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EDITORIAL

Editorial

This second issue of 2019 brings together authors from Thailand, Mexico, Turkey, the United States, and Ghana as they address issues concerning science education. This is the first edition of *Science Education International* with articles having a doi. The seven papers of this issue explore a range of topic, such as chemistry, web-assisted collaborative learning, teachers' understanding of students prior knowledge, and STEM-based out-of-school environments. The first four articles address chemistry in four different ways. The first article by Mexico's Mayra Guadalupe Perez-Rivero, Adolfo Eduardo Obaya Valdivia, Lucila Giamatteo, Carlos Montaño-Osorio, and Yolanda M. Vargas-Rodríguez investigated a didactic strategy for learning and teaching of functional groups in high school chemistry. The second article by Nigeria's Lawrence Achimugu and Hassana Phebe Obaka explored the influence of principals' leadership styles on senior secondary (SS) school students' achievement in chemistry. The third article by Judith L. Jenkins and Elizabeth M. Howard from the United Stated of America addressed the implementation of modeling instruction in a high school chemistry unit on energy and states of matter. The fourth and final article related to chemistry is from Ghana's Ruby Hanson who reported on understanding teacher trainees' reasoning patterns about the formation and description of chemical compounds.

Mayra Guadalupe Perez-Rivero, Adolfo Eduardo Obaya Valdivia, Lucila Giamatteo, Carlos Montaño-Osorio, and Yolanda M. Vargas-Rodríguez highlighted that when students learn organic chemistry, they are frequently overwhelmed by the amount and complexity of the information that they are supposed to acquire. As such, their study aimed to improve the teaching and learning of chemistry through a didactic strategy designed on real-life situations. The didactic strategy was based on real-life problems using an interactive board to improve the learning and teaching in high school. To achieve this, the researchers divided the participants into two groups: The application of the strategy to the experimental group and the traditional teaching for the control group. The participants were 3rd year students (students aged 16–17) from a high school in Mexico. The study's experimental group consisted of 31 female and 26 male students and the control group had 31 female and 20 male students. After applying the strategy for learning and teaching using the interactive board software and applying the final evaluation to both the experimental and control groups, the evaluation instrument was graded. As a conclusion, the applied strategy and the use of ICTs allowed participants to achieve higher levels of learning when compared to those experiencing more traditional teaching. Perez-Rivero, Valdivia, Giamatteo, Montaño-Osorio, and Vargas-Rodríguez concluded that this strategy should be used for learning and teaching in high school.

Nigeria's Lawrence Achimugu and Hassana Phebe Obaka noted in spite of the importance of chemistry in the socioeconomic and technological development of any nation Nigerian secondary school students have performed poorly in chemistry in SS certificate examinations. Therefore, they explored the influence of principals' leadership styles on SS school students' achievement in chemistry in the Kogi State of Nigeria. The principals were chosen as principals exhibit leadership characteristics when they direct the activities of the staff and students toward the achievement of the school goals. These leadership characteristics of principals are sometimes referred to as leadership styles. The three major types of leadership styles of a principal are authoritarian, laissez-faire, and democratic styles of leadership. Their study adopted a correlation survey research design to establish the relationship between the principals' leadership styles and academic achievement of students in chemistry. There were 260 SS 3 chemistry teachers and 4100 SS 3 students in the 264 public secondary schools in the Kogi State. A multistage sampling technique was used in selecting the SS 3 chemistry teachers and students for this study. The results indicate that no significant correlation exists between the use of authoritarian leadership or Laissez-Faire style and students' achievement in chemistry. The study revealed that there was a significant positive correlation in chemistry students' achievement when principals practiced a democratic leadership style. As a result, the study concludes the use of the democratic leadership style to encourage teachers to work harder and subsequently influence students' academic achievement in chemistry.

Judith L. Jenkins and Elizabeth M. Howard reported how learning through modeling instruction employs processes, so students make observations and then work individually or in small groups to explain their observations. Students' explanations were then shared, refined, and used to generate more broad conceptual models. Modeling instruction has been successful in physics, and Jenkins and Howard investigated its impacts on students studying chemistry. This method prioritizes the development of conceptual understanding by providing evidence of concepts and their inherent interrelatedness. As such, the goals of modeling instruction are enabled by two key factors – the use of class time and the organization of content. Modeling instruction was implemented in two sections of a general level chemistry (46 students) during the academic year 2016–2017. This elective course is taken by junior and senior students (students aged 15–18) who are likely to attend university but who are not interested in pursuing a science major. After the students' initial attempts

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to draw what they have observed in a laboratory activity, the teacher facilitated a class discussion, guiding students to a more thorough understanding of the content. Students were encouraged to make connections between what they observed and what happened at the particle level. Students used each other's understandings to both defend and refine their own understanding of the concept. In addition, students interpreted their evidence in light of evidence collected in other laboratories. Once the discussion was over, students completed a post-lab analysis to show their understanding of the material that was observed in the laboratory. Although there was a general increase in mastery from pre-test to final examiantion, the extent of mastery varied. Semester-long trends in examiantion scores suggested that modeling instruction facilitated content mastery and retention more effectively than traditional instruction.

The final three articles of this issue come from Thailand and Turkey. The fifth article is from Luecha Ladachart and Ladapa Ladachart who completed a document analysis of Thai science educators' perspectives on students' prior knowledge. Turkey's Nazire Burcin Hamutoglu, Orhan Gemikonakli, and Deniz Mertkan Gezgin studied the effectiveness of Edmodo on preservice classroom teachers' views of web-assisted collaborative learning environments, sense of classroom community, and perceived learning in the sixth article. The final article of this issue is from Turkey's Esra Bozkurt Altan, İrem Üçüncüoğlu, and Nurhan Öztürk who investigated the effects of a STEM-based out-of-school learning environment on high school students.

