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What has ECRICE 2016 brought to chemistry education researchers and the education community?

Què ha aportat ECRICE 2016 als investigadors en educació química i a la comunitat educativa?

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abstract

The article summarizes the main features of the 13th edition of ECRICE, held in 2016 in Barcelona. It includes participation data and a brief description of the content of guest lectures, symposia and social events. The topics chosen for the invited lectures and the communications received give a vision of the moment in research and practice in chemical education. The perception of members of the SCQ members of the organizing committee is expressed through the co-chairs of ECRICE 2016.

keywords
Chemical education, educational research, European conference, ECRICE 2016.

resum

L'article resumeix els principals trets de la 13a edició d'ECRICE, celebrada l'any 2016 a Barcelona. Inclou dades de la participació i una breu descripció del contingut de les ponències invitades, dels simposis i dels esdeveniments socials. Les temàtiques escollides per a les ponències i les comunicacions rebudes donen una visió del moment en recerca i pràctica en educació química. S'hi expressa la percepció dels membres de la SCQ integrants del comitè organitzador a través dels coorganitzadors d'ECRICE 2016.

paraules clau
Educació química, recerca educativa, congrés europeu, ECRICE 2016.

ECRICE: a trajectory since the beginning

ECRICE (European Conference on Research in Chemical Education) is a European conference of reference for researchers and professors of chemistry that has finished sharing data of research in didactics of chemistry and innovative classroom practices related to chemistry. It is the forum for researchers and teachers to exchange research experiences in chemistry education and about teaching and learning chemistry at all levels.

Table 1 shows some information about all ECRICE conferences since the beginning until the 13th edition in 2016 in Barcelona (Tsaparlis, 2017).

ECRICE 2016: aims and features

The 13th edition of ECRICE Conference was held in Barcelona. It took place between the 7th and 9th of September in the atmospheric and historical surroundings of the Casa de la Convalescència, headquarters of the Institut d'Estudis Catalans, in the heart of the old city of Barcelona. The closing conference and the closing of the congress were held at the CosmoCaixa Science Museum, Barcelona. ECRICE 2016 collaborated with the Generalitat de Catalunya's Department of Education, the La Caixa Foundation, the National Art Museum of Catalonia (MNAC) and sponsors, included among them the *Journal of Chemical Education* and others related to instruments and work techniques experimental in the teaching of chemistry.

The 13th edition of ECRICE in Barcelona had the title «Inspiring Science Education through Research». The delegates of the Division of Education of Eu-

Table 1. Year and place of ECRICE events

ECRICE	*Year*	*Venue and/or city, country*
1st ECRICE	1992	University of Montpellier, Montpellier, France
2nd ECRICE	1993	Pisa, Italy
3rd ECRICE	1995	Lublin & Kazimierz University, Lublin, Poland
4th ECRICE	1997	University of York, York, England, UK
5th ECRICE	1999	University of Ioannina, Ioannina, Greece
6th ECRICE	2001	University of Aveiro, Aveiro, Portugal
7th ECRICE	2003	University of Ljubljana, Ljubljana, Slovenia
8th ECRICE	2006	Eötvös Loránd University, Budapest, Hungary
9th ECRICE	2008	Istanbul, Turkey
10th ECRICE	2010	Pedagogical University of Krakow, Krakow, Poland
11th ECRICE	2012	Sapienza University of Rome, Rome, Italy
12th ECRICE	2014	University of Jyväskylä, Jyväskylä, Finland
13th ECRICE	2016	Institut d'Estudis Catalans, Catalan Society of Chemistry, Barcelona, Spain

ChemS of the Societat Catalana de Química, together with other members of this society, lead this event in collaboration with the other delegates of EuChemS. The main ideas behind the ECRICE 2016 were to:

— Improve and inspire chemistry education by taking into account research achievements and conclusions in this field and create innovative teaching methods to teach new generations with new challenges.

— Adapt the research in teaching and education to teachers' needs, and transfer and disseminate the results of research in education to the teaching community.

