

China annual report for Committee on Chemistry Education 2012

Abstract

In 2012, in order to promote the development of chemistry education in China, the Division of Chemistry Education of Chinese Chemical Society has organized five conferences on chemistry education, covering chemistry education in high school, in the medical speciality, the graduate students' chemistry education, and the chemistry education in China. More than 150,000 senior high school students participated in the Chinese Chemical Society National Chemistry Contest for High School Students. In addition, the Chinese Chemical Society has organized the 2012 National University Chemical Video Contest.

1. National educational policy

Describe any changes/ developments in national educational policies concerning chemistry that have taken place in primary, secondary and tertiary education.

(1) Since the year of 2000, the changes/ developments in national educational policies of China concerning chemistry that have taken place in primary, secondary and tertiary levels are culturing scientific literacy of all students, constructing "Big Idea", and instruction studies based on school.

(2) *Guidance of Professional Norms of Chemistry Majors in Chinese Universities* was proclaimed and published in October of 2011.

2. Events in chemical education

Describe major events conferences that took place concerning chemistry education in your country.

(1) The First Summit of National Chemistry Education in High School took place in April 10-12, 2012 at Chengdu, China. There were more than 100 participants including schoolmasters as chemistry teachers.

(2) The Seventh National Conference On Implementing Results and Experiences for chemistry new curriculum in high school took place in April 12-14, 2012 at Chengdu, China. There were more than 500 high school chemistry teachers participants.

(3) The branch conference of Chemistry Education of the Chinese Chemical Society with its 28th Academic annual meeting took place in April 13-16, 2012 at Chengdu, China. There were more than 100 participants.

(4) The 6th conference of chemistry education in medical speciality took place in July 20-23, 2012 at Quanzhou, China. There were about 100 participants.

(5) The 2nd conference of graduate students' chemistry education took place in September 20-22, 2012 at Lanzhou, China. There were more than 80 participants.

3. Activities of the national adhering organizations of IUPAC, usually the chemical society.

Chinese Chemical Society as the adhering organization of IUPAC celebrated its 80th anniversary in 2012. CCS organized 32 conferences with more than 16000 participants, including the biennial congress taking place in Chengdu with about 6000 people. CCS has solicited participation of Chinese chemistry educators in ICCE-Rome. Prof. Zhigang Shuai as the national representative of IUPAC-CCE helped to write review reports on the submitted abstracts and to make suggestion for speakers.

4. Publications about chemical education in your country, including websites/ books magazines

(1) The monthly magazine of "Chemical Education"(Chinese) sponsored by Chinese Chemical Society have being published since 1980 in College of Chemistry , BeijingNormal University, Beijing, China.

(2) A book entitled "The Rapid Development of Chemistry in China 1982-2012" was issued in 2012 in the occasion of celebrating CCS 80th anniversary.

5. Activities relating chemical industry and education

The Chinese Chemical Society and the Association of International Chemical Manufacturers (AICM) held the First National University Chemical Video Contest in 2012 at Shanghai, China.

6. International activites that were visited

Prof. Mei-Hung Chiu, the Chairman on Chemistry Education, IUPAC, invited by Prof. Lei Wang, visited Beijing Normal University in 2012. During the CCS Congress in Chengdu, April 13-17, 2012, leadership from national/regional chemical societies from US, UK, Japan, Singapore, South Korea, Taipei, etc have been invited. Some of them delivered congratulation speeches in the opening ceremony. World Forum of Chemistry Leadership was organized featuring in international collborations to meet global challenges.

7. other events or activities

8. Brief resume or CV of the national representative.

Zhigang Shuai, born 1962, in Jiangxi, China, Ph.D. 1989 Fudan University, Shanghai. 1990-2001, postdoc and research associate in the University of Mons, Belgium. 2002-2008, "Hundre-Talent" professor at the Institute of Chemistry of the Chinese Academy of Sciences in Beijing. 2008-date, Changjiang Scholar Chair professor in Theoretical Chemistry, Tsinghua University, Beijing. His research interests are theoretical chemistry and modeling of the organic functional materials for the opto-electronic properties. 270 publications with h-index= 45. Outstanding Young Scientist Award (NSFC, 2004) and Chinese Chemical Society-AkzoNobel Chemical Sciences Award (2012). Elected member of the International Academy of Quantum Molecular Science (2008), Fellow of the Royal Society of Chemistry (2009), Foreign Member of the Academia Europaea (2011), and Associate Member of the Royal Academy of Belgium. Associate Editor-in-Chief of "Acta Chimica Sinica" and "Frontiers of Chemistry in China". Deputy-Secretary General of the Chinese Chemical Society (2007-2010, 2011-2014). IUPAC CCE National Representative (2011-2012, 2013-2014).

