Editorial: *Asia-Pacific Science Education (APSE)*: Building a Community of Scholars

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1 Introduction

In this issue, I am happy to share articles written by over 30 colleagues from six different countries. These papers represent research that was conducted by scholars in Korea, Singapore, the United Kingdom, the United States, Hong Kong, the Philippines, Indonesia, and Australia. We are happy to see that *APSE* is becoming a home for more researchers from all across the Asia-Pacific region and for those conducting research with teachers and students representing the Asian diaspora in other parts of the world. As I review the content compiled for this issue, I am struck by the diversity of the work and the potential for these studies to effect positive change in science research and science teaching and learning. We are truly building a community of scholars committed to improving science and science education in the region and it is something worth celebrating – especially in these difficult times.

In this issue, there are 12 papers focusing on a range of topics, including inclusive science education and special education, classroom science for culturally and linguistically diverse students, the impact of the COVID-19 pandemic on science teaching and learning, the impact of instructional strategies for socio-scientific issues (SSIs), and content-specific teaching and learning. Also in this issue, I share some articles related to the June 2021 special issue on the development and implementation of STEAM curricula for students in or from the Asia-Pacific region. This set of two papers on STEAM highlights the work of five researchers from three countries (United States, Australia, and

Korea). In the section below, I briefly introduce each of the papers in the issue. This is followed by an invitation to submit papers for our upcoming special issue on the use of technology in science/STEM teaching and learning and an exciting announcement about the future of *APSE*.

2 Overview of This Issue

There has been a dearth of science education research studies examining special education and inclusion in classrooms in the Asia-Pacific. To help fill this gap, Tang Wee Teo (Singapore) and Ching Yee Pua (Singapore) share three case studies from Singapore elementary science lessons to examine the pedagogical practices that took place in classrooms using specific intervention strategies to address the needs of students with dyslexia. Using event-oriented inquiry, the researchers share nine pedagogical practices adapted by the science teachers in the context of inclusive education. The authors make connections to the discourse about inclusivity in science teaching by suggesting some ways to adapt these pedagogical practices to enhance the reflexivity of teachers in inclusive science teaching.

Wonyong Park (UK), Doy Kim (USA), and Da Yeon Kang (Korea) offer a cross-disciplinary analysis of publications in selected science education and mathematics education journals in South Korea from 2014–2018 to identify and discuss commonalities and divergences across the two fields. This study provides insights about the distribution of research topics across both fields and raises questions about the benefits of fostering parallel research agendas that focus on topics of self-reflection and the facilitation of interdisciplinary communication and collaboration. The authors offer innovative possibilities for opportunities to cross-fertilize research in both math and science education.

The next contribution is from Melanie Williams (AUS) and Kok-Sing Tang (AUS) who propose an introduction to the use of visual metalanguage in a fifth-grade science class in Hong Kong to support emergent bi/multilingual students to construct scientific explanations more effectively. Using a framework informed by social semiotics, the two researchers analyzed the meanings the students made and found an increased awareness of the visual metalanguage improved students' abilities to illustrate explanations of phenomena and to explain key concepts with more context than before. The researchers raise questions about the importance of teacher questioning strategies when supporting emergent bi/multilingual students to use visual metalanguage to learn science and offer implications for practical use in the classroom.

The next three papers focus on the impact of the COVID-19 pandemic on physics teaching practices and on pre-service teacher education. In the first paper, Nam-Hwa Kang (Korea) and Juri Seo (Korea) share insights from high school physics teaching cases in South Korea, where online science teaching emerged in response to the need for non-face-to-face classrooms. The researchers examined eight high school physics teachers' online teaching practices during the first semester of school lockdown to reveal that teachers' physics teaching practices were contingent on content explanations, participatory learning, and opportunities for independent first-hand experience. The researchers identified three essential practices of physics teaching maintained across teaching contexts. These practices reflect the nature of schooling and the subject matter. The researchers conclude with a discussion of implications for teacher professional development and the need for further research.

