Systems Thinking and Sustainability — A Workshop at 5th ACRICE

by Marietjie Potgieter and Ghada Bassioni

The Fifth African Conference on Research in Chemistry Education (ACRICE2022) was held at the Ain Shams University in Cairo, Egypt, from 6-10 December 2022. The objectives of the conference were to emphasize the importance of chemistry education for sustainable development and to promote partnerships between those in charge of teaching chemistry in Africa and world experts in this field to further this cause. The conference provided an opportunity for the presentation of chemistry education research and the exchange of experiences in curriculum development to align chemistry education with the imperatives of sustainability. The conference was endorsed and financially supported by IUPAC. IUPAC president Javier García-Martínez attended the conference and delivered a plenary address during the opening ceremony.

The IUPAC Committee on Chemistry Education (CCE) accepted an invitation by the organizers of ACRICE2022 to present a one-day workshop on Systems Thinking in Chemistry Education (STICE) as the feature activity of the conference. The workshop was presented on Wednesday, 8 December 2022 in three 2-hour sessions and was led by Felix Ho and Marietjie Potgieter, the chair and secretary of the CCE, respectively. It was attended by approximately 40 participants: Chemistry educators from different faculties at Ain Shams University—professors, lecturers, assistant lecturers and demonstrators—and secondary school chemistry teachers. Before the event, all participants received access to a reading pack consisting of 20 key articles on the topic. The workshop consisted of presentations during which the basic tenets of STICE were explained, alternating with interactive hands-on activities where participants applied these principles to a relevant contextual challenge in Egypt. Eight self-assigned small groups were formed at the start of the workshop for participants to exchange ideas and collaborate on activities. A trademark of the workshop was the lively debate and active participation of all members which was enabled by this configuration.

Workshop outcomes

- The workshop provided an opportunity for participants to engage experts on the principles of STICE and its relevance to sustainability. They applied these principles to the design of a learning sequence on the chemistry involved in the sustainable provision of clean water for all inhabitants in Cairo which would be suitable to implement in their teaching.
- Participants acknowledged the need for global collaboration to move urgently towards new educational systems that can prepare the next generations to be systems thinkers able to solve global systemic problems and crises. Systems thinking is essential not only for deep learning of chemistry but also to prepare students for the future professions of the 4th Industrial Revolution.
- Attendees were introduced to the limitations of traditional teaching approaches as compared

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to the potential of STICE to prepare chemistry graduates to contribute meaningfully in multidisciplinary teams working on sustainability challenges. In addition, STICE encourages students to take personal responsibility for lifestyle choices that contribute to sustainability.

- The conference highlighted the need to distinguish between STICE and a systemic approach to the teaching and learning of chemistry (SATL). STICE represents an area of active development in chemistry education internationally and is supported by IUPAC (https://iupac.org/project/2017-010-1-050/, https://iupac.org/project/2020-014-3-050/, https://iupac.org/project/2023-004-2-050/). SATL was pioneered and refined by Farouk Fahmy, Emeritus Professor of Chemistry at Ain Shams and conference chair for ACRICE2022.

- Several participants, especially high school chemistry teachers, were inspired by the potential of STICE to demonstrate the relevance of chemistry to everyday contextual problems and were empowered to infuse that in their chemistry teaching. Tertiary educators were similarly convinced of the need to infuse STICE but acknowledged the constraints imposed by fixed curricula and the unavailability of textbooks in which STICE is made explicit.

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