Annual National Report on Chemical Education in Finland 2012-2013

1. Abstract

The Division of the Chemical Education is the national Society for chemistry teachers. The intension of the division is to inform and to offer seminars and other appointments for the chemistry teachers at all educational levels and to maintain the cooperation between teachers and the Finnish industry. The division has around 300 members all over Finland.

During the past three years the Finnish Chemical Societies has prepared the renewal and simplification of the organization of chemistry societies. This work will be completed during year 2013.

2. National Education Policy

One of the basic principles of Finnish education is that all people must have equal access to high-quality education and training. The key words in Finnish education policy are quality, efficiency, equity, and internationalization.

In Finland everyone has the right to free basic education, including necessary equipment and text books, school transportation and meals. Post-compulsory education is also free: there are no tuition fees in general and vocational upper secondary education, in polytechnics or at universities. Education is primarily co-financed by the Government and local authorities.

The Finnish National Board of Education has begun to prepare the new national core curriculum for basic and pre-primary education.

The renewed core curriculum will be completed by the end of 2014. New local curricula that are based on this core curriculum should be prepared by the beginning of school year 2016–2017.

The preparation is carried out in working groups that focus on structure and objectives, conceptions of learning, support for learning and the different subjects taught in basic education. Each working group consists of educational officials, researchers, and teachers.

The preparation of the curriculum is interactive. All education providers can follow the preparation and give feedback at the different phases. They are also encouraged to involve students and their parents in the process. The Finnish National Board of Education has begun to prepare the new national core curriculum for basic and pre-primary education. The new curriculum will be based on the Decree on national objectives and distribution of teaching hours in basic education (422/2012), issued by the Government in June 2012.

The renewed core curriculum will be completed by the end of 2014. New local curricula that are based on this core curriculum should be prepared by the beginning of school year 2016–2017.

3. Events in Chemical Education

Organizations organizing annually seminars, further education, and offering services etc. for chemistry teachers are the following:

- The Finnish National Board of Education, <http://www.oph.fi/english>
- The Finnish Association for Teachers of Mathematics, Physics, Chemistry and Informatics MAOL <http://www.maol.fi/maol-ry/?L=2> is a pedagogical subject organization which works for the advancement of mathematics and natural sciences in Finnish society) offering local pedagogical club functions, networking, further education, and support material for education
- Finland's Science Education Centre LUMA <http://www.helsinki.fi/luma/english>, is an organization coordinated by the Faculty of Science of the University of Helsinki to bring schools, universities, and industries together.
- The Finnish Chemical Society, <http://www.kemianseura.fi>, which offers in-service training

The European Conference on Research in Chemical Education (ECRICE) offers researchers and teachers the possibility to exchange experiences on research in chemical education carried out at every educational level - from primary school up to graduate studies. The University of Jyväskylä will host the ECRICE 2014 conference.

4. Activities and Liaison with the Chemical Industry

The Division has in co-operation with the LUMA-center organized The Day of Chemistry during the ChemBio Finland conference and exhibition in Helsinki. ChemBio Finland is focused on chemistry or biotechnology products and services, and the event brings together people from the industry and the educational field.

5. International and European Initiatives

Members of the Finnish Chemical Societies and its divisions have participated in numerous international networks, expert committees, and projects for example in the IUPAC Committee on Chemistry Education, Division of Chemical Education of the European Association for Chemical and Molecular Sciences, and in European Chemistry and Chemical Engineering and Education Network activities.

Mariann Holmberg

Lecturer

Arcada, Finland

**Vice chairperson Society for chemistry teachers
chemistry teachers**

Kati Vilonen

Teacher and researcher

**Aalto University,
School of Chemical
Technology,
Finland**

Chair Society for



Prof. Dr. Christiane S. Reiners

University of Cologne

Institute of Chemistry Education

Herbert-Lewin-Str. 2

D-50931 Köln

Tel.: +49-221-470-4648

Email: christiane.reiners@uni-koeln.de

Report 2012/2013

1. Abstract

On school level, discussions about the length of school years at the Gymnasium and the early introduction of science classes are ongoing. The first test results of the Science Standards shall be presented in October 2013. The German Chemical Society and the Foundation of the Chemical Industries continuously support in-service teacher training and innovative projects at schools and in chemistry education on a high level.

On university level, the Federal Ministry of Education has initiated two large programs on quality development of tertiary teaching and learning; one of them specifically focussing on university pre-service teacher training.

