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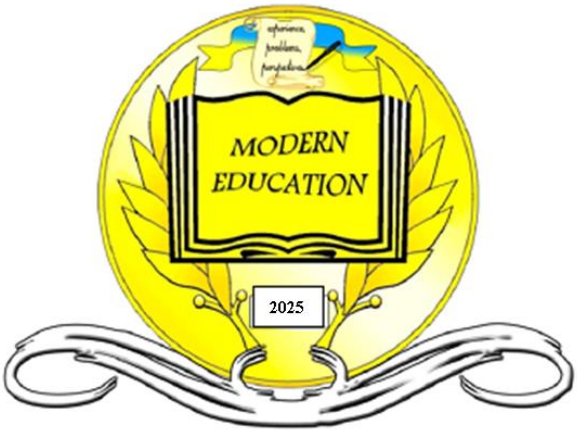


**XVII INTERNATIONAL SCIENTIFIC CONFERENCE**

# MODERN EDUCATION - AVAILABILITY, QUALITY, RECOGNITION

## Collection of Scientific Papers

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Kramatorsk-Vinnytsia-Ternopil, Ukraine, 2025

UDC 378.1
C 56

Publisher:
Donbas State Engineering Academy (DSEA), Kramatorsk (Ukraine)

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(Protocol No. 3 dated October 30, 2025)

C 56 Modern Education – Accessibility, Quality, Recognition: Collection of Scientific Papers of the XVII International Sciencific Conference, November 12–13, 2025., Kramatorsk-Vinnytsia-Ternopil / [edited by Dr. Sc. Techn., Prof. S. V. Kovalevskyy & Hon. D.Sc., Prof. Dasic Predrag]. – Kramatorsk (Ukraine): DSEA, 2025. – 309 p.

ISBN 978-617-7893-14-0

The collection contains materials addressing the current issues in contemporary education in Ukraine and European countries: training specialists for competitive enterprises, innovative technologies in modern education, and challenges in the upbringing process within higher education institutions. It is intended for practical use by professionals and learners at all levels of higher education.

UDC 378.1
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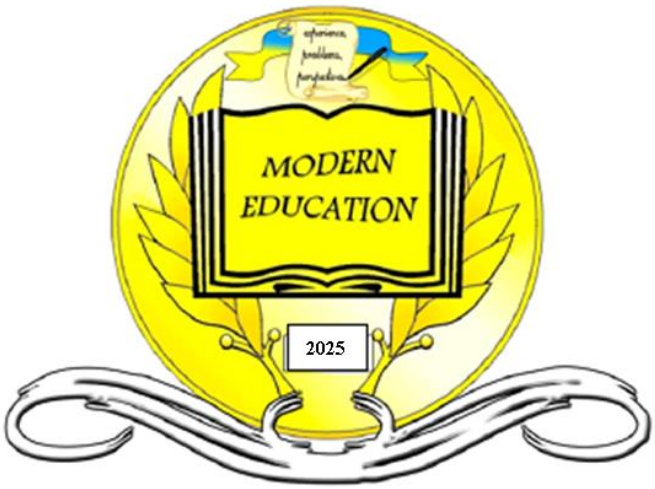


**XVII МІЖНАРОДНА НАУКОВА КОНФЕРЕНЦІЯ**

# СУЧАСНА ОСВІТА – ДОСТУПНІСТЬ, ЯКІСТЬ, ВИЗНАННЯ

## Збірник наукових праць

**XVII Міжнародної наукової конференції**

з використанням Інтернет-платформ

12-13 листопада 2025 року

За загальною редакцією
д-ра техн. наук, проф. С. В. Ковалевського and
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Затверджено
на засіданні вченої ради ДДМА
(протокол № 3 від 30.10.2025)

С 56 Сучасна освіта – доступність, якість, визнання: збірник наукових праць XVII міжнародної наукової конференції, 12–13 листопада 2025 року, мм. Краматорськ-Вінниця-Тернопіль / [за заг. ред. д-ра техн. наук., проф. С. В. Ковалевського і Hon. D.Sc., prof. Predrag Dasic]. – Краматорськ : ДДМА, 2025. – 309 с.

ISBN 978-617-7893-14-0

У збірнику опубліковано матеріали щодо вирішення актуальних проблем сучасної освіти України та європейських країн: підготовка фахівців для конкурентоспроможних підприємств, перспективні технології сучасної освіти, проблеми виховання у ВНЗ.

Призначений для використання в практичній діяльності фахівців і здобувачів ВНЗ.

**УДК 378.1**

ISBN 978-617-7893-14-0

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## ЗМІСТ

## 8. Conclusions

### 8.1 Establishing a European Standard

AI TEACH establishes a comprehensive, evidence-informed model for ethical and effective AI use in education that has potential to serve as a European standard. Through its integrated approach to technological, pedagogical, and ethical dimensions, the project provides a template for systematic teacher preparation addressing one of the most significant educational transformations of our era.

