

Non-governmental Organization
International Center of Scientific Research



PROCEEDINGS OF THE
IX INTERNATIONAL SCIENTIFIC
AND THEORETICAL CONFERENCE

THEORY AND
PRACTICE OF
MODERN SCIENCE

28.03.2025

KRAKÓW
REPUBLIC OF POLAND

 **SCIENTIA**
COLLECTION OF SCIENTIFIC PAPERS

with the proceedings of the

IX International Scientific and Theoretical Conference


**Theory and practice
of modern science**

28.03.2025

Kraków, Republic of Poland

Kraków, 2025

UDC 082:001
T 44

 <https://doi.org/10.36074/scientia-28.03.2025>




Chairman of the Organizing Committee: Goldenblat M.

Responsible for the layout: Babych Yu.

Responsible designer: Bondarenko I.

T 44 **Theory and practice of modern science:** collection of scientific papers «SCIENTIA» with Proceedings of the IX International Scientific and Theoretical Conference, March 28, 2025. Kraków, Republic of Poland: International Center of Scientific Research.

ISBN 979-8-88955-779-1 (series)  Bowker

DOI 10.36074/scientia-28.03.2025

Papers of participants of the IX International Multidisciplinary Scientific and Theoretical Conference «Theory and practice of modern science», held on March 28, 2025 in Kraków are presented in the collection of scientific papers.

The conference is included in the Academic Research Index ReserchBib International catalog of scientific conferences and registered for holding on the territory of Ukraine in UKRISTEI (Certificate № 120 dated January 6th, 2025).



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UDC 082:001

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ISBN 979-8-88955-779-1

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SECTION 17.

PEDAGOGY AND EDUCATION

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PEDAGOGICAL FOUNDATIONS FOR THE FORMATION OF PROFESSIONAL MATHEMATICAL COMPETENCE OF FUTURE SPECIALISTS

Higher professional education aims to prepare future specialists for solving professional tasks arising in a specific field of activity. Professional competence of a specialist presupposes a high level of analysis of production processes and documentation, the creation of professionally significant information concerning the state of activity objects, forecasting the emergence and development of unforeseen situations, adherence to technological requirements, and timely elimination of deviations in economic processes. Professional competence is revealed through knowledge in various fields, such as economics, mathematics, psychology, and others. For example, when solving an economic problem, an economist requires constructive skills in organizing knowledge, which necessitates the formation of informational, mathematical, and prognostic competencies.

The use of mathematical modeling, quantitative research methods, and computational tools is a crucial component of a modern specialist's professional activity. This necessitates a reconsideration of the role of the mathematical component in student training systems and the development of corresponding approaches and technologies. Thus, our research problem is formulated as follows: "How can the teaching and learning process in mathematics be designed and organized to enhance both mathematical and professional training for students of various specializations?" Addressing this issue requires aligning the content of mathematical education with new societal needs and requirements, specifically focusing on the formation of professional competence in future specialists.

Even so, school mathematics often adopts approaches that emphasize the memorization of facts and mechanical repetition of procedures. However, as Pólya (1957) warns, teachers who prioritize routine exercises and training tasks risk

destroying students' interest and limiting their intellectual development [2].

To clarify the essence and content of "competence," various authors define professional competence as the unity of theoretical and practical readiness for professional activity. Analyzing the literature allowed us to conclude that mathematical competence is an integrative property of an individual, ensuring the ability to independently and responsibly apply mathematical tools to solve professional tasks. A meaningful examination of "mathematical competence" requires defining its structural components. The components of mathematical competence are distinguished:

– **Professional-activity component:** subject competence (a coherent system of integrated economic-mathematical knowledge and the readiness to apply it in professional activities; the ability to solve typical professional problems using math).

– **Informational competence:** the ability to find mathematical and mathematical information, systematize and generalize it, and work with mathematical information.

– **Communicative component:** communicative competence (proficiency in special economic-mathematical terminology, the ability to convey mathematical information, and the use of verbal and non-verbal means for its communication)

– **Personal component:** reflexive competence (aspiration for excellence in professional activity through mathematics); creative competence (the ability to use innovative mathematical methods in professional activities).

