Editorial: STEAM Education in the Asia Pacific Region

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1 Introduction

The integration of the arts into the teaching of STEM subjects (STEAM) is an innovative approach to teaching science that has been tried out or adopted in several countries in and outside the Asia-Pacific region. The term ‘arts’ covers a broad area including visual arts (drawing, photography etc.), the humanities (history and literature) and any socio-cultural practice or product (e.g., media facade, traditional house architecture, musical instruments, etc.).

There have been many publications on STEAM education in Korean journals in Korea, where STEAM has been implemented in the national curriculum since 2012. However, there have been few publications in English on Korean efforts at implementing STEAM and Korean research on STEAM. Publications in English disseminate information and research results about STEAM in Korea to a wider international audience. In addition, while there have been few reports on STEAM from other countries in the Asia-Pacific region, this does not mean that STEAM is unknown or has not been attempted in those countries.

Using the Visualization of Similarities (VOS) program (Van Eck & Waltman, 2010) and the key words ‘STEAM education’ to analyze 470 papers published in SCOPUS yielded the results shown in Figure 1.

From the results we can see that there has been work on STEAM in five Asia-Pacific countries: China, Indonesia, Singapore, the Philippines and Thailand. It is possible that interest in and research on STEAM in Asia-Pacific countries has been under-represented in SCOPUS and other English language science education journals because of the challenges of writing papers for

FIGURE 1 Density of published countries

English-language journals and being accepted by reviewers. Since the aim of APSE is to provide researchers in the Asia-Pacific region with a channel for disseminating research in science education in local contexts, it was decided to devote a special issue to STEAM in Asia-Pacific countries.

The STEAM approach to teaching science incorporates elements from the arts, which includes all socio-cultural practices, into the teaching/learning activities for building learners' understanding of science concepts. The incorporated arts events or products are not meant merely to introduce 'fun' into the science lesson but are intended to serve as a means of elucidating science concepts and demonstrating their relevance to students' everyday life. The benefits of the STEAM approach for science learning and learners have been documented in the literature (Chu, Son, Koo, Martin & Treagust, 2019; Gulbin & Topsakal, 2020). There have been Korean publications on STEAM reporting improvement in students' attitudes towards science (Kim, Han, & Hong, 2014; Park & Shin, 2012), and in creative problem-solving ability (Kim & Choi, 2012). It is highly possible that similar benefits may have been noted in some schools in Asia-Pacific countries other than Korea. The APSE editors hope that this special issue will serve as a platform from which similar or other outcomes of STEAM and reports of trials of STEAM in Asia-Pacific countries can reach an international audience.

2 Overview of Papers

This special issue contains seven papers, five of them reporting on research in STEAM education in Japan, South Korea, the United States, and Uzbekistan. The remaining two papers from authors in Singapore, Indonesia, the United States,

and Korea, while not directly dealing with the STEAM approach, examine factors that are relevant to the successful implementation of STEAM in schools. More will be said about these two papers later.

The papers by Takuya Matsuura and Daiki Nakamura (Japan) and Yumi Lee (Uzbekistan) relate to effects of and issues in implementation of STEAM in schools in their respective countries. In Japan, where the implementation of STEAM in schools has the backing of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Matsuura reports indications of positive effects on perceptions of science and science learning for students' science-related career choices in their future. In Uzbekistan, where efforts at implementing STEAM in schools began only in 2019, Lee has documented challenges such as that of helping teachers to understand the aims, principles and practices of STEAM. As of yet, there has been limited research published about science education in Uzbekistan and Japan in *APSE*, so we are pleased to include these papers in the special issue, and we look forward to more scholarship from these countries in the future.

The three papers by Bhaskar Upadhyay et al. (United States), Su-Yeon Choi et al. (Korea) and A-Rang Won et al. (Korea and Australia) pertain to the potential of STEAM education to encourage the growth of critical consciousness and social awareness on students. The paper by Upadhyay et al. investigates the effect of the STEAM approach on the development of social and critical consciousness, including raising awareness of social injustice. The paper by Choi et al. reports the positive results of applying the STEAM approach on teaching socio-scientific issues (SSI) in schools in an SSI-STEAM program featuring climate change. The result was an increase in students' climate change literacy. The paper by Won et al. examines the role of teachers' practical knowledge in designing and implementing SSI-STEAM lessons to promote climate change literacy.

As mentioned earlier, the last two papers in this issue discuss issues that are relevant to the degree of success of STEAM implementation. The first of these two papers, by Uma Natarajan et al. (Singapore), offers a theoretical model for growing STEM leadership in schools, proposing that building teachers' agency, identity and sense of belonging will empower them to engage in and support STEM education initiatives. Science educators interested in fostering teacher leadership in STEAM education might pay serious attention to the model proposed by Natarajan et al. The second paper, by Ai Nurlaelasari Rusmana et al. (Indonesia, Korea, and the United States) discusses factors that can affect development of accurate science concepts in learners as related to genetics content. Among them are teaching/learning practices, learners' difficulties with abstract terminology and instructional materials that do not adequately facilitate growth of conceptual understanding in students. These same factors can also affect learning outcomes in STEAM education.

3 Invitation to Contribute Additional Work Focused on STEAM Education in the Asia-Pacific

As there are currently several papers focusing on STEAM education expected to be published in the next issue of *APSE*, we take this opportunity to encourage researchers to contribute their work. In addition, *APSE* invites proposal submissions for other special issues by writing to the Editor-in-Chief.

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About the Author

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