A second paper exploring educational responses to school disruption caused by COVID-19 comes from Jiyeon Yoon (USA), Yeonjoo Ko (Korea), and Hyunju Lee (Korea), who introduce an online pre-service teacher education program called Virtual and Open Integration of Culture for Education (VOICE). The VOICE program was designed to improve Korean pre-service teachers' cultural competencies and confidence in teaching diverse students by providing online education opportunities for teachers to become more culturally responsive and to reduce their cultural bias and preferences about Korean culture by communicating with American students, teachers, and parents. Analysis of the impact of the program found that VOICE increased teacher candidates' cultural proficiency and interest in science. The researchers conclude the paper by sharing suggested guidelines for research on designing online programs for teachers.

The third paper in this group, by Jeongho Cha (Korea) and Mary Dane F. Leonardo (Korea), evaluates a government-implemented science teacher education program in the Philippines using webinars to instruct teachers about a wide variety of technology to support science teaching in online environments in response to COVID-19 school restrictions. This study measures the impact of these webinars on science teachers' self-efficacy for delivering science instruction during the pandemic. Study participants evaluated the webinar content using Universal Design for Learning (UDL) elements and considered the impact of the webinar content on science teachers' self-efficacy for teaching science. Implications for the use of UDL to design long-term professional development offerings beyond the pandemic are discussed.

This issue also offers two papers related to research on SSI-based instruction. The first paper, by Agung Subianto (Indonesia), David Treagust (Australia), and Kok-King Tang (Australia), reports findings from a case study exploring

the perceptions of four Indonesian biology teachers about SSI-based biology instruction after engaging in an SSI-focused teacher professional development program. Building from interviews, written reflections, and survey responses, the authors found teachers' positive development with regard to knowledge about SSIs and scientific literacy, the necessity of including SSIs in science instruction, situational factors related to addressing SSIs in class, and teachers' attitudes towards teaching SSIs. The researchers conclude by discussing the value of SSI-based instruction in Indonesian contexts and describe the need for and benefits of teacher professional development to promote SSIs in school science.

Hyunju Lee (Korea) and Yunhee Choi (Korea) examine the effects of a research-based SSI program on fostering students' understanding of issues and their willingness to act. This research describes the experiences of 25 middle school students engaged in a long-term SSI research program that expanded students' understanding of the hidden nature of some SSI issues related to the food industry and business networks. Students became more aware of positionality of stakeholders and of the inequality and injustice that arose in business networks. The study demonstrates that students' experiences of executing SSI-based research increased their confidence and willingness to act to address difficult issues. Implications about the impact of SSI instruction on student awareness and activism related to challenging social, economic, and political issues are explored.

In this issue, we also have two papers related to specific content focused on the preparation of pre-service science teachers. The first paper, by Hong-Jeong Kim and Sungmin Im (Korea), investigates pre-service teachers' beliefs about learning physics and explores how teacher beliefs correlate with conceptual understanding and grades in their physics courses. The researchers found pre-service physics teachers' beliefs about learning physics had positive correlation with conceptual understanding, but not with motivational beliefs. In addition, teachers' grades in physics showed a positive correlation with cognitive beliefs. Drawing from these findings, the authors discuss implications for pre-service physics teacher preparation.

The second paper describes the development and implementation of a field-based chemistry experiment (FCE) teaching model to strengthen pre-service teachers' competence for teaching chemistry experiments. In their paper, Sung Woo Bae (Korea), Jae Hwan Lee (Korea), and Jongseok Park (Korea) discuss how the FCE model minimized the role of the instructor when applying flipped learning and cooperative learning so that learners could construct their own class content. The authors describe how this arrangement allowed pre-service science teachers to acquire knowledge related to conducting experiments and

teaching others how to conduct experiments. The authors provide practical examples of how to implement the FCE model in a university chemistry classroom and the offer implications for pre-service chemistry teacher education.

The first paper in the second set of STEAM-related papers is offered by Ha My Anna Mang (Australia), Hye-Eun Chu (Australia), Sonya Martin (Korea), and Chan Jong Kim (Korea). The researchers have been working as part of an international STEAM collaborative research group to connect teachers, students, and researchers in Australia and Korea through STEAM education projects. For this issue, they offer a study that employed a multi-phased development process to guide the development of an approach for integrating SSIs and STEAM education to help improve scientific literacy in schools. This paper offers a theoretical description of how an SSI-based STEAM approach could be used to redesign and integrate content across the curriculum. The authors offer a practical example of a climate change program designed using this SSI-based STEAM approach that emphasizes an enactment phase in a refined 6E inquiry model. The authors discuss the benefits and challenges of employing an SSI-based STEAM approach in classroom contexts and offer implications for using this approach to improve science learning opportunities in cross-cultural contexts, such as Australia and Korea.

