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IMPROVING THE METHODOLOGY OF TEACHING MATHEMATICS IN HIGHER EDUCATION BASED ON A COMPETENCY-BASED APPROACH AND DIGITAL TECHNOLOGIES

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Abstract
This article explores modern approaches to improving the methodology of teaching mathematics in higher education institutions. Special attention is given to the competency-based approach as a key factor in developing students’ professional, cognitive, and analytical skills. The didactic potential of digital technologies and interactive teaching methods is analyzed, highlighting their role in enhancing students’ motivation, independent learning, and problem-solving abilities. The article also examines the importance of mathematical modeling, student-centered learning, and the development of teachers’ methodological and digital competencies. The findings emphasize that the integration of innovative pedagogical technologies contributes significantly to improving the quality and effectiveness of mathematics education.

Keywords: Mathematics teaching methodology, competency-based approach, digital technologies, interactive methods, higher education

Annotatsiya
Ushbu maqolada oliy ta’lim muassasalarida matematika fanini o‘qitish metodikasini takomillashtirishning zamonaviy yondashuvlari tahlil qilingan. Talabalarning kasbiy, kognitiv va tahliliy ko‘nikmalarini rivojlantirishda muhim omil sifatida kompetensiyaviy yondashuvga alohida e’tibor qaratilgan. Raqamli texnologiyalar va interfaol o‘qitish metodlarining didaktik imkoniyatlari tahlil qilinib, ularning talabalarning o‘qishga bo‘lgan motivatsiyasini, mustaqil ta’lim olish va muammolarni hal etish qobiliyatlarini rivojlantirishdagi roli yoritilgan. Shuningdek, matematik modellashtirish, talaba markazli ta’lim va o‘qituvchilarning metodik hamda raqamli kompetensiyalarini rivojlantirish masalalari ko‘rib chiqilgan. Tadqiqot natijalari innovatsion pedagogik texnologiyalarni joriy etish matematika ta’limi sifati va samaradorligini sezilarli darajada oshirishini ko‘rsatadi.

Аннотация
В статье рассматриваются современные подходы к совершенствованию методики преподавания математики в высших учебных заведениях. Особое внимание уделяется компетентностному подходу как ключевому фактору развития профессиональных, когнитивных и аналитических навыков студентов. Проанализирован дидактический потенциал цифровых технологий и интерактивных методов обучения, а также раскрыта их роль в повышении учебной мотивации, развитии самостоятельной учебной деятельности и навыков решения проблем. Кроме того, рассматриваются вопросы математического моделирования, студентоцентрированного обучения и развития методической и цифровой компетентности преподавателей. Результаты исследования показывают, что интеграция

инновационных педагогических технологий способствует существенному повышению качества и эффективности математического образования.

Introduction

In the context of rapid technological development and global digitalization, higher education systems are facing new challenges and expectations. Mathematics, as a fundamental academic discipline, plays a crucial role in developing analytical thinking, logical reasoning, and problem-solving skills required in various professional fields. Therefore, the methodology of teaching mathematics in higher education institutions requires continuous improvement in accordance with modern educational demands.

Traditionally, mathematics teaching has focused on the transmission of theoretical knowledge and procedural skills. However, contemporary educational paradigms emphasize the necessity of developing students' competencies that enable them to apply mathematical knowledge in real-life and professional contexts. This shift has led to increased interest in competency-based education, student-centered learning, and the integration of digital technologies into the teaching process.

The purpose of this article is to analyze the methodological foundations of teaching mathematics based on a competency-based approach and to identify effective ways of integrating digital technologies and interactive teaching methods into higher education mathematics courses.

Contemporary Goals and Objectives of Mathematics Education. The primary objective of modern mathematics education is not limited to mastering mathematical concepts and formulas. Instead, it aims to develop a wide range of competencies that are essential for students' academic and professional success. These competencies include logical thinking, critical analysis, mathematical modeling, and the ability to solve complex problems independently. In higher education, mathematics education should support interdisciplinary integration and prepare students for practical applications of mathematical knowledge. This requires redefining learning outcomes in terms of competencies rather than isolated knowledge units. Consequently, teaching methods must be aligned with these outcomes to ensure the effectiveness of the educational process.