2. National Educational Policy

Secondary Level and below

On school level, two discussions are still continuing that also effect teacher training, curriculum development and research: The first is the reduction of one year of school at the Gymnasium (lower and upper secondary) from nine to eight years. Some states have offered their schools to choose while others had to change to eight years only. The second one is the decision for an integrated introduction of science in the first years of secondary education (years 5 and 6 in most states). While some states have implemented this entry subjects in all types of school, others do not offer it to their Gymnasium students. This effects the start of chemistry education in particular, as this is usually the last of the three science subjects, being introduced too late for the development of interest for many students.

A very positive activity to report is the support of the German Chemical Society (GDCh) and the Chemical Industry. As in the previous years, the German Chemical Society and the chemical industry (Fonds der Chemischen Industrie / VCI) are funding centres for in-service training of chemistry teachers at seven universities with a total amount of about Euro. In 2012, 280.000€ had been invested, with a total number of 464 courses and 7211 participants. A new center had been opened in Karlsruhe.

The foundation of the Chemical Industries also sponsors innovative projects at schools and in chemistry education.

On a national level, tests for the science standards have been developed and analysed, first results for two areas of competence (application of subject-matter knowledge and methods of investigation) will be presented in October 2013.

Tertiary Education

The Federal Ministry of Education (BMBF) has initiated two large programs to support the quality development of university studies. One is focussing on teaching and learning at tertiary level in general. A second one has been announced for 2014, focussing on teacher training programs at the university.

Since 2012, universities did not start Diploma study courses in chemistry anymore, so the change to Bachelor and Master, following the Bologna reform, has now been completed. The numbers of chemistry entry students have slightly decreased at the universities by 15%. More information are given at the website: www.gdch.de/statistik.

[Some universities offer a special BA/MA-program for chemistry teachers.](#)

[The process of reaccreditation has begun at several universities.](#)

3. Activities of the German Chemical Society (GDCh) and the Chemical Industry Association (VCI) regarding education (for other topics see the annual reports of the GDCh and the VCI)

The support of teacher training and school programs have been named in section 2.

The annual conference had been organized at the University of Education (Pädagogische Hochschule) in Freiburg in September 2012. More than 300 participants were enjoying 16 experimental and 28 discussion talks as well as 52 posters. For the first time, the in-service training centers offered workshops for teachers as well. The plenary lectures focused on the topics of energy, related to the educational work on lithium ion cells of the colleagues at the University of Education in Freiburg.

4. New Publications

The brochure about studying chemistry has been published in its 8th edition: www.gdch.de/studium

In continuation of the International Year of Chemistry in 2011, topics and tasks from the International Chemistry Olympiade, IChO, are used to prepare information and problems for school students in the journal of the division of chemical education, "Chemkon".

5. Liaison with the Chemical Industry

On European level a new project EC2E2N has been approved. Its objective is "Chemistry and Engineering skills for Europe in 2020. It is a three years project with 7 Work Packages. For further information see <http://ectn-assoc.cpe.fr/network/ec2e2n/>

6. International Initiatives

Many universities, especially those with the label of "Excellence" have developed international strategies. The University of Cologne (UoC), for instance, has come up with an international Faculty Programme which aims at attracting outstanding international researcher who already have intense collaboration with researchers based at the UoC. This novel programme will be rolled out and further developed in the key profile areas increasing their visibility and competitiveness at an international level. The programme will also contribute to the internationalisation of teaching especially at the post graduate level.

It should also be mentioned that the GDCh has funded six graduates to participate in the IUPAC conference in Istanbul. With these grants the GDCh offers young chemists the possibility to attend the biggest international conference and to get into contact with the international community.

7. CV of the delegate

Christiane S. Reiners has become Director of the Institute of Chemistry Education at the University of Cologne in 1997. 2003-2005 she was Vice-rector at the UoC. Since 2008 she is the National Representative of the IUPAC Committee on Chemistry Education (CCE) and since January 2013 she is member of the Administration Council of EC2E2N. One of her main research interests is in Nature of Science.

Annual Report on Chemical Education in the Republic of Ireland June 2012-June 2013

Peter E. Childs

Emeritus Senior Lecturer, University of Limerick, Limerick, Ireland

Peter.childs@ul.ie

Summary:

Education in Ireland is in a state of rapid change, despite economic restrictions, due an energetic and reforming Minister of Education. Several initiatives announced this year have implications for chemical/science education.