The second paper, by Jennifer Park (USA), explores the cultivation of STEAM literacy via a teaching and learning framework focused on utilizing multimodal texts to expand students' reading strategies for science- and STEAM-related texts. The paper describes several strategies for supporting K-12 students to become independent readers who can select texts of interest to them and engage in various strategies focused on improving reading and science literacy. The strategies are suggested as important tools for supporting culturally and linguistically diverse Asian and Asian-American students in the United States whose reading challenges may be masked by the myth that these students are model minorities in school and society. This research argues the importance of fostering both improved literacy strategies and discourse practices to improve STEAM literacy for all students.

3 Invitation to Contribute to *APSE* Special Issue 8.1 (June 2022)

In response to the global pandemic, science educators everywhere have been struggling to meet the needs of science learners through new and innovative ways. Around the world, educators are using technology to teach science online and in blended classrooms as schools have begun to transition back into the regular classroom. The pandemic has radically changed how school

and science has been taught and learned in K-12 contexts and in higher education. In addition, the pandemic has also changed how scholars are conducting research with teachers and students.

The proverb “necessity is the mother of invention” aptly describes the fast-paced changes that have occurred over the last year and a half in the fields of education and educational research. At this time, it is important to document and disseminate research about these innovations and their impact on science learners. To support this initiative, *APSE* invites scholars to submit papers for the June 2022 issue that will focus broadly on the topic of technology use and integration in science teaching and learning. We invite studies using various methodological approaches to describe and evaluate innovations in curriculum and instructional strategies in science at all levels. We invite not only classroom-focused studies, but also review papers that introduce some of the advances in and uses of artificial intelligence (AI), virtual reality (VR), augmented reality (AR), and myriad other tools that have emerged in response to the pandemic. At this time, education systems, schools, and teachers will need to start making decisions about whether and how to continue using various resources and tools in the science classroom. Research demonstrating the effectiveness, challenges, and benefits of various tools and strategies can be informative for individual educators, curriculum designers, and policy makers.

This special issue will appear in June 2022. We will begin accepting contributions for the special issue in January. In addition to papers targeting the special issue, we also welcome contributions not related to the special issue topic, which can appear in parallel to articles related to innovation in technology use. Please contact us if you have any questions about the submission process or timeline.

4 Exciting News from *APSE*: We Are Officially SCOPUS Indexed!

I conclude this editorial by making an important and exciting announcement about *APSE*. Over the last 7 years, our board members and reviewers have worked hard to grow and develop the journal. Starting a new journal in a crowded field of prominent and well-established science education journals was a daunting task. But we all believe that it is crucial for scholars in the Asia-Pacific region and scholars conducting research in Asian diaspora communities to have a channel for disseminating research. As a result of our commitment and hard work, over the last two years, *APSE* has seen growth in the number of scholars submitting high quality manuscripts and in the number and the diversity of the readers accessing our articles.

Our journal has become a home for researchers to share work from countries with few (or no) English-language publications about science education, including Uzbekistan, Vietnam, and Japan. Papers from these countries have been very popular for downloads as the work available in our field and in English has been scarce. In addition, we are building a strong presence for researchers in countries like Korea, Australia, and Singapore who have published in mainstream science education journals – but who appreciate the space offered by *APSE* to highlight research and issues of importance in the region. We offer researchers an important venue for sharing research that is richly contextualized and meaningful for both local and international scholarship. Our editorial board is extremely proud of this aspect of our journal and have worked hard to protect this special focus for the manuscripts we publish.

As a result of our unique contribution to the field, the hard work of our editorial board, and the active participation of science education scholars who have contributed manuscripts, served as reviewers, and downloaded, read, and cited our papers – *APSE* has been officially selected for inclusion in the SCOPUS index. The updated information already appears on our journal website, and we will officially be updated in the Elsevier system in the next few weeks. I want to congratulate all the scholars who have played a role in supporting the growth and development of *APSE*. We are especially appreciative to the executive board members and membership of the Korean Association for Science Education (KASE), which supports and sponsors the journal. We offer our sincere gratitude to everyone and we look forward to continuing to grow together in the future.