The scientific topics that were discussed at ECRICE 2016 included: assessment for learning, chemistry and scientific literacy, context-based chemistry education, ICT in chemistry education, inquiry-based science education, interdisciplinary fields: chemistry in STEM education, learning and acquiring chemistry skills, nature and history of science, new trends in chemistry education research, professional development of chemistry teachers.

ECRICE 2016 welcomed 205 participants. Figure 1 shows the average number of participants from each country that had more than 3 participants and the names of countries with 1, 2 or 3 participants.

The topics of plenary lectures and keynote lectures were diverse. Invited speakers try to cover the most relevant fields in science education and its research as inquiry-based science education (IBSE), context-based science education (CBSE), scientific literacy, assessment, curricula development, the use of ICT, responsible research and innovation (RRI) and teacher training. Invited speakers were the protagonists of the 5 plenary conferences, 11 keynote conferences and 5 chemical demonstrations. This important group of experts in the field consisted of several members from various European countries, while five were from the United States and they were a key part of the success of the conference and their contributions covered the broad range of congress themes.

The communications initially received (almost 200) where categorized by one or two topics by the authors. The analysis of this categorization showed the following results: 16.4 % for learning and acquiring chemistry skills, 14.2 % for assessment, 13.7 % for scientific literacy 10.4 % for CBSE, 9.8 % IBSE, 9.2 % for new trends in research, 8.7 % for ICT, 7.6 % for professional development and around 5 % for nature and history of science and for STEM.

A total of 109 oral presentations were given throughout the congress, 17 of which were part of 4 symposia, while the poster sessions saw a total of 59 contributions (fig. 2). This represents a total of 168 communications. This important number of communications complemented and enriched the guest presentations and made the congress an authentic forum for communication and research and practice debate related to the teaching and learn-

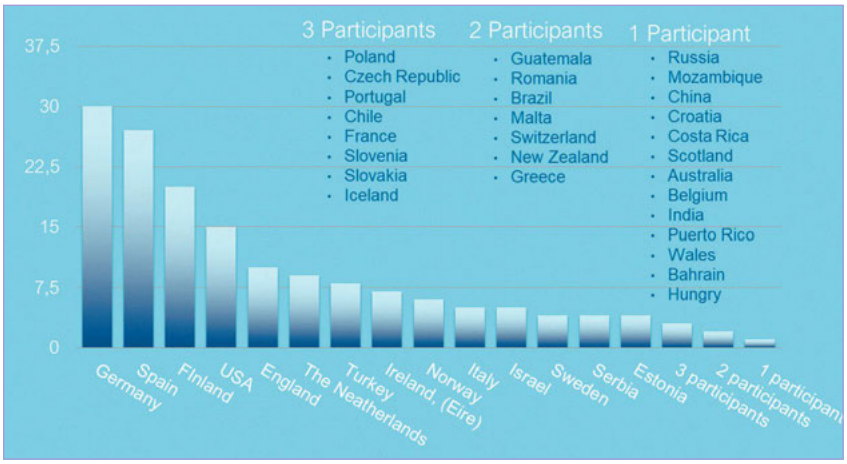

Figure 1. Names and percentage of participants from countries.

Figure 2. Participants discussing during a poster session

ing of chemistry. The outstanding scientific proposal was accompanied by events of a social and cultural nature: participants enjoyed a reception and guided tour of MNAC, CosmoCaixa and the Casa de la Convalescència, as well as the Royal Academy of Medicine of Catalonia.

The book of abstracts can be found at: http://taller.iec.cat/quimica/ecrice/book-of-abstracts/index.html.

