

Conference Call



ICCE 2022 delegates against the backdrop of Table Mountain and Lion's Head. Photo credit Debbie Rorich.

Chemistry Education (ICCE 2022)

by **Bette Davidowitz**

In July 2017, Cape Town, South Africa, made a successful bid to host the 26th IUPAC International Conference on Chemistry Education in July 2020. After two postponements due to the COVID-19 pandemic, the decision was finally made to hold the conference as an in-person event to allow the ICCE family to reconnect with each other and to welcome new members. The conference took place from 18-22 July 2022 at the Lagoon Beach Conference Centre in Cape Town. The conference Local Organising Committee comprised members from the four universities in the Western Cape, namely the University of Cape Town, Stellenbosch University, the University of the Western Cape and the Cape Peninsula University of Technology. Event Management Solutions provided administrative and technical support.

While 150 delegates represented a smaller number than previous conferences, it was a reasonable turnout in a post-COVID world where there was still uncertainty about a possible new wave of infections, travel restrictions, and very high air fares. Of the 150 delegates, 76 were from Africa, the majority from South Africa, 20 from USA, 14 from Germany with smaller groups from 17 other countries around the world. Responses from 89 delegates who completed a post-conference survey revealed that 66 % of them were attending an

ICCE conference for the first time. These are excellent achievements, as it clearly demonstrates the benefits that can be derived from hosting the conference in locations around the globe that are chosen less often. The smaller size had other benefits too; the conference had an intimate atmosphere which facilitated extensive networking.

The conference started on 18 July, which was designated as Nelson Mandela International Day by the United Nations in November 2009 in honour of Nelson Mandela, and celebrated annually on his birthday, on July 18. The conference sought to honour his views on education:

"Education is the most powerful weapon which you can use to change the world."

-Nelson Mandela (1997)

It was a feather in the ICCE 2022 cap to have the president of IUPAC, Javier García Martínez present at the conference. He gave a presentation at the opening ceremony, participated in the conference and visited local universities. In his opening address, he outlined what IUPAC is doing towards achieving the United Nations Sustainable Development Goals, and the importance of chemistry education. (read more at <https://www.iybssd2022.org/en/chemistry-education-is-the-way-forward-iupac-president/>) He highlighted IUPAC initiatives on Green Chemistry

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and Chemical Research Applied to World Needs, CHEMRAWN, as well as specific projects such as systems thinking in chemistry for sustainability. He emphasised that chemistry education is about people, and that it is a scholarly discipline in its own right. The theme of his presentation, as well as the timing, were particularly appropriate since July 2022 marked the start of the UNESCO International Year of Basic Sciences for Sustainable Development, IYBSSD 2022. (see <<https://iupac.org/iybssd2022/>>)

Education Imperatives in the 21st Century

The conference theme, *Responding to 21st Century Imperatives in Chemistry Education*, was reflected in the seven programme themes with Chemistry Teaching and Learning, Pedagogy and Cognition being the most dominant followed by Teacher Education, Teacher Knowledge and Continuous Professional Development. Chemistry for Sustainability also featured as a strong theme. The programme included a total of 127 presentations, comprising five plenary lectures, 14 invited lectures, 74 oral presentations, 29 posters and five workshops. COVID-19 infections and travel restrictions meant that two of the plenary lectures and four of the invited presentations were delivered online. The five plenary lectures reflected the main programme themes. A brief description of each lecture follows:

- **Bridging the theory-practice divide in chemistry education through pedagogical content knowledge (PCK)** presented by Elizabeth Mavhunga (Wits University, South Africa) in which she pointed out that chemical education is a discrete disciplinary field, with its own practice, specific content and decision-making processes. She works in the domain of topic-specific PCK and noted that teaching is often neat in planning, but explosive in practice.
- **Systems thinking in foundational chemistry: connecting chemistry content to earth and societal systems** was presented by Thomas Holme (Iowa State University, IA, USA). This presentation focused on systems thinking, planetary boundaries and context. He described various resources such as Systems-Oriented Concept Map Extension (SOCME), diagrams and writing assignments for teaching chemistry in context. The presentation was pre-recorded as Professor Holme was unable to attend due to COVID restrictions. Despite this, the session chair was able to facilitate a productive discussion.