- a) A major restructuring of the Junior Certificate (age 12-15) is underway with the changes starting to come into effect in 2013. Three subjects are compulsory (English, Mathematics and Irish) with 240 hours teaching time and schools may choose between 6-8 other subjects (200 hours a reduction in time), which includes Science (a single, combined subject). There is also an option for schools to offer and even create up to four short courses (100 hours). Science is not compulsory and students will do less science. There will be less emphasis on a terminal examination and more continuous assessment. (<http://ncca.ie/framework/doc/NCCA-Junior-Cycle.pdf>)
- b) A major revision of the Leaving Certificate (age 15-17) Science subjects (Biology, Chemistry and Physics) is also underway. New syllabi have been produced, sent out for consultation and revised. A major change is the inclusion of practical assessment for the first time, examined in schools through a practical examination. There are also proposals to revise the style and structure of the examination papers to encourage more creativity, critical thinking and understanding rather than rote learning and regurgitation of answers to standard questions. (http://www.ncca.ie/en/Publications/Reports/Senior_Cycle_Science_Report_on_the_consultation.pdf)
- c) A major shake-up of third level has also been announced: some Institutes of Technology will merge to form technological universities; teacher education providers will merge their activities into a smaller number of centres; higher education institutions will form regional clusters to encourage cooperation and sharing of resources. (<http://www.heai.ie/content/new-landscape-higher-education>)
- d) Teacher education providers will merge their activities into a smaller number of regional centres, based on the recommendations of an International Review Panel (<http://www.education.ie/en/Press-Events/Press-Releases/2012-Press-Releases/Report-of-the-International-Review-Panel-on-the-Structure-of-Initial-Teacher-Education-Provision-in-Ireland.pdf>)
- e) The length of the Postgraduate Diploma in Education (major route to producing second level science teachers by the consecutive model) has been increased from one year to two years from September 2013. The Teaching Council is proposing to change the registration requirements for second-level teachers to strengthen their subject knowledge, and this has implications for those institutions producing teachers, as it may mean restructuring courses. (<http://www.teachingcouncil.ie/teacher-education/initial-teacher-education-ite.191.html>)
- f) Enrolments in chemistry at second level and at third level continue to increase, with a greater demand for science courses at third level.

International science education projects

For a small country Ireland has become a major player in international science education projects. Dublin City University is the coordinator for two FP7 Science and Society projects in Inquiry Based Science Education: ESTABLISH (<http://www.establish-fp7.eu/>) and SAILS (<http://www.sails-project.eu/portal>). Ireland is also a partner in PROFILES (<http://www.profiles-project.eu/>) through University College Cork. The University of Limerick was a partner in the Tempus project SALiS, Student Active Learning in Science, (<http://www.salislab.org/>), which ran from 2010-2012. A special issue of *Chemistry in Action!* was published in 2012 (#97, Summer 2012) to summarise the work of the project. The University of Limerick is also a partner in two new FP7 projects starting in 2013: Chain Reaction and TEMI. European projects are an important source of funding in Ireland for science education research and development, as there is little support for science education research otherwise. Limerick Institute of Technology is a partner in the Comenius project Chemistry is all around us (<http://chemistrynetwork.pixel-online.org/>) and the project website contains useful information on teaching resources in chemistry.

Courses, conferences and workshops

The two FP7 projects ESTABLISH and SAILS based at Dublin City University (DCU) have generated a number of training workshops, both for Irish teachers and also for international partners. The science and mathematics education conference SMEC 2012 focused on inquiry-based science education and the ESTABLISH project. (<http://www.dcu.ie/smec/index.shtml>) DCU was also the venue for the annual ChemEd-Ireland conference for chemistry teachers (<http://www4.dcu.ie/conferences/chemed2012/index.shtml>). The Proceedings of these conferences (which started in 1982) are published in the Spring issue of *Chemistry in Action!* and the 2013 conference will be held in October in Limerick Institute of Technology.

In 2012 the 8th Irish Variety in Chemistry Education meeting was held in Dublin Institute of Technology for third-level chemistry lecturers (modelled on the successful UK Variety meetings) see <http://teachingchemistry.net/home/index.php/archives/289>. In July 2013 the University of Limerick will host the 5th European Variety in Chemistry Teaching (Eurovariety), an activity of the EuCheMS Division of Chemical Education. (www.eurovariety2013.ul.ie) There is also an annual conference organised by NAIRTL for third-level lecturers across all disciplines, with the aim of sharing ideas and innovations, which was held in June 2013 with the theme 'Threshold Concepts'. (<http://www.nairtl.ie/index.php?pageID=1>)

The first Boyle Summer School (<http://www.robertboyle.ie/>) was held in 2012 in Waterford and a second one is happening in July 2013, emphasising the contributions of the Irish scientist Robert Boyle.

The Royal Society of Chemistry Education Division Ireland Region supported the first workshop for non-specialist teachers in 2012 and in June 2012 two courses were held, one in Dublin and One in Limerick. The aim of the workshops is to help teachers who are teaching chemistry but do not have chemistry in their degree, and are based on a model used in the UK. (A major programme was launched in 2012, coordinated by the University of Limerick, has been started to upskill non-specialist mathematics teachers, since survey had shown that many mathematics teachers in Ireland were non-specialists. www.nce-mstl.ie)

The annual Chemistry Demonstration Workshop for teachers and trainee teachers was held in June 2012 and June 2013 at the University of Limerick, and aims to give chemistry teachers and trainee chemistry teachers more confidence in doing chemical demonstrations.

