Preface

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Abstract

This document is the preface and overview of the 4th Yurii Ramskyi STE(A)M Workshop co-located with the XVII International Conference on Mathematics, Science and Technology Education (May 14, 2025, Ternopil, Ukraine), brought together educators and researchers to share ideas, discuss research, present results, and identify trends in STEM education. The workshop explored various innovative approaches to STEM and STEAM education across different educational contexts, including student perceptions of STEM disciplines, multilingual coding education, automated assessment methods using NLP, biological data visualization, 3D printing for adults, integration of humanities into STEAM, ethical hacking platforms, game design for programming education, AI applications for language learning, universal design principles, and STEM approaches for educational continuity during crisis situations.

Keywords

STEM, STEM education, STEAM, educational technology, computational thinking, programming education, educational innovation

1. Introduction

Yurii Ramskyi STEM@ICon-MaSTEd is a peer-reviewed international Computer Science and educational workshop focusing on researching a wide range of ideas, concepts, practices, and techniques that are geared towards ensuring that society and humans will be ready for life in the future digital world. These practices are based on key principles such as applying character to real-world problems, learning through problem-solving and critical thinking, and integrating different content. The goal of STEM@ICon-MaSTEd is to bring together educators and researchers from schools, universities, colleges, cultural institutions, businesses, industries, and other private and public agencies around the world to share their ideas, discuss current research works, present practical results, and identify new trends in this important emerging area. The 4th Yurii Ramskyi STEM@ICon-MaSTEd workshop is a great place to check out new education products and platforms, see some curriculums in action, communicate with other STEM professionals, and reevaluate your own teaching strategies.

4th Yurii Ramskyi STEM@ICon-MaSTEd topics of interest are included:

- Innovative pedagogical approaches in STEM education: project-based learning, inquiry-based learning strategies, and interdisciplinary approaches
- Technology integration in STEM education: Artificial intelligence applications, virtual and augmented reality, robotics and coding in K-12 STEM curricula

STEM@ICon-MaSTEd 2025: 4th Yurii Ramskyi STE(A)M Workshop co-located with XVII International Conference on Mathematics, Science and Technology Education, May 14, 2025, Ternopil, Ukraine
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- Online and blended learning in STEM education: design principles, assessment strategies, collaborative learning tools for remote STEM education
- Mathematical and computational modeling in STEM: integration of computational thinking across STEM disciplines, data science and big data analytics, machine learning applications in STEM research and education
- 2D and 3D modeling in STEM education: CAD/CAM technologies, 3D printing applications, visualization techniques for complex STEM concepts
- Artificial Intelligence in STEM education: AI-powered adaptive learning systems, natural language processing, and ethical considerations of AI in STEM education
- Gamification and game-based learning in STEM: design principles, assessment strategies, integration of commercial games in STEM curricula
- Augmented and virtual reality in STEM Education
- Cybersecurity education in STEM: cybersecurity awareness and skills development in K-12 STEM, integration of cybersecurity concepts across STEM disciplines, ethical hacking and penetration testing in STEM education
- Technology-enhanced mathematics instruction
- STEM and physics education: innovative approaches to teaching quantum concepts
- STEM and biology education: bioinformatics and computational biology in STEM education
- STEM and computer science education
- STEM and technology education: emerging technologies and their impact on STEM education, design thinking and engineering design processes in STEM, makerspaces and fab labs
- STEM and art integration (STEAM)

2. STEM 2025 committees

2.1. Program committee chair

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2.2. Program committee

- *Cynthia Bailey Lee*, Stanford University, USA
- *Ashok Basawapatna*, SUNY Old Westbury, USA
- *Sing Chun Lee*, Bucknell University, USA
- *Michael J. Oudshoorn*, High Point University, USA
- *Christopher Kumar Anand*, McMaster University and STaBL Foundation, Canada
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- *David Miller*, University of Oklahoma School, USA
- *Stamatis Papadakis*, University of Crete, Greece
- *Martin K. Yeh*, Penn State Brandywine, USA

2.3. Additional reviewers

- *Kimberley Gomez*, Urban Schooling, UCLA, USA
- *Corinna Hörmann*, Johannes Kepler University Linz, Austria

2.4. Organizing committee

- *Vasyl Oleksiuk*, Ternopil Volodymyr Hnatiuk National Pedagogical University, Ukraine
- *Serhiy Semerikov*, Kryvyi Rih State Pedagogical University, Ukraine
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3. Workshop overview

The workshop focused on various innovative approaches to STEM and STEAM education across different educational contexts. Article [1] examined how students initially perceive STEM disciplines in school settings, providing insight into student attitudes and preconceptions. The article [2] explored the potential for teaching coding in multiple human languages, addressing accessibility and inclusivity in programming education. Article [3] presented a method using Natural Language Processing to automatically evaluate how well test tasks align with the semantic structure of STEM educational materials.

In [4] discussed using compilation data to improve the preparation and assignment of coding mentors for K-12 students. In [5] explored the role of graph structures in visualizing and analyzing biological data for STEM education. The [6] shared experiences in developing a 3D printing workshop program specifically designed to develop STEAM skills in adults.

Balyk et al. [7] proposed "STEAM+H" as a model that integrates humanities and sustainable development into the STEAM educational framework. Pinchuk et al. [8] focused on developing ethical hacking skills through the PentestHUB Platform. In [9] presented approaches to teaching programming to future IT specialists through comprehensive computer game design.

Piatykop et al. [10] investigated how artificial intelligence language models could be used to develop virtual language learning assistants. Khalupa et al. [11] examined universal learning design as a factor in developing students' competence potential in STEM education during computer science lessons. Finally, Lukychova et al. [12] addressed how elements of STEM education could compensate for educational losses experienced during distance learning under martial law conditions.

4. Conclusion

This workshop explored contemporary approaches to STEM and STEAM education across various contexts. The presentations examined student perceptions of STEM disciplines, multilingual coding education, automated assessment methods using NLP, and data-driven mentorship strategies. The workshop addressed innovative teaching methods, including biological data visualization, 3D printing for adults, integration of humanities into STEAM, and ethical hacking platforms. Discussions covered programming education through game design, AI applications for language learning, universal design principles in computer science, and STEM approaches for educational continuity during crisis situations. Overall, the workshop brought together diverse perspectives on making STEM education more inclusive, effective, and adaptable to modern educational challenges.

Many thanks for the opportunity to submit the workshop proceedings to CEUR Workshop Proceedings (CEUR-WS.org), the world's best Diamond Open-Access proceedings publisher for Computer Science workshops.

Declaration on Generative AI

The authors have not employed any Generative AI tools.

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