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- **The role of chemistry education in managing humanitarian challenges** was presented by Ruby Hanson (University of Education, Winneba, Ghana). She talked about humanitarian and environmental problems, and the role of chemistry in contributing to the problems as well as in solving them. Professor Hanson then explained how she had implemented these ideas in her practical classes. Interesting questions and comments included an observation that so-called rich countries were actually poor because they made others poor, with the counter argument that it is the governments in some countries that impoverish their own people.
- **Empowering and inspiring the future generation: Uncovering relevancy and meaning in chemistry education** was presented by Ozcan Gulacar (University of California, Davis, CA, USA). This presentation captured and held attention. Using an apple as a prop and an excellent slide presentation, he highlighted the need to make chemistry teaching relevant and to address social issues. Topics should be meaningful to students to capture their interest. One of the delegates noted that teachers would need to be trained as they need to understand the context to teach it in a meaningful way.
- The final plenary lecture was the last item on the conference programme: Hannah Seviaan (University of Massachusetts, Boston, MA, USA) presented **an asset-based approach to closing asymmetries and supporting student success in general chemistry**. This was a live online broadcast from Boston which worked well as she could interact with the audience and answer questions herself. Professor Seviaan noted that research reveals that most bridging and remediation programmes have very little long-term benefit. She described an asset-based intervention programme based on an anti-deficit achievement framework in the form of a supplemental course for general chemistry. This approach provided positive outcomes for students.

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At left, Participants at Teacher Day.

Below, Siphamandla Secondary School Grade 10 Mathematics and Physical Sciences learners display their pencil bags and mathematics sets. Pictured with Esihle Somfongo (left) and principal Lonwabo Mbeke (right).



Systems thinking and planetary boundaries were also described in numerous presentations and two workshops, as tools to help students to grasp multiple interactions between chemistry and human activities and the environment. This approach shifts the chemistry curriculum from the abstract to a focal point in the real world, making the subject more accessible and relevant.

The organisers introduced an innovation for the poster sessions, namely the elevator pitch. Each presenter was notified in advance that they would be invited to deliver a 1-minute presentation to “sell” their poster to the audience without the use of slides. These snapshot talks were presented at the start of the poster sessions and were effective in giving an overall picture of the posters to be viewed in the session. The quality of the pitch formed part of the criteria for judging the best poster for each session. Data from the post-conference survey revealed that this initiative received positive feedback from participants.

In addition to the oral presentations and posters, the conference offered several workshops focusing on aspects of teaching and learning of chemistry, two of which focused on systems thinking. Several leading researchers participated in a panel discussion on how to make research visible. This provided useful information about relevant journals and mentioned conferences as well as IUPAC structures. *Chemistry Teacher International* was highlighted as an emerging journal.

Leaving a legacy

In their bid for the ICCE conference, the organisers expressed their commitment to building a network of

chemistry education researchers and practitioners in the host country. This was achieved as about 40 % of participants came from South Africa, many of them were emerging researchers and post-graduate students. In-person conferences provide opportunities to build networks between researchers both in their own countries and abroad.