Ireland runs a very successful national Young Scientist's Exhibition each January (a science fair), which draws a large number of entries from the whole of Ireland and the winners have gone on to be very successful in international competitions. It is a major showcase of young talent and creativity. January 2013 marked the 50th annual event (<http://www.btyoungscientist.ie/>). More recently Discover Science started the annual SciFest competitions, which have gone from strength to strength. They are held each in third-level colleges around the country and are open to senior primary and junior second-level pupils. (<http://scifest.ie/>) SciFest has been successful in arousing an interest in science in a larger number and wider range of pupils than the more selective Young Scientist's Exhibition. The success of these events is in marked contrast to the relative unpopularity of science at second-level.

In 2012 and 2013 workshops were held in July in the Eureka Centre, University College Cork to explore ways of assessing practical work for the revised Leaving Certificate Chemistry course, and prepare teachers for the new practical assessment. (<http://www.ista.ie/news/assessment-practical-work-revised-leaving-certificate-chemistry-syllabus>)

The Irish Science Teacher's Association (ISTA) holds regional meetings around the country and an annual conference (in April 2013 in Gorey, Co. Wexford) and publishes SCIENCE magazine three times a year. (<http://www.ista.ie/>)

Publications

Chemistry in Action! is the only dedicated publication for Irish chemistry teachers (published three times a year) and 2013 will see the production of the 100th issue. This publication is free to any teacher requesting it. Science teachers who are members of the ISTA also receive SCIENCE three times a year. Ireland also has a popular science magazine, Science SPIN (<http://www.sciencespin.com/>).

Curriculum and examinations

A major restructuring of the Junior Certificate (age 12-15) is underway with the changes starting to come into effect in 2013. Three subjects are compulsory (English, Mathematics and Irish) with 240 hours teaching time and schools may choose between 6-8 other subjects (200 hours a reduction in time), which includes Science (a single, combined subject). There is also an option for schools to offer and even create up to four short courses (100 hours). Science is not compulsory and students will do less science. There will be less emphasis on a terminal examination and more continuous assessment. (<http://ncca.ie/framework/doc/NCCA-Junior-Cycle.pdf>) This may have major implications for the place of science in the junior cycle curriculum and also for the take-up of the senior cycle science subjects. It is possible that fewer students may take science and the content of the course has also been reduced. This may have the effect of reducing the numbers taking senior cycle science subjects: junior science feeds into five separate senior cycle courses.

A major revision of the Leaving Certificate (age 15-17) Science subjects (Biology, Chemistry and Physics) is also underway. New syllabi have been produced, sent out for consultation and revised. A major change is the inclusion of practical assessment for the first time, examined in schools through a practical examination. There are also proposals to revise the style and structure of the examination papers to encourage more creativity, critical thinking and understanding rather than rote learning and regurgitation of answers to standard questions.

http://www.ncca.ie/en/Publications/Reports/Senior_Cycle_Science_Report_on_the_consultation.pdf

In a time of economic austerity, where many schools have lost teachers and science subjects may be dropped due to the lack of specialist teachers (<http://www.asti.ie/publications/other/>), imposing major curriculum change at both junior and senior cycle seems unwise. The introduction of practical assessment for senior cycle science subjects, although desirable, presents major logistical problems, will be disruptive to schools and will be very expensive.

The latest survey of 2012 examination statistics in science (*Chemistry in Action!*, #98, 2013) shows similar trends to 2011: Biology is by far and away the dominant science, followed by Chemistry and Physics. Chemistry numbers and percentage share continue to rise but Physics is still in decline and Agricultural Science overtook Physics in 2012 (see Figure 1).