### 8.2 Enhancing Educational Resilience

By building teachers' capacity to navigate technological change thoughtfully and ethically, AI TEACH enhances the resilience of European education systems. Teachers equipped with AI literacy are better positioned to adapt to future innovations, respond to emerging challenges, and maintain educational quality amidst rapid change.

### 8.3 Call for Continued Development

While AI TEACH represents significant progress, the work of developing pedagogical AI literacy remains ongoing. Continued research, policy development, resource creation, and community building are essential to ensuring that AI serves genuinely educational purposes aligned with humanistic values and social good.

The AI TEACH initiative demonstrates that systematic, collaborative, and ethically grounded approaches to educational technology integration are both possible and necessary. As AI continues to reshape educational landscapes, projects like AI TEACH provide crucial frameworks for ensuring that this transformation enhances rather than undermines the quality, equity, and humanity of education.

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UDC 373.51

**Dymertsov D.O.** *(Simon Kuznets Kharkiv National University of Economics, Kharkiv, Ukraine).*

# DIGITAL TRANSFORMATION OF EDUCATION: THE POTENTIAL OF THE STEAM LABORATORY.

***Abstract.*** *In today's digital world, education is undergoing a profound transformation. With the advancement of artificial intelligence, automation, and global digitalization, the requirements for professionals are changing, which in turn affects the entire system of training future specialists. STEAM education (Science, Technology, Engineering, Art, Mathematics) has become a key tool for developing the*

*competencies of the future — critical thinking, creativity, interdisciplinary approaches, communication, teamwork, and digital literacy. These skills define the competitiveness of young people in a rapidly changing world. At the same time, an essential principle of modern education is academic freedom, which allows educators, researchers, and learners to freely explore, experiment with teaching methods, implement innovative technologies, and adapt programs to the needs of specific audiences. Such freedom creates a space for creativity, collaboration, and the exchange of ideas between teachers and students. At the intersection of academic freedom, innovative approaches, and interdisciplinarity, a new type of educational environment is emerging — one that focuses on developing creative, independent, and responsible individuals.*

***Keywords:*** *STEAM education, inclusion, VR, space.*

***Анотація.*** *У сучасному цифровому світі освіта переживає етап глибокої трансформації. В умовах розвитку штучного інтелекту, автоматизації та глобальної цифровізації змінюються вимоги до фахівців, а отже — і до самої системи підготовки майбутніх кадрів. STEAM-освіта (Science, Technology, Engineering, Art, Mathematics) стає ключовим інструментом формування компетентностей майбутнього — критичного мислення, креативності, міждисциплінарного підходу, комунікації, командної роботи та цифрової грамотності. Саме ці якості визначають конкурентоспроможність молодої людини у світі, що швидко змінюється. Водночас важливою засадою сучасної освіти виступає академічна свобода, яка дозволяє педагогам, науковцям і здобувачам освіти вільно досліджувати, експериментувати з методами навчання, впроваджувати інноваційні технології та адаптувати програми під потреби конкретної аудиторії. Така свобода створює простір для творчості, співпраці та обміну ідеями між викладачами й учнями. На перетині академічної свободи, інноваційних підходів і міждисциплінарності формується новий тип освітнього середовища, орієнтований на розвиток творчої, самостійної та відповідальної особистості.*

***Ключові слова:*** *STEAM-освіта, інклюзія, VR, простір.*

**Introduction.** Modern education is undergoing a profound transformation driven by the development of digital technologies, the need to form new competencies, and the necessity to prepare specialists capable of creative thinking and solving complex problems. Traditional learning models, which are primarily focused on knowledge transmission, no longer ensure sufficient student engagement and fail to develop the ability to apply knowledge in real-world contexts. Therefore, there arises a need to search for effective educational environments and methodologies that combine a scientific approach, practical activity, and digital technologies.

In this context, STEAM education represents one of the most promising directions for modernizing the learning process. It is based on an interdisciplinary approach that integrates science, technology, engineering, art, and mathematics, fostering the development of critical and creative thinking. The STEAM Laboratory of Simon Kuznets Kharkiv National University of Economics serves as a vivid example of the practical implementation of these principles. It is an innovative educational space that harmoniously combines scientific inquiry, creativity, and modern digital technologies. Here, the core idea of STEAM education is realized — the transition from the teacher's role as a source of knowledge to the role of a learning facilitator, where the student or pupil and their active cognitive engagement are at the center of the educational process.

**Problem Statement.** An analysis of recent studies on STEAM laboratories demonstrates their effectiveness in developing students' key competencies, such as critical thinking, creativity, interdisciplinary approaches, and digital literacy. In particular, research conducted in Ukraine between 2022 and 2024 confirms the positive impact of STEAM education on the development of information and digital competence among secondary school teachers. The use of a STEAM-oriented educational environment promotes the formation of such competencies as information literacy, data handling, communication and collaboration, as well as problem-solving skills [1,2].