Plenary lectures

Plenary lectures were related to the incorporation of ICT in the teaching-learning of chemistry, the nature and history of chemistry, scientific literacy in chemistry, teaching of chemistry based on context and in inquiry, and the evaluation of learning. There were a total of 5 plenary lectures, around which ECRICE 2016 was build. The first one was given by Ton de Jong, from the Department of Instructional Technology, Faculty of Behavioral, Management and Social Science at the University of Twente, in The Netherlands, under the title «Online labs in science education, new possibilities for active student learning». The premise for this lecture was how active learning engages students while also proving to be an effective form of science learning, and that inquiry learning with online laboratories fits very well with this approach of active learning. The second plenary lecture was on «Learning science through contemporary research vs. using a historical approach» and was presented by Rachel Mamlok-Naaman and Ron Blonder, from Department of Science Teaching of the Weizmann Institute of Science, Israel. This lecture focussed both on a historical approach for science teaching that supports students' understanding of the nature of science as well as their motivation to study science and in learning science through contemporary research and cutting-edge development of scientific ideas. Ilka Parchmann, from Leibniz-Institute for Science and Mathematics Education of Kiel, Germany, presented her plenary lecture on «How to engage students in and for science? Perspectives for school and out-of-school learning». Many initiatives have been developed to raise students' interests in STEM careers, such as curriculum development programs, pointing out the relevance of science (context-based learning, CBL) and/or the excitement of scientific inquiry (inquiry-based learning, IBL), extracurricular learning opportunities like science competitions or the huge development of student labs with more than 300 registered labs in Germany. This plenary lecture explored the different fields of activities and the state of research on effects and conditions of successful school and out-of-school science enrichment activities. Furthermore, «Inquiry and its assessment: lessons from research and practice» was the 4th plenary lecture and was given by Odilla E. Finlayson, from Dublin City University, Ireland. This presentation explored the interrelation between learning aims, teaching strategies and assessment practices within the context of an inquiry framework and the learning potential and variety of assessment opportunities was discussed. The final plenary lecture was given by Melania M. Cooper, from Chemistry Department of Michigan State University, USA, and had the title «Evidence-based approaches to curriculum reform and assessment». The lecture discusses evidence-based reform arguing that there is a large body of work from the learning sciences providing us with insights into how people learn, however, relatively little of this understanding has made its way into the designing of science curricula and the assessments of student learning.

Figure 3. A keynote lecture in room 1 (Sala Prat de la Riba).

Keynote lectures

There were a total of 11 keynote lectures (fig. 3): Diana Bunce with «A new approach to pedagogical change: research the problem and involve the teachers in the process», Sarah Hayes with «Informal chemistry education: a missed opportunity?», Astrid Bulte presented «An instructional framework for transforming authentic practices into contexts for the outline of chemistry curricula», Ingo Eillks with «How to transform the learning of chemistry in relevant education», Norbert J. Pienta with «Studying student behaviour and chemistry skills using brower-based tools and eye-tracking hardware», Cecília Galvão with «Inquiry-based learning: some results of research in chemistry education in Portugal», Marcy H. Towns with «Under-

graduate chemistry laboratory: goals and novel assessments», Maija Aksela gave «Promoting holistic sustainable development through chemistry teacher education», Martin Bílek with «Virtual and real environments interaction in chemistry education». The eleventh and last keynote lecture was given by Dragica Trivic and dealt with «The development of pre-service chemistry teachers' pedagogical content knowledge through research activities». Murat Kahveci finally could not attend the conference although there was the possibility of hearing and viewing his talk «Advancing chemistry education research: dual-process theories, learning objects and student response systems» via the video that was sent to the organizers.

Chemical demonstrations

A total of 5 chemical demonstrations (figure 4) were given during ECRICE 2016 and included engaging topics such as «Nanotechnology experiments for general chemistry laboratory classes». David A. Katz utilises low-cost nanotechnology experiments, and related demonstrations using nanoparticles, cholesteryl liquid crystals and aqueous ferrofluid. These hands-on experiments along with discussions about the application of these experiments give students an understanding of nanotechnology. The chemical demonstration «React… explode! From alchemists to catalysts through experiments you can do in the classroom» was performed by Josep Duran and Pep Anton Vieta, who developed this project to fight against the lowering of interest in chemistry by high school students. Klemens Kock presented «Inquiring energy through simple experiments: a differentiation of concepts to strengthen energy literacy», in which explored enthalpy as a more convenient concept than energy for chemical reactions and explained the principles of galvanic cells. Robert Worley presented the demonstration «In a little you can see a lot: the impact of practical microscale chemistry on chemical education» with the aim to promote microscale techniques and the use of modern inexpensive IT facilities. The final demonstration was given by Carles Lozano on the «APQUA project: 25 years of integrated inquiry-based, issue-oriented and hands-on science education in grades 4 to 11». Materials are organized into modules in which problem-solving situations and experiments provided, and guided inquiry and cooperative teamwork promoted.