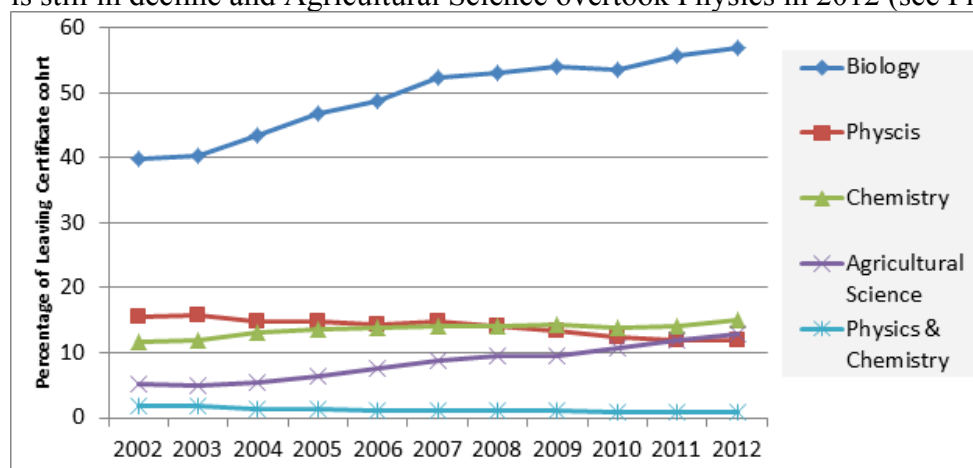


Figure 1 Enrolments in LC science subjects as a percentage of the student cohort

The numbers opting to study science at third level has continued to increase and this has meant an increase in the points required for many science courses and hence the quality of students choosing to degree courses and sub-degree courses. In 2013 the numbers putting science as a first choice went up by 4% (up 67.5% since 2008).

National report from Italy

Rome 2012: the conference in numbers



The conference in Rome has been a remarkable event. Just some numbers:

574 registered delegates, from 71 countries;

624 abstracts submitted;

356 oral communications;

237 posters.

Participants

Participants came from 71 countries; the most numerous were: Germany, Italy, USA, Turkey. 85 from US; 43 from South America; 284 from Europe; 35 from Africa; 114 from Asia, and 16 from Australia.

Topics, Sessions & Workshops:

Communicating chemistry (15 sessions & workshops)

Didactics of Third level chemistry (16 sessions & workshops)

ICT and multimedia in teaching chemistry (9 sessions & workshops)

Didactics of Second level Chemistry (16 sessions & workshops)

Laboratory work in teaching chemistry (12 sessions & workshops)

Liberato Cardellini

Report about chemistry education events in Japan.

Masahiro Kamata (Japan)

Although this is not limited to chemistry education, a recent trend on education in Japan is internationalization of secondary/university education, which will encourage more students to go and study abroad.

In 2012, the University of Tokyo announced to end spring enrollment and change to a two semester system with autumn enrollment in accordance with international standard. This is because the number of the Japanese students studying abroad and international students studying at the University of Tokyo is low in comparison to leading overseas universities, and they considered that the current April enrollment can be a barrier to the internationalization. Although this became big news in Japan when it was announced, the University of Tokyo has recently cancelled the fall enrollment and is now planning to implement a quarter system, instead.

MEXT (Ministry of Education) is now increasing the use of the International Baccalaureate (IB) in secondary education. They are planning to increase the number of IB high schools up to 200 during five years.

(The International Baccalaureate (IB) and The Ministry of Education, Culture, Sports, Science and Technology of Japan (MEXT) on Thursday announced the launch of a collaborative project which will see the development of a Dual Language IB Diploma and which will facilitate access to an IB education across Japan.

(May. 24, 2013 from www.japantoday.com)

Others (Topics related to 3.11 Great Eastern Japan Earthquake)

Since laboratory facilities of many schools were damaged in 3.11 disasters, micro-scale experiments have been reevaluated very useful in North East area of Japan. Prof. Kazuko Ogino is now engaged in diffusing the use of micro-scale experiments as reconstruction assistance to the region with CSJ.

As a very local topic...

Radiation education in pre-service and in-service teacher training is urged by MEXT quite recently, and a new curriculum is being built for teacher education course in my university (Tokyo Gakugei University) now.

CHEMISTRY EDUCATION IN MALAYSIA

The IKM Education and Community Section Committee has been active in promoting both formal and informal chemical in schools and at the tertiary level. The main activities of the Section in the 2012/2013 session were the following:

- I. Kuiz Kimia Kebangsaan Malaysia (K₃M) 2012
- II. Karnival Kimia Malaysia (K₂M) 2012
- III. 44th International Chemistry Olympiad (IChO) 2012
- IV. Jawatankuasa Pendidikan Sains dan Matematik Kebangsaan (JPSMK)
- V. IUPAC Committee on Chemistry Education (CCE) and 24th International Conference on Chemical Education (24ICCE) 2016

I. Kuiz Kimia Kebangsaan Malaysia (K₃M) (Malaysian National Chemistry Quiz) 2012

1. Kuiz Kimia Kebangsaan Malaysia (K₃M), or the Malaysian National Chemistry Quiz 2012, was jointly organized with the Ministry of Education (MOE) Malaysia.
2. K₃M 2012 was held on Thursday, 19th July 2012 in all schools taking part in the Quiz.
3. A total of 33,556 (31,982 in 2011) students from 743 (669 in 2011) schools throughout Malaysia, comprising 4,321 (4,045 in 2011) at the Senior Level and 29,235 (27,937 in 2011) at the Junior Level, took part in K₃M 2012.
4. Three K₃M 2012 top scorers comprising two from the Senior Level and one from the Junior Level were awarded a special certificate and cash prize of RM 200 each. They received their awards at Malam Kimia 2012.
5. Eighteen K₃M 2012 top scorers will be selected for training for taking part in the 45th International Chemistry Olympiad (45IChO) in Moscow, Russia from 15 – 24 July 2013.

