

The improvement of the pedagogical system also requires the professional development of teacher educators. Instructors working with future preschool specialists should be able to use meta-learning methods, organize digital learning environments, support reflection and assess learning processes. Without the methodological readiness of teacher educators, meta-learning technologies may remain formal.

Another significant issue is the balance between innovation and pedagogical tradition. Meta-learning technologies should not replace the fundamental values of preschool education, such as care, emotional support, play, communication, creativity and respect for the child's individuality. Instead, they should strengthen these values by preparing future specialists who are more conscious, flexible and capable of lifelong learning.

Improving the pedagogical system of training future preschool education specialists based on meta-learning technologies is an important direction of modern higher pedagogical education. Meta-learning technologies develop students' ability to learn consciously, regulate their educational activity, reflect on results and apply knowledge in new professional situations. For future preschool teachers, these abilities are essential because their professional work requires flexibility, creativity, observation, communication and continuous self-development.

The article shows that the improved pedagogical system should include goal-oriented, content-based, methodological, technological, reflective and evaluative components. These components should be connected with active methods, independent work, digital tools, project-based learning, reflective tasks and formative assessment. The effectiveness of the system depends on the creation of a reflective

educational environment, purposeful use of digital technologies, meaningful feedback and the methodological readiness of teacher educators.

The integration of meta-learning technologies into preschool teacher education increases students' motivation, independent learning skills, reflective competence, digital literacy and professional readiness. It helps future specialists move from passive acquisition of knowledge to active, conscious and responsible professional development. Therefore, meta-learning technologies should be considered an important pedagogical condition for improving the quality of training future preschool education specialists.

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