Figure 4. A chemical demonstration in room 2 (Sala Pere i Joan Coromines).

Symposia

A symposium was held on each of the 4 days of the conference. The symposium «Towards more relevant chemistry education» was chaired by Ingo Eilks, from the University of Bremen, Germany, and Avi Hofstein, from The Weizman Institute of Science, Israel, and had 4 contributions that deal with directions and obstacles regarding research, and development and practice for a relevant chemistry education. The symposium «Teacher training made irresistible» was chaired by Sevil Akaygun, from Bogazici University in Turkey, and had 4 communications dealing about RRI and teachers' profiles in teaching RRI. The symposium «The irresistible way to engage school students with RRI» was chaired by Jan Apotheker, University of Groningen, and had 5 communications that included data and reflections about the introduction of RRI into the secondary school classroom and students' attitudes toward RRI in the context of nanotechnology. The symposium «Language and chemistry teaching and learning» was chaired by Silvija Markic, University of Bremen, Germany, and had 4 contributions that deal with the students' understanding of language used in chemistry instruction, and the use of chemistry corpus to develop academic writing skills resources.

Social events

Besides the enriching breaks for coffee and the times for lunch in the cloister of the venue building (figure 5), a variety of social events were organised for the attendees to help enjoy their time in Barcelona. Among the conference sessions, guided tours of the Casa de Convalescència, the venue for ECRICE 2016, and tours of the Royal Academy of Medicine of Catalonia were provided. A welcome reception was held of the iconic terrace of the MNAC (figure 6). The attendees enjoyed a reception from a privileged location: sweeping views across Barcelona up to the beautiful horizon of Collserola, where the church of Tibidabo had been especially illuminated. The famous musical

Figure 5. Lunch time at the cloister during ECRICE 2016.

Figura 6. Welcome reception in the MNAC.

coloured water fountains of Montjuïc took the colours used in the ECRICE 2016 theme and a special playlist had been chosen. Attendees were able to take advantage of a private visit and tour of MNAC. The conference dinner took place at the Museu d'Història de Catalunya, with its privileged views across the old harbour. The final plenary session and closing ceremony was held in CosmoCaixa, the science museum (figure 7) nestled amongst the unique modernist villas located below Tibidabo. Guided tours of the museum and planetarium were available.

A reflection from the Organizing Committee

Oral feedback was gained from participants and many e-mails from attendees from different countries giving thanks and congratulations to the organizers. Most feedback said that the event was successfully because of two main reasons: the content and the good organization. The content was felt to be of good quality and that the selection of invited speakers had been well chosen. The invited speakers were current researchers and chemistry teachers of reference, and as such they brought experience and reflections that were very much appreciated by all. They contributed with new tends, interacted with the participants and shared their

Figure 7. Visiting the science museum CosmoCaixa.

experience and results. The work of the members of the International Advisory Board composed by delegates of the Division of Education of EuChemS was very important and their advice and guidance were invaluable.

The main responsibility was held by the Organizing Committee, which was main responsible for content, abstracts selection and had especial contribution in the organization with the support of the Technical Secretariat in charge of Pacific World. We had together many meetings to organize the event and had also meetings to collect feedback from participants, and to reflect on the event. Issues which could be improved upon included problems with internet connexions, this was quickly solved. The conference schedule was tight, but was, on the whole kept on time, due to the exacting measurements used by the committee. Further to this, there were several complaints about the heat from participants who found Barcelona to be hotter than they would have expected for the time of year, however, our friends from more northern climes soon got used to it, and were enjoying the late summer by the end of the conference.

Webpages and references

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