Teacher day

Hosting an international conference in South Africa allowed high school teachers to attend the Teacher Day which ran on Friday, 22 July in parallel to the programme of the conference. The programme, which was opened by IUPAC president, featured a variety of hands-on and heads-on activities to motivate and excite the participants, to make them think about their teaching and connect them to others in the profession. 102 teachers from across South Africa attended, the cohort represented a diverse group across a spectrum of schools from private to those in the townships. Experienced teachers presented interactive classroom activities to enhance the conceptual understanding of chemistry concepts and demonstrated how educational gamification can effectively motivate learners and stimulate their interest in science. Teachers were introduced to the IUPAC Periodic Table Challenge and

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Above, Young Ambassadors for chemistry work on experiments designed especially for young learners. One experiment involved magic inks, seen at right.



had an opportunity to reflect on the impact of lockdown over the past two years and to share experiences during and post lockdown. Lecture demonstrations are a popular way to capture interest and teachers enjoyed the presentation, *A Pollutant's Tale*, which has been featured in 31 countries and on 5 continents, thus the audience was part of an international story. This presentation focused on atmospheric chemistry and climate change which ties in with the conference theme. The day concluded by considering how participants can create communities of science teachers who can support one another.

Stationery Drive

Delegates attending the ICCE 2022 (see IUPAC project 2021-031-2-050) conference were requested to contribute to a Stationery Drive to provide much needed items for local schools. The response to the call was excellent, many delegates brought the items requested while others donated money which enabled the organisers to buy mathematics sets as well as stationery bags to pack selected items for learners. Donations of stationery were made to 42 Grade 10 learners at Siphamandla Secondary School

in Khayelitsha. Stationery such as crayons and colouring pencils were donated to the Bokmakierie Primary School in Hazendal.

Young Ambassadors for Chemistry

Young Ambassadors for Chemistry, YAC, one of the flagship programmes of the IUPAC Committee on Chemistry Education, was hosted at the Cape Town Science Centre (CTSC), on Saturday, 23 July 2022. (see IUPAC project 2021-031-2-050.) The YAC committee organized a special Open Day at CTSC which included several activities contributed by the Centre itself. The theme chosen for the Open Day was **Celebrating Chemistry—Chemistry for Sustainability**. The Open Day represented the start of the IYBSSD activities in the region and was registered as such on the national record of IYBSSD activities. (see <https://www.iybssd2022.org/en/events/>)

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open-day-to-celebrate-chemistry-and-introduce-the-iybssd/) Sponsorship from IUPAC and Merck Global allowed free admission to the CTSC; over 700 children and their parents enjoyed the many activities on offer. The experiments designed for the day, such as magic inks, will form part of the ongoing suite of activities available at the Cape Town Science Centre.

Social and cultural events

As was the case for previous ICCE meetings, the conference in Cape Town featured several social and cultural activities.

Demonstration of indigenous African instruments

Professor Dizu Plaatjies from the College of Music at the University of Cape Town and his postgraduate student, Tabisa Dinga, presented the first item on the programme for the conference. The demonstration of musical instruments and music struck the right note to start the conference. It set the tone of a conference with an African flavour with its combination of academic and the indigenous knowledge (see <https://www.youtube.com/watch?v=pasCSMgm5QY>). This was aptly described by one of the delegates:

"I really enjoyed the instruments demonstration. It was a great way to kickstart our brains in creating the cognitive impact that I know will have a lasting memory, at least for me, of this conference. I will always remember the time here, what I have learnt, and the people I have met. What a great way to start the conference!"

Visit to the Spice route

Excursions have been a feature of many ICCE conferences. The organisers chose the Spice Route which is situated on the slopes of the scenic Paarl Mountains, offering various tasting and aesthetic experiences. Visitors could relax and enjoy the beautiful scenery and sample the many local products on offer. These included chocolates, wine, cured meats, beer, and ice cream. Delegates were able to gather in small groups to chat and build friendships in a relaxed atmosphere.

Guests were welcomed by a performer dressed as a large Mali puppet which set the tone for the evening. This restaurant offers a tasting menu, with 14 different dishes from different African countries, all served at the tables thus delegates could relax without having to queue at a buffet. The entertainment in the form of puppets, singers, dancers, and face painters was innovative, with just the right mix of performance time and time in between for chatting. It represented an excellent introduction to African food and entertainment for international visitors, as well as being a very different



From top, a mali puppet and other performers showcase the regions rich artistic history for conference attendees. An african feast.

experience for most South Africans. As one delegate noted "the conference dinner was a terrific experience" see https://www.youtube.com/watch?v=_g5dksx4vGk.

