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INNOVATIVE PEDAGOGICAL APPROACHES TO INTEGRATING FOREIGN EXPERIENCE IN DEVELOPING STUDENTS' MATHEMATICAL COMPETENCIES

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Annotatsiya: Ushbu maqolada matematik kompetensiya va kompetentlik tushunchalari, ularning ta'lim jarayonida shakllanishi va rivojlanishidagi xorijiy pedagogik tajribalar tahlil qilinadi. Jo Boaler va Alan Schoenfeldning ishlari asosida matematik kompetensiya nafaqat nazariy bilimlar, balki murakkab muammolarni hal qilish qobiliyati sifatida ko'rib chiqiladi. Shuningdek, o'quvchining motivatsiyasi, hissiy holati, kognitiv jarayonlar va metakognitiv nazoratning ahamiyati ta'kidlanadi.

Kalit so'zlar: matematik kompetensiya, kompetentlik, kognitiv jarayonlar, metakognitiv nazorat, ta'lim, Jo Boaler, Alan Schoenfeld

Аннотация: В статье анализируются понятия математической компетенции и компетентности, а также зарубежный педагогический опыт их формирования и развития. На основе работ Джо Боалера и Алана Шенфельда математическая компетенция рассматривается не только как теоретические знания, но и как способность решать сложные задачи. Подчеркивается роль мотивации, эмоционального состояния, когнитивных процессов и метакогнитивного контроля.

Ключевые слова: математическая компетенция, компетентность, когнитивные процессы, метакогнитивный контроль, образование, Джо Боалер, Алан Шенфельд

Abstract: The article analyzes the concepts of mathematical competence and competence, as well as international pedagogical experiences in their development. Based on the works of Jo Boaler and Alan Schoenfeld, mathematical competence is considered not only as theoretical knowledge but also as the ability to solve complex problems. The importance of students' motivation, emotional state, cognitive processes, and metacognitive control is highlighted.

Keywords: mathematical competence, competence, cognitive processes, metacognitive control, education, Jo Boaler, Alan Schoenfeld

In the modern education system, the concept of "mathematical competence" occupies a central place in preparing individuals for life and professional activity. Mathematical competence is not merely a set of knowledge and skills; it also includes the ability to apply them effectively in various situations, as well as personal qualities and professional readiness. The competence-based approach is gaining increasing importance worldwide as a means of improving the quality of education, particularly in the context of the Bologna Process and the initiatives of the Council of Europe (Plakhova, 2010; Zimnyaya, 2004).

In scientific literature, the concepts of "competence" and "competency" (or "competent performance") are distinguished. Competence refers to the body of knowledge and the potential

capabilities required for activity in a particular field ("I know"), whereas competency reflects the ability to apply this knowledge in practice ("I can do") (Khutorskoy; Tojiboeva & Pulatova, 2020; Qorayev & Tirkashev, 2022).

Modern pedagogical research, including the works of Jo Boaler and Alan Schoenfeld, views mathematical competence not as a static body of knowledge but as a dynamic, complex, and multidimensional ability. Boaler emphasizes the influence of students' motivation, emotional state, and learning environment, while Schoenfeld highlights the role of cognitive processes, strategies, and metacognitive control. At the same time, mathematical competence manifests itself through solving practical problems and developing mathematical thinking.

One of the main requirements of the contemporary education system is to prepare individuals for successful participation in life and professional activity. From this perspective, the concept of "mathematical competence" is becoming increasingly central. It implies not only the acquisition of mathematical knowledge but also the ability to apply it effectively in diverse situations, integrating personal qualities and professional readiness.

The relevance of the competence-based approach in education is sharply increasing worldwide, especially in the context of international educational integration processes such as the Bologna Convention and the initiatives of the Council of Europe (Plakhova, V. G., 2010). This approach goes beyond the mere acquisition of knowledge, skills, and abilities (KSA), focusing instead on their effective practical application and activity-based outcomes. I. A. Zimnyaya (2004) explains the necessity of implementing the competence-based approach through global educational integration trends, changes in the educational paradigm, and relevant governmental directives.

In Uzbekistan, strategic documents such as the Concept for the Development of Public Education until 2030 and the Action Strategy for the Further Development of the Republic of Uzbekistan (2017–2021) emphasize the importance of developing state educational standards based on a competence-based approach.

In scientific literature, there are different interpretations of the relationship between "competence" and "competency." Some authors, including those referenced in the European Training Foundation glossary, consider them synonymous, while many researchers argue for their distinction (Aronov & Znamenskaya, 2010; Tojiboeva & Pulatova, 2020; Qorayev & Tirkashev, 2022). Tojiboeva and Pulatova (2020) state that competence represents the general body of knowledge possessed by an individual ("I know"), whereas competency refers to the ability to apply that knowledge effectively in practice ("I can do" and "I do").