II. Karnival Kimia Malaysia (K₂M) (Malaysian Chemistry Festival) 2012

6. IKM, Ministry of Education (MOE), Academy of Sciences Malaysia (ASM), National Science Centre (PSN), Jabatan Kimia Malaysia (JKM) and PETROSAINS Sdn Bhd jointly organised **Karnival Kimia Malaysia (K₂M) 2012** with the theme of “Chemistry and Climate Change”.
7. **K₂M 2012** was held from July 7 – 8, 2012 at the National Science Centre (PSN), Bukit Kiara, Kuala Lumpur. About 200 students from the following six schools took part in **K₂M 2012**:

Sekolah Menengah Sains Kuala Selangor

Sekolah Berasrama Penuh Integrasi Gombak

Sekolah Menengah Teknik Kuala Lumpur

Sekolah Menengah Teknik Ja'far, Seremban

Sekolah Menengah Kebangsaan Agama Maahad Hamidiah, Kajang

Sekolah Menengah Agama bestari, Subang Jaya

8. **K₂M 2012** comprised lectures on issues related to Climate Change such as global warming, energy, water, food safety and sustainable lifestyles delivered by invited lecturers.

III. 44th International Chemistry Olympiad (IChO) 2012, University of Maryland, USA

9. A Malaysian team took part in the 44th International Chemistry Olympiad (IChO) 2012 which was held in University of Washington, Maryland, USA from 21 – 30 July 2012:

45th International Chemistry Olympiad (IChO) 2013, Moscow, Russia

10. Malaysia will send a team to take part in the 45th International Chemistry Olympiad (45IChO) 2013 to be held from 15 – 24 July 2013 in Moscow, Russia.

IV. Malaysia Education Blueprint (2013 – 2025) – National Committee on Science and Mathematics Education (JPSMK)

11. The Malaysian Government has come up with the Malaysia Education Blueprint for 2013 – 2025 as a educational blueprint to steer Malaysia to become a high income developed country.
12. One main focus of the Malaysia Education Blueprint is to engage parents, community and the private sector in education development plan.
13. A National Committee on Science and Mathematics Education (Jawatankuasa Pendidikan Sains dan Matematik Kebangsaan or JPSMK) to implement various recommendations on science education, IKM President, Datuk Dr Soon Ting Kueh, is appointed as a member of this Committee.

V. IUPAC Committee on Chemistry Education (CCE) Meeting and 22nd International Conference on Chemical Education (22ICCE), Rome, Italy

14. IKM President, Datuk Dr Soon Ting Kueh, Hon Secretary, Prof Datin Dr Zuriati Zakaria and Council Member, Dr Choo Yeun Mun attended the IUPAC Committee on

Chemistry Education (CCE) Meeting and participated in the 22nd International Conference on Chemical Education (22ICCE) held from July 15 – 20, 2012 in Rome, Italy.

15. At this Meeting, Datuk Dr Soon made a presentation to express IKM's interest to host the 24th International Conference on Chemical Education (24ICCE) in Kuching, Sarawak, Malaysia. The decision on the bid be will made at the CCE Meeting at 47th IUPAC General Assembly in Istanbul, Turkey in August 2013.
16. The bidding to host 24ICCE in Kuching, Malaysia in 2016 received the support of the Sarawak Convention Bureau and Malaysian Convention and Exhibition Bureau (MyCEB).
17. The 22nd International Conference on Chemical Education (22ICCE-11ECRICE) started with a Welcome Reception on the evening of Sunday, July 15, 2012. At the Opening on July 16, 2012 at the University of Rome, CCE presented the DCCEA to Prof Robert (Bob) Bucat and Prof Peter Mahaffy. The citation for Bob Bucat was read by Datuk Dr Soon Ting Kueh.
18. 22ICCE 2012 attracted close to 600 participants. Datuk Dr Soon presented an oral paper on "Inquiry-Based Science Education in Malaysia – Issues and Challenges". Prof Datin Zuriati and Datuk Dr Soon also presented a poster on "Generating Interest in Chemistry among the Younger Generation in Malaysia".
19. Datuk Dr Soon Ting Kueh continues to serve as the National Representative in CCE for 2012/13.