Feedback from delegates

89 delegates completed the post-conference survey online. Delegates appreciated being able to attend an in-person event, the opportunity to network, the location of conference venue, and the presentations. The few comments that appear to be critical confirm the authenticity of all the responses. Selected responses are shown below:

"Very open and collegiate atmosphere, very easy to talk to others. Super friendly and helpful staff at the hotel and also wonderful conference organisers. Very good social program, the conference dinner was a terrific experience. Brilliant how much the organisers managed despite the tight economic circumstances due to the lower than usual attendance. "

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“It was an excellent conference all around. It was really stimulating and engaging and so beneficial to be able to engage face-to-face with people after Covid isolation and virtual conferences. Very well organised. I don't know why, but somehow the conference seemed to be particularly effective at encouraging discussion with a wide range of people—old and new acquaintances. I had so many highly stimulating discussions with so many different people throughout the conference. It was outstanding! Thank you! “

“Thank you so much for all the hard work you've put in over the years and your tenacity in making this a reality! Also great that you've put in so much effort to try to make a difference to the local community as well! “

“Overall good job given the uncertainty of the COVID pandemic, heartfelt congratulations for pulling off the conference after a delay of two years. I am very glad that many African chemistry educators are given a chance to showcase their research which might not be possible if the conference is held outside Africa. “

In summary, the conference achieved the objective of bringing the ICCE family together again at an in-person event. The conference enabled delegates from Africa to attend an international conference as well as leaving a legacy to promote the field of chemical education among secondary and tertiary educators. The local community was also enriched as items such as conference bags were made by women working in a non-government organisation which promotes job creation.

Acknowledgements

In my capacity as Chair of the Local Organising Committee I should like to thank the following people who contributed to the success of ICCE 2022:

- The President of IUPAC, Javier García Martínez for attending the conference and presenting inspiring messages to the delegates at the conference, the teachers who attended the Teacher Day, and the audience at the YAC activities at the Cape Town Science Centre. His ability to pitch the message at the level of the audience is to be admired.
- The Local Organising Committee for their hard work and persistence during the longest tenure of any organising committee in the history of

ICCE conferences, in particular René Toerien, who organized both the Teacher Day and the Stationery Drive.

- The National and International Advisory boards for input on various aspects of organising the conference, in particular thanks are due to Marissa Rollnick for compiling the conference programme and Helen Drummond for taking notes during the conference.
- The reviewers for their time and effort necessary to review the abstracts.
- The delegates, whose presence was so gratifying after the uncertainty posed by the COVID-19 pandemic. Thank you for their excellent presentations, posters, and workshops.
- Jan Apotheker and Marietjie Potgieter, the past and present chairs of the IUPAC Committee for Chemistry Education, for their guidance and support through many discussions about logistics and planning.
- The sponsors for financial support.
- Debbie Rorich and her staff from Event Management solutions whose can-do attitude in the face of many obstacles was instrumental in bringing plans to fruition in terms of running the conference.

I should like to end with a quote from Jonathan Jansen who gave a brief address at the opening ceremony. His message sums up the challenge for chemistry educators in a changing world: He urged the delegates to:

“teach chemistry for attitude, teach chemistry for meaning, and teach chemistry for change.”

Bette Davidowitz, a professor at the University of Cape Town, is chair of the Local Organising Committee (LOC).

ICCE—a short historical perspective

by Elise de Vries

The pandemic of 2020 prompted me to conduct research into the teaching and learning of chemistry, and so as a new member of the Chemistry Education community, I eagerly anticipated the commencement of the 2022 International Conference on Chemistry Education (ICCE) conference. As a first timer, I was interested in the conference's history, and my objectives were to understand global educational concerns, past and present, and look for solutions to my classroom dilemmas.