

Editorial:

Contemporary Science Education Initiatives Undertaken in the Asia Pacific Region

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INTRODUCTION

The theme issue on ‘contemporary science education initiatives undertaken in Asia Pacific region’ presents the compilation of efforts across primary to tertiary levels performed by science education researchers and practitioners across Asia Pacific countries, including Indonesia, India, Japan, Malaysia, Philippines and Thailand. Large-scale studies such as PISA and TIMSS identified students lacking interest and negative attitudes towards science education (OECD, 2009). The organization further documented that one of the primary reasons for the problematic situation is due to the teaching and learning of science content that is irrelevant and uninteresting (Giamellaro, 2014). The didactic teaching prevalently embraced in science education often results in the development of “inert knowledge”, a knowledge which is decontextualized from the real world (Holbrook et al., 2022). Decontextualizing science education not only contributes to declining intrinsic motivation and attitude but is also problematic for understanding the current real-world problems, which are complex and interdisciplinary. Contextualization of science education is necessary for educating students to appreciate the importance of scientific knowledge to deal with challenges from the advent of digitalization and technological advancement, climate change, pandemic and many more. The theme issues on science education present the compilation of articles describing contextualization occurring in various forms in the Asia Pacific region.

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OVERVIEW OF THE 15 ARTICLES

Studies from Indonesia gave a glimpse of the future of the science teaching and learning process as they embed different forms of technology in the different aspects of the teaching and learning process. Yamtinah and colleagues, for example, have developed and implemented a Computerized Testlet instrument to assess students' conceptual understanding of stoichiometry. The instrument's psychometric properties, including its validity and reliability, were analyzed through Rasch analysis. Similarly, Widhiyanti and colleagues explored the use of a predict-observe-explain mental model diagnostic test to reveal students' conceptions of troublesome knowledge and the threshold concept of chemical equilibrium. Meanwhile, Sakukardi and colleagues attempted to generate students' creative ideas about climate change in read-answer-discuss-explore-create online classes. Mudzakir and his team designed a teaching-learning sequence to construct a study on fire retardant bamboo. Finally, Shidiq Ari and colleagues introduced contemporary hybrid laboratory pedagogy that blended STEM and project-based learning to develop system thinking skills of students.

Kumari and Kataria from India proposed an intervention module for slow learners of environmental science. The module, implemented with two groups of students-remedial and inclusive classes, resulted in a positive outcome. The authors suggested that the module introduced through this study is crucial for India and perhaps other countries experiencing environmental problems like India.

From the Japanese perspective, Isozaki employed a historical approach to answer the question, 'what led Japanese students often obtain higher scores on international science assessment test than students from Western countries and what can be expected in the future?' The findings reveal that Japan will continue to develop *rika* that encompasses both homogeneous and heterogeneous Western science education, considering the global trends in science education. The author said that the policy of "Science for all" would be maintained in the near future, and "Science for excellence" programs can be extended to supply future scientists and engineers.

Malaysian studies provide various perspectives to contextualise science education to cater to the country's needs. Mustafa et al., for instance, explored the views of the science teachers who have participated in the regional courses conducted at SEAMEO RECSAM. The findings revealed five most important challenges encountered by the participant of the courses. The challenges include (1) English proficiency, (2) socio-cultural preferences in social activities, (3) digital technology access and skills, (4) time and schedule constraints, and (5) institutional challenges. In terms of recommendations, participants shared their thoughts on facilitating and managing course administration. The findings provide insights to contextualise the regional course to cater for Southeast Asia (SEA) countries that are culturally and ethnically diverse to better support the education system in the SEA. In another study, Nageswana Row and Sathasivam recommended using heuristic curriculum material called Skilful Thinking Educative Pedagogical Support (STEPS) to develop students' habit of questioning and posing problems (HQP). Specifically, Nageswana Row

and Sathasivam explored how three Year 4 science teachers up-took educative features in STEPS to develop students' habit of questioning and posing problems (HQP). The findings revealed that STEPS encouraged students' HQP skills development. STEPS introduced by the authors is exemplary for contextualising the teaching and learning of Year 4 science.

In the study by Law et al., science laboratory learning environment and science learning motivation are significant predictors of student engagement in learning science. Precisely, student cohesiveness, open-endedness, integration and material environment in the science laboratory learning environment and all the dimensions of motivation predict student engagement in science learning. The findings suggest that Malaysian educators, especially science teachers, should utilise the laboratory effectively and keep students motivated to ensure their active engagement in science learning. The important role of educational leadership in contextualising science instruction appeared in the systematic review using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines performed by Adams et al. postulated seven primary themes: facilitating high-quality learning experiences; monitoring the curricular program; creating a safe school environment; distributing leadership to advance science instruction; resources support; recruiting qualified science teachers; and quality teacher professional development programmes that informs reforming science instruction in Malaysian schools.

Studies from the Philippines included college teachers' and students' teaching and learning experiences, respectively, and the development and implementation of an intervention. Fulminar has explored the differences in the challenges experienced by college physics teachers in teaching students with and without STEM backgrounds in high school. He deduced four key challenges: lack of knowledge and poor conceptual understanding, teaching problem solving, conducting laboratory, and negative perceptions towards physics. Such findings are an eye-opener to key areas that require urgent attention in the Philippine context and elsewhere. Meanwhile, Amamio and colleagues presented a study that explored students' experiences of virtual laboratory classes and assessed students' perceived usability, sense of reality, and quality of service of the virtual laboratory. Although virtual laboratories may not be completely new in distance education, studies related thereto in the context of 'regular' university science teaching are imperative. Important elements of a virtual laboratory class are deemed relevant to education resiliency, such as during the COVID-19 pandemic. Finally, Yu and Sumayao presented a conceptualization of contextualized instructional material, a comic book, to improve students' conceptions of cell division. Studies on the development of instructional materials remain relevant in science teaching and learning, considering the enormous changes brought by technology and societal pressures in the teaching and learning process.

The authors from Thailand, Sohsomboon and Yuenyong, examined Thai STEM teachers' initial perception of STEM education using an interpretative paradigm. The qualitative interview findings revealed that many STEM teachers had never implemented STEM education in their teaching, and teachers tend to separate STEM teaching into each discipline rather than link the disciplines for problem-solving. Teachers indicated pedagogical knowledge and assessment as the most significant competency for STEM

education. Teachers also said that good organization and support from schools on resources, policy, and professional development are necessary for successful STEM implementation. The findings indicate the necessity to provide context-specific professional development courses to train Thai STEM teachers on STEM education.

RECOMMENDATIONS

Today, monsoon rains and heavy thunderstorms resulted in flash floods in the different regions of Southeast Asia has resulted in increasing interruptions in schools and universities that are detrimental to the teaching and learning process. Ensuring continuity of the teaching and learning process amidst natural hazards is important to quality education. Contextualization education to meet the local challenges is integral to ensure students across all levels receive a quality education. The 15 articles included in the theme issue are informative for science educators and practitioners from the countries where the studies have been conducted, and for other readers, the articles provide useful information for them to integrate into their research and practices.

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