Theoretical Foundations of the Competency-Based Approach. The competency-based approach focuses on learning outcomes that reflect students' ability to apply acquired knowledge, skills, and attitudes in various situations. In mathematics education, this approach emphasizes understanding concepts, interpreting results, and using mathematical tools to analyze real-world problems. From a methodological perspective, the competency-based approach requires the use of active learning strategies, problem-based tasks, and formative assessment methods. Students are encouraged to engage in meaningful learning activities that foster independence, creativity, and responsibility for their own learning. Research indicates that competency-based mathematics education enhances students' motivation and contributes to deeper conceptual understanding. It also promotes the development of transferable skills that are valuable beyond academic settings.

The Role of Digital Technologies in Mathematics Teaching. Digital technologies have become an integral component of modern education, offering new opportunities to enhance the teaching and learning of mathematics. Educational software, virtual simulations, learning management systems, and

online assessment tools enable teachers to diversify instructional methods and personalize learning experiences. In mathematics education, digital tools support visualization of abstract concepts, dynamic representation of mathematical processes, and immediate feedback on learning progress. These features help students better understand complex topics and improve their engagement in the learning process. Moreover, digital technologies facilitate blended and online learning environments, allowing students to access educational resources anytime and anywhere. This flexibility is particularly important for supporting independent learning and lifelong education.

Interactive Teaching Methods in Mathematics Education. Interactive teaching methods play a significant role in implementing a competency-based approach to mathematics education. Methods such as problem-based learning, project-based learning, case studies, and collaborative group work actively involve students in the learning process. Through interactive activities, students learn to communicate mathematical ideas, justify their reasoning, and collaborate with peers. These methods also create opportunities for developing critical thinking and reflective skills.
The effectiveness of interactive methods largely depends on the teacher's ability to design meaningful tasks and facilitate productive learning interactions. When properly implemented, interactive teaching significantly enhances students' academic performance and learning satisfaction.

Teaching Mathematical Modeling as a Core Competency. Mathematical modeling is a key component of competency-based mathematics education. It involves representing real-world situations using mathematical concepts and analyzing the obtained models to make informed decisions. Teaching mathematical modeling helps students understand the practical relevance of mathematics and develop problem-solving strategies applicable in various disciplines. It also fosters interdisciplinary connections and enhances students' analytical abilities. Methodologically, teaching modeling requires the use of contextualized tasks, real-life examples, and open-ended problems. This approach encourages students to explore multiple solution strategies and critically evaluate results.

Organization of Independent Learning in Mathematics Courses. Independent learning is an essential element of competency-based education. In mathematics courses, independent learning activities include solving problems, conducting research, using digital resources, and reflecting on learning outcomes. Effective organization of independent learning requires clear learning objectives, well-structured tasks, and continuous feedback. Digital platforms and online resources play a crucial role in supporting students' independent work and monitoring their progress. By developing independent learning skills, students become more autonomous and better prepared for professional challenges and lifelong learning.

The Teacher's Methodological and Digital Competence. The successful implementation of innovative teaching approaches largely depends on the teacher's professional competence. Mathematics teachers in higher education must possess strong methodological knowledge, digital literacy, and the ability to adapt teaching strategies to diverse learning needs. Continuous professional development is essential for teachers to keep pace with technological advancements and pedagogical innovations. Participation in training programs, research activities, and professional communities

contributes to enhancing teaching quality. A competent teacher serves as a facilitator of learning, guiding students toward meaningful understanding and practical application of mathematical knowledge.

Assessment and Evaluation in Competency-Based Mathematics Education. Assessment in competency-based education focuses on evaluating students' ability to apply knowledge rather than memorization. In mathematics education, this involves using formative assessment, performance-based tasks, and reflective evaluation methods. Digital assessment tools provide efficient ways to collect and analyze learning data, offering timely feedback to students. Transparent and criterion-based assessment practices enhance students' awareness of learning expectations and outcomes.

Conclusion

In conclusion, improving the methodology of teaching mathematics in higher education requires a comprehensive approach that integrates competency-based education, digital technologies, and interactive teaching methods. These elements contribute to developing students' mathematical competencies, independent learning skills, and readiness for professional practice. The findings of this study confirm that modern pedagogical approaches enhance the quality and effectiveness of mathematics education. Future research may focus on empirical evaluation of specific teaching strategies and their impact on student learning outcomes.

References

1. Polya, G. How to Solve It. Princeton University Press.
2. Tall, D. Advanced Mathematical Thinking. Springer.
3. OECD. Education 2030: The Future of Education and Skills.
4. UNESCO. Digital Technologies in Higher Education.
5. Hattie, J. Visible Learning. Routledge.
6. Biggs, J., Tang, C. Teaching for Quality Learning at University. McGraw-Hill.