Ruby Hanson reports on understanding Ghanaian teacher trainees' reasoning patterns about the formation and description of chemical compounds. Hanson notes that, in traditional classroom, a teacher introduces a concept by explaining a theory without incorporating students' views for a balance. More importantly, attempts to find and challenge students' prior knowledge are rare in traditional settings. As a result, learners memorize and regurgitate information without adequate reflection, deconstruction, construction, and reconstruction procedures that are required for concept formation. Traditional learning makes the process of personal development and accommodation of scientific views a challenge to learners, who often develop alternative conceptions of chemical principles. Hanson argues that the prediction, description, and explanation of chemical reactions are fundamental in chemistry education. Her study investigated the possibility of using simple diagnostic worksheets as a complement to microscience equipment. The sample consisted of twelve chemistry major teacher trainees and 24 non-major teacher trainees from the 2014/2015 academic year. A pre-test, post-test, and a retention test were administered after 2 and 3 weeks of treatment, respectively, to assess the trainees' gains in knowledge. The pre-test implied that there was no statistical difference in academic conceptions about chemical compounds between the experimental and control groups. There was a statistically significant difference between the success of the groups when the post-test results were compared. In conclusion, Hanson determined that teacher trainees had a number of misconceptions about how chemical compounds were formed for which remediation was successful. It is important to note that as the participants of this study were training to become teachers, it was important that their own conceptions were identified and corrected early so that they would not transfer their wrong ideas and inefficiencies to their future students.

The fifth article is from Luecha Ladachart and Ladapa Ladachart who completed a document analysis of Thai science educators' perspectives on students' prior knowledge. Ladachart and Ladachart reported that, in many cases, students' prior knowledge was often not consistent with scientific knowledge. They go on to highlight that research in science education has focused on exploring and facilitating school science teachers' constructivist beliefs and teaching practices, which are often done by university-based science educators. However, little is known about science educators themselves. Despite abundant research on how science teachers perceive students' prior knowledge, the number of studies addressing this issue with science educators is very limited. Ladachart and Ladachart's study was documentary research. For their study, the target documents were research reports about students' prior knowledge of scientific topics, written by Thai science educators. Ladachart and Ladachart focused only on research reports written in Thai as these were accessible to and readable by all Thai science teachers. In their analysis of 78 documents, they noted three major findings. A majority of Thai science educators: (1) Convey an obstacle perspective on students' prior knowledge, (2) respond to students' prior knowledge in an evaluative manner, and (3) do not connect their use of instructional interventions to students' prior knowledge in concrete ways. The results of this research highlight the need for Thai science educators to explore reflectively and then broaden their own perspectives on students' prior knowledge in a way that is better aligned with international science education communities.

In the sixth article, Turkey's Nazire Burcin Hamutoglu, Orhan Gemikonakli, and Deniz Mertkan Gezgin studied the effectiveness of Edmodo on preservice classroom teachers' views of web-assisted collaborative learning environments. This study explored the effectiveness of using web-assisted collaborative learning environments on the sense of classroom community and perceived learning using a learning platform Edmodo to enhance face-to-face learning within the framework of a community of inquiry. This study investigated how combining face-to-face and web-assisted collaborative learning environments promoted efficiency and effectiveness of teaching and learning experiences. In this respect, this study aimed to bring together various educational environments from different perspectives using constructivist approaches. For this study, the researchers noted that it was important to investigate empirically the relationship between students' perceived learning and interaction dynamics within web-assisted collaborative learning environments. As such, this study used

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pre-experimental quantitative research approaches based on single group, pre-and-post-test model. The participants were from the pre-service teacher population of the 2015–2016 spring term cohort of a Turkish faculty of education. The study highlighted the effect of web-assisted collaborative learning environments on the sense of community of classroom and perceived learning. The results obtained from pre- and post-tests showed the effectiveness of experimental process on changing participants' views. The findings highlight that it is worth using web-assisted collaborative learning environments to improve students' PL and support the SCC.

The final article of this issue is from Turkey's Esra Bozkurt Altan, İrem Üçüncüoğlu, and Nurhan Öztürk who investigated the effects of a STEM-based out-of-school learning environment on high school students. Out-of-school learning environments can offer students exciting and motivating learning opportunities that formal environments cannot. The researchers noted that out-of-school learning may be performed in environments such as museums, nature trips, botanic gardens, and camps with planned content or science schools. STEM education is based on the integrated teaching of science, technology, engineering, and mathematics disciplines within the context of real-life problems and in coherence with the works of real-life professionals. This research aimed to prepare an out-of-school STEM education program for secondary school students and investigate the effects of the program on students' interest in STEM fields. The research design of this study was the concurrent nested design. The participants of the research consisted of 24 secondary school students (11 boys and 13 girls) in the 6th, 7th, and 8th grades. Students, all of whom were attending public schools, voluntarily applied to participate. For this study, five different STEM-centered activities were developed. It was identified that the students attending an out-of-school STEM education had an increased awareness of building a career in the fields of science, engineering, and mathematics. Furthermore, the researchers noted that students had fun during the activities and made positive comments. In consideration of all findings, the research results indicate that STEM education program designed as an out-of-school program improved students' interest in and career awareness of the STEM fields of the study.

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