Scholars emphasize that professional competence consists of at least three spheres: motivational, operational-technical, and self-awareness. Besides knowledge and skills, motivation and values are essential components of competence. A lack of motivation turns professional activity into a chaotic accumulation of separate actions without a clear and conscious goal. The absence of self-awareness results in unregulated actions rather than a sequence of purposeful, conscious activities.

The formation of mathematical competence progresses through several stages, characterized by increasing generalization of knowledge and skills, their productive and creative application. Some researchers [1] distinguish the following components:

– **System-forming component of mathematical abilities:** mathematical orientation of the mind as a personal characteristic manifested in structural and mathematical thinking.

– **Coding-formalized component:** the ability to formalize theoretical and practical material by establishing its mathematical structure and creating and

analyzing sign-symbolic interpretations of problem situations.

– **Cognitive-generalizing component:** the ability to semantically generalize mathematical material at multiple levels, find alternative solutions, and recognize typical formal structures (algorithms).

– **Mnemonic generalization component:** the ability to memorize mathematical material at different levels of theoretical generalization, recall formulas, reasoning schemes (algorithms), and the structure of methods for solving problems.

After analyzing various studies, we identify five stages in forming professional competence:

1. **Motivational stage:** fostering students' desire to engage with the material.
2. **Awareness stage:** defining a framework for oriented actions.
3. **Training stage:** performing exercises with increasing complexity.
4. **Rehearsal stage:** discussing and explaining thoughts and actions.
5. **Control stage:** assessing the level of competency formation.

Since competence is the ultimate learning outcome, it is necessary to define criteria for evaluating its formation. Based on the research objectives, we propose the following criteria:

– **Cognitive criterion:** knowledge of fundamental mathematical laws and the ability to use mathematical theories to solve professional problems.

– **Operational criterion:** possession of practical skills in applying mathematical methods to analyze management decisions and optimize professional activities.

– **Behavioral criterion:** motivation and aspiration for professional self-development and self-improvement in mathematical training.

Achieving a high level of mathematical competence among specialists in economics is possible through implementing several pedagogical conditions in the learning process. These conditions, defined as a set of pedagogical and didactic factors influencing the educational process, ensure its rational management through effective forms, methods, and techniques. The necessary and sufficient pedagogical conditions for forming professional competence include:

- Modernizing the structure of mathematics lessons.
- Ensuring the practical orientation of mathematical content.
- Using professionally-oriented problems.
- Integrating mathematical knowledge with professional disciplines.
- Incorporating developmental teaching methodologies.
- Engaging students in formulating mathematical problem-solving tasks and research projects.

– Implementing pedagogical monitoring and self-monitoring to obtain objective feedback and adjust the process.

In conclusion, mathematical competence is a crucial structural component of professional competence for future economists. Without it, the formation of a competent specialist capable of competing in the labor market is impossible.

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SCIENTIFIC PUBLICATION



WITH THE PROCEEDINGS OF THE IX INTERNATIONAL
SCIENTIFIC AND THEORETICAL CONFERENCE

**«THEORY AND PRACTICE
OF MODERN SCIENCE»**

March 28, 2025 | Kraków, Republic of Poland

in English and Ukrainian

*All papers have been reviewed. Organizing committee may not agree with
the authors' point of view. Authors are responsible for the correctness of the papers' text.*

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URL: www.scientia.report

Signed for publication 28.03.2025. Format 70×100/16.
Offset Paper 80gsm. Times New Roman and Open Sans typefaces.
Digital color printing. Conventionally printed sheets 15,6.
Circulation: 50 copies. Printed from the finished original layout.

Publisher [PDF]: Primedia E-launch LLC
TX 75001, United States, Texas, Dallas. E-mail: info@primediaelaunch.com

Publisher [printed copies]: LLC UKRLOGOS Group
21005, Ukraine, Vinnytsia, Zodchykh str. 18, office 81. E-mail: info@ukrlogos.in.ua
Certificate of the subject of the publishing business: ДК № 7860 of 22.06.2023.