In 2024, it was revealed that digital laboratories became more widespread, allowing students to conduct experiments and explore scientific phenomena in a virtual environment. This trend is significant as it overcomes the limitations of physical laboratory spaces and resources, addresses accessibility challenges, and makes practical learning more scalable [3,4].

International studies also confirm the effectiveness of STEAM laboratories. In particular, a survey of university laboratory instructors in Germany, Finland, and Croatia showed that the use of digital technologies in physical laboratory courses positively influences students' motivation, enhances their competencies, and aligns educational practices with modern requirements [5].

**Results of the STEAM Laboratory.** At the STEAM Laboratory of Simon Kuznets Kharkiv National University of Economics (KhNEU), faculty members have developed a series of motivational lessons in physics, chemistry, and various life-related fields, including:

- The Science of pH: Acidity and Alkalinity in Our Lives.
- Virtual Space: Exploring the Universe through VR.
- Ecology of the Future: Practical Skills in Waste Sorting.
- Measurements in the World of Science: From the SI System to Modern Instruments.
- Ice Science.
- The World of Electricity.
- Microscopes and Lasers.
- Magnet Energy: How Electric Motors Work in TESLA.
- Technological Discoveries: VR Technologies and Robotics.
- Basics of Radioactivity: Operation of Nuclear Power Plants and Protection Methods. VR Reactor Tour.
- Quadcopters in Modern Education.

Each lesson consists of two parts: a theoretical component, where students learn the scientific foundations of the topic, and a practical component, where they conduct experiments, hands-on activities, or creative tasks. This approach allows students to understand the application of theoretical knowledge in real-life situations, while developing confidence, analytical skills, teamwork, and responsibility for collective results.

The results indicate that the STEAM Laboratory at KhNEU is an effective educational environment that combines an interdisciplinary approach, digital technologies, and practical activities, contributing to the development of key competencies for future specialists.

Research conducted at the KhNEU STEAM Laboratory focused on studying the effectiveness of implementing an interdisciplinary approach in the educational process and its impact on developing key competencies among students. The main areas of research included:

- dynamics of learning motivation;
- level of engagement in experimental and practical activities;
- development of critical thinking, analytical skills, modeling, and creative problem-solving.

The results show that a learning process built on STEAM principles significantly increases student activity and interest. Unlike traditional reproductive methods, laboratory lessons are oriented toward practical application of knowledge: students carry out research tasks, conduct experiments, create models of technical objects, analyze natural phenomena, and test their own hypotheses. This approach promotes deeper material comprehension, analytical thinking, and the formation of a research culture.

Lessons combining experimental activities with digital technologies proved particularly effective, including VR/AR, 3D modeling, virtual simulations, and the use of quadcopters. These tools allow visualization of complex processes, immerse students in research, and enable them to observe the consequences of their decisions in real time, enhancing cognitive motivation and interest in STEM disciplines.

**Conclusions**. Based on the conducted research and obtained results, the following conclusions can be drawn:

1. The STEAM approach opens new horizons for pedagogical creativity. For teachers, it creates conditions for flexible integration of various disciplines, implementation of problem-based and project-based learning, and the use of augmented and virtual reality technologies. This contributes to increased students' cognitive motivation, as well as the development of their activity and independence in the learning process.

2. Practical experience of implementing STEAM education at Simon Kuznets Kharkiv National University of Economics (KhNEU) has shown that this form of work ensures deeper student engagement in the learning process. After lessons in STEAM classrooms, students actively discuss acquired knowledge, exchange ideas, and are eager to repeat experiments independently. This indicates that learning goes beyond the traditional educational space and fosters intrinsic motivation for knowledge acquisition.

3. Inclusion is an integral component of modern STEAM education. It ensures equal access to knowledge for all participants in the educational process, regardless of social status, physical abilities, or developmental characteristics. Within the STEAM approach, inclusion is realized through the creation of an accessible, comfortable, and personalized learning environment in which every student can realize their potential.

4. The results of our research confirm the effectiveness of the STEAM laboratory as an educational environment that promotes the development of critical, creative, and research-oriented thinking. It cultivates not only knowledge but also practical skills, initiative, the ability to make independent decisions, and social responsibility.

5. The combination of the STEAM approach, academic freedom, and inclusion in the digital age, implemented by the KhNEU STEAM Laboratory team, forms a new educational paradigm — open, innovative, and human-centered. Such education not only imparts knowledge but also nurtures a generation capable of thinking creatively, acting responsibly, and creating new technological and cultural values for the future.

6. During the implementation of the STEAM approach, a positive trend is observed in the development of teamwork, communication skills, and student independence. According to survey results, 78% of participants noted that laboratory lessons motivate them to pursue further research in the scientific field, while 65% expressed a desire to participate in scientific project competitions.

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