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EDITORIAL

Editorial

Dear Readers,

We are excited to present the December issue of Science Education International, a collection of 13 innovative and insightful articles that explore the diverse landscape of science education worldwide. This issue features contributions from educators in Estonia, Ukraine, Bangladesh, Türkiye, Portugal, Ghana, South Africa, the Philippines, Indonesia, Germany, and Georgia, offering a truly global perspective on the challenges and opportunities in science teaching and learning.

The first article, written by 4 different countries' science educator, is a thought-provoking study exploring the intersection of culture and science education in addressing "'wicked problems" such as pandemics, war, and natural disasters. By examining teacher perceptions in countries grappling with diverse challenges – the war in Ukraine, the earthquake in Turkey, refugee influx in Estonia, and recurring floods in Bangladesh – the research delves into how science education can be more effectively integrated with cultural considerations. This cross-cultural analysis provides valuable insights into how teachers perceive the roles of both culture and science in navigating complex societal issues.

The second article in this issue focuses on a critical and timely topic: Eco-anxiety in early childhood. This study investigates the eco-anxieties of young children (ages 4-8) regarding drought, forest fires, and endangered species. Utilizing qualitative research methods, the study reveals a high prevalence of eco-anxiety among these children, highlighting the profound impact of environmental issues on their emotional well-being. The findings underscore the need for a more nuanced understanding of children's perspectives on environmental problems and the importance of incorporating their emotional experiences into environmental education and public discourse.

The third article in this issue investigates the effectiveness of an Erasmus+ project that engaged pre-service elementary teachers in a socio-scientific scenario focused on green cities. Through a panel discussion activity, participants explored different stakeholder perspectives on transforming a city into a greener space. The study found that this approach effectively promoted a holistic understanding of environmental issues and enhanced pre-service teachers' capacity for "justified decision-making." These findings highlight the potential of such projects to cultivate critical thinking, responsible citizenship, and innovative teaching practices in future educators.

The fourth article investigates the effectiveness of educational strategies in combating "plant blindness" and fostering a deeper understanding of biodiversity among pre-service teachers in Portugal. The study examines the impact of field trips and research activities focused on plant biodiversity on student teachers' interest, knowledge, and conceptual understanding. While the findings demonstrate a significant improvement in reducing plant blindness and enhancing biodiversity understanding, the study also highlights the challenges of changing deeply ingrained attitudes and perceptions toward plants.

The fifth article focuses on identifying common difficulties and areas for improvement in organic synthesis among undergraduate chemistry students in Ghana. By analyzing student responses to mid-semester examinations, the study reveals significant challenges in areas such as reaction mechanisms, drawing resonance structures, and proposing synthesis of target molecules. The findings underscore the need for focused interventions and teaching strategies to enhance students' understanding of fundamental concepts and improve their problem-solving skills in organic synthesis.

The sixth article explores how physics teachers perceive the utilization of Concept Cartoons as a formative evaluation tool in the teaching of Newton's Laws. This study, conducted with teachers in the Nelson Mandela Bay district of Gqeberha, South Africa, found that while teachers were not initially using formal assessment techniques effectively, the intervention, which focused on the use of Concept Cartoons, significantly improved their understanding of how to use this tool to assess student understanding of Newton's Laws. The study highlights the potential of Concept Cartoons as a valuable formative assessment tool for enhancing student learning in science.

The seventh article investigates the current state of Science, Technology, Engineering and Mathematics (STEM) education implementation across ASEAN countries. By analyzing existing literature, this study provides a comprehensive overview of STEM education practices, their implementation status, and their impact on learners. The findings highlight the need for a shared understanding of STEM implementation within the ASEAN community to guide educators and policymakers in developing more effective and consistent STEM education programs.

The eighth article investigates how Filipino STEM learners perceive and navigate the learning process of science concepts in the wake of the pandemic. This qualitative study explores the strategies and approaches employed by both learners and teachers to develop conceptual understanding. The findings reveal a range of learning strategies, including extended reading, seeking help from others, self-directed learning, and experiential learning. The study highlights the importance of diverse and personalized learning approaches that cater to the individual needs and learning styles of STEM learners.

The ninth article analyzes science questions from the Basic Education Certificate Examination (BECE) in Ghana, examining their alignment with Bloom's taxonomy. The study found that the majority of questions assessed lower-order thinking skills, such as remembering and understanding, with limited emphasis on higher-order thinking skills such as analysis, evaluation, and creation. The findings highlight the need to incorporate more higher-order thinking skills in the BECE to better assess students' scientific literacy and encourage deeper learning in science education.

The tenth article presents the development and validation of an Instructional Activity Framework that Integrates Design-based Learning and Computational Thinking (CT) within a physics experiment design course. This innovative framework aims to enhance student engagement, foster computational perspective, and develop CT skills. The study involved a systematic literature review, content validity assessment, and statistical analysis with a group of 23 students. The findings demonstrate the effectiveness of the framework in significantly influencing student engagement, CT processes, and perspectives. This research provides valuable insights for educators seeking to integrate CT and design-based learning to enhance student learning experiences in science education.

The eleventh article investigates the effectiveness of Structure of the Observed Learning Outcome (SOLO)-based formative assessments in improving student comprehension of seismic events. Employing a mixed-methods approach, the study demonstrates a significant positive impact of SOLO-based assessments on student learning and highlights their high acceptance among students. The findings provide valuable insights for educators on the pedagogical benefits of SOLO-based assessments and offer actionable suggestions for their effective implementation in science education.

The twelfth article explores the opinions and attitudes of prospective primary school teachers regarding the use of digital media in out-of-school learning places. While recognizing the potential benefits of this combination, the study reveals that prospective teachers have concerns and reservations about its practical implementation, citing challenges such as technical issues and their own perceived lack of skills. This research provides valuable insights into the perspectives and concerns of future educators regarding the integration of digital media in out-of-school learning environments.

The thirteenth article is related to the critical role of technological, pedagogical, and content knowledge (TPACK) in effective science teaching. The study employs a quantitative approach, utilizing the TPACK questionnaire and data from the Association of Physics Teachers of Georgia, to investigate the TPACK levels of physics teachers. Through confirmatory factor analysis, the study identifies four distinct factors, offering valuable insights into the nuanced relationship between technology, pedagogy, and content knowledge in physics education. The findings provide a crucial foundation for improving teacher education programs and supporting the effective integration of technology in physics classrooms.

As the world becomes increasingly interconnected, it is more important than ever to cultivate a globally minded citizenry. Science education plays a crucial role in this endeavor by equipping students with the knowledge and skills they need to address complex global challenges. We believe that the articles in this issue offer valuable insights for educators, policymakers, and researchers seeking to improve science education worldwide.

We would like to express our sincere gratitude to the authors for their contributions and to the reviewers for their careful evaluations. We hope that this issue will stimulate further research and discussion on the critical issues facing science education today.

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