This distinction aligns with the views of A. V. Khutorskoy, who defines a competent person as one who possesses the necessary knowledge and skills to perform effectively in a specific field. V. V. Serikov describes competency as a system of personal qualities that enables an individual to demonstrate their educational attainment in practice (Qorayev & Tirkashev, 2022). Thus, competency is not merely a set of knowledge, skills, and abilities but an integrated quality that reflects readiness and capability for independent and successful activity (Tojiboeva & Pulatova, 2020).

The Resolution No. 187 of the Cabinet of Ministers of the Republic of Uzbekistan (April 6, 2017), approving the State Educational Standard for General Secondary Education, defines competence as the ability to apply existing knowledge, skills, and abilities in everyday activities.

The distinction between "competence" and "competency" has long been debated in the scientific community. Scholars such as A. V. Khutorskoy, I. A. Zimnyaya, and J. Raven advocate for a clear differentiation between the two terms. Khutorskoy defines competence as a requirement set before the learner—a set of qualities necessary for successful activity in any field. In his view, competence represents a potential or a standard. Competency, however, is a formed personal quality and minimal professional experience achieved as a result of mastering a particular competence.

Similarly, B. I. Kanaev defines competence as a capacity to be developed in a particular direction and competency as the achieved result in that direction. N. Chomsky, though in a linguistic context, also distinguishes between "competence" (knowledge of one's native language) and "performance" (the actual use of language in real situations). This parallels Khutorskoy's differentiation between competence (potential/requirement) and competency (result/practice).

Some sources, however, treat competence and competency as identical concepts. Such an approach may reduce conceptual clarity, as it blurs the distinction between goal (competence) and outcome (competency).

Based on a critical analysis of the reviewed works, we propose the following interpretation: if "mathematical competence" is understood as a student's potential ability for logical thinking, understanding problems, and applying mathematical methods, then "mathematical competency" manifests in practical results such as effectively solving complex mathematical problems, performing mathematical modeling, and justifying solutions.

This distinction is advantageous in curriculum design, as it allows educators to clearly define required mathematical competencies (standards) and then assess the level of achieved competency (results). However, in practice, strictly separating these concepts may be challenging, since knowing and applying are often closely interconnected processes.

From Jo Boaler's perspective, mathematical competence is not merely knowing formulas or performing calculations but the ability to apply mathematical knowledge to real-life problems, identify appropriate mathematical methods in unfamiliar situations, and use them effectively. She connects mathematical competence more with "thinking" than with "calculating." Her research demonstrates that when students perceive mathematics as meaningful and relevant, their competence significantly increases. In works such as "Jo Boaler's Six Keys to Mathematical Success," she proposes practical approaches to enhancing mathematical competence.

According to Alan Schoenfeld, mathematical competence involves not just obtaining correct answers but effectively utilizing resources (knowledge, strategies, metacognitive control) and belief systems necessary for solving complex and unfamiliar problems. His book Mathematical Problem Solving thoroughly explores various aspects of mathematical competence. Schoenfeld argues that a mathematically competent individual not only strives for the final answer but also understands the problem-solving process itself.

Both Jo Boaler and Alan Schoenfeld are leading figures in contemporary mathematics education theory. They define mathematical competence as a complex and dynamic process rather than a simple ability to calculate or memorize formulas. Both emphasize deep understanding and the ability to explain "why," rather than focusing solely on correct answers.

Boaler's work places strong emphasis on emotion and meaning. She highlights the importance of students' attitudes toward mathematics, their emotional states, and motivation. Her concept of developing a "growth mindset" aims to enhance mathematical competence through supportive learning environments and effective teaching methods.

Schoenfeld, in contrast, focuses primarily on cognitive processes and metacognitive regulation. He analyzes in detail the internal mechanisms of problem solving, emphasizing the importance of knowledge resources, strategic thinking, monitoring, and belief systems in shaping mathematical competency.

In conclusion, both scholars view mathematical competence as a dynamic, multifaceted ability rather than a static body of knowledge. Boaler emphasizes motivation, emotional factors, and the learning environment, while Schoenfeld highlights cognitive processes, strategies, and self-regulation.

Foreign pedagogical research demonstrates that for mathematical competence and competency to be effectively developed, their conceptual distinction must be clearly defined. Competence represents mathematical knowledge and potential ability, while competency reflects the practical application of that knowledge in solving complex problems and conducting modeling.

Boaler's research shows that motivation, emotional engagement, and meaningful learning environments are key factors in developing competence. Schoenfeld demonstrates that cognitive resources, strategies, and metacognitive control are decisive in forming mathematical competency.

Thus, foreign experience confirms that both theoretical and practical pedagogical approaches are essential in shaping mathematical competence and competency. When these approaches are integrated into the educational process, students' ability to solve complex mathematical problems increases significantly.

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