Annual National Report on Chemistry Education for IUPAC Committee on Chemistry Education in Taiwan 2012-2013

1. Abstract

Taiwan launched curriculum standards in 2010 in which the use of models to convey chemical concepts in the microscopic world was emphasized for teaching and learning in high schools. While the years of the compulsory education changed from 9 to 12 years, the Ministry of Education in Taiwan decided to have minor changes in the curriculum standards and then formed a new committee to develop new framework for the new educational system in 2017. Before then, MOE continuously supports in-service teacher professional development and innovative projects in schools at various levels. National Science Council also provides financial support for some high schools to collaborate with universities to develop innovative projects for improving science education at schools.

2. National educational policy

- (1) To promote the new curriculum standards of chemistry to high schools, Ministry of Education established a center for high school chemistry that has the following missions in 2005. The Chemistry Center is monitored by the Ministry of Education, National Taiwan Normal University, the Department of Education of Kaohsiung City, and the Kaohsiung Senior High School. This Center has been very active to promote chemistry education with various formats (such as teacher training workshops, students' hands-on activities, and lab skills competitions). The missions of the center are:
 1. To share resources and collaborate with education publication institutions to facilitate educators in curriculum development
 2. To update the Website frequently to (<http://chem.kshs.kh.edu.tw>) improve communication and collaboration
 3. To utilize the Website in all manners possible to simplify and improve all processes
 4. To examine the functionalities of the center's Website and consolidate its resources
 5. To create an online database of chemistry professionals and share with other similar databases
 6. To place all educational materials online to be shared with high school teachers nationwide.
- (2) In 2010, the government announced the formal chemistry curriculum and showed the differences between the draft version and the formal versions to

help teachers understand the changes of expected students' achievements and instruction. They are listed below:

Content Removed (Present in Draft, Absent in Formal):

- Grade 10: Chemistry and Daily Lives – Chemists and Abbreviated History of Chemistry
- Grade 10: Elements of the Natural World:
Water (Purification, Decontamination, “Softening”, and Ocean Resources)
Air (Pollution and Prevention)
Earth (Composition and Applications)
- Grade 10: Materials in Daily Lives –
Material Chemistry (Nano-material)
Pharmaceutical Chemistry (Drugs – Marijuana, Heroin, Dosage, Anti-inflammation Medication, Pain-killers...)
Food Chemistry (Composition of tea, coffee, starch, protein)
Textile Chemistry (Soap, detergent)
- Grade 11: Characteristics of Solvent – ionic reaction in the solvent
- Grade 11: Characteristics of Gases – Law of Dispersion (Fugitive effect of gas emission of gases)
- Grade 11: Rate of Chemical Reactions – Reaction Rate Law (zero order reaction)
- Grade 12: Types and Characteristics of Solvent – Colloidal Solvent and its application, colligative properties
- Grade 12: Balance in water solvent (Not involving the acid-base balance calculation of salt in water solvent)

Content Added (Absent in Draft, Present in Formal)

- Grade 10: Chemistry and Advanced Technology (Simplify the importance of chemistry to the development of advanced technology)
- Grade 10: Oceanic Resources (Briefly introduce renewable energy of Taiwan and the availability and development of ocean-based resources)
- Grade 10: Atoms and Molecules – Law of definite proportion and multiple proportions
- Grade 11: Nucleotides and nucleic acids
- Grade 12: Macromolecules of Organisms – DNA and RNA
- Grade 12: The Application and Development of Chemistry – Common Advanced Material (Common advanced materials such as semiconductor, liquid crystal, conductive polyacetylene, nanoscale)

- Grade 12: The Application and Development of Chemistry – Chemical Industry (Chemistry and Chemical Industry, Chemistry, Chemical Industry and Environment Protection and Sustainable Development)
- Non-Grade Specific: Appendix: Measurement of Material (Error, accuracy, precision and significant figures)

These changes were taking into account the teaching time and students' prior knowledge in chemistry.

3. Events in chemical education

- (1) The 5th International Conference on Network for Inter-Asian Chemistry Educators (NICE) is going to be held in Pingtung, July 25-27, 2013. This conference has been alternately held among Taiwan, Japan, and Korea to link chemistry educators together. It was initiated by representatives from these three countries. The aims of the 5th International Conference on NICE are promoting the communication between inter-Asian chemistry educators, exchanging the chemistry teaching strategies and materials in different countries, as well as sharing the fruitful results in research and practice. The conference provides a platform to bridge the gap between chemistry researchers and chemistry teachers, to increase the opportunities of the communication of theory and practice between researchers and practitioners (school teachers). Details of the conference can be seen at <http://www.5thnice.org/>.
- (2) Annual National Conference on Chemistry was held in Tainan, Taiwan in December 1-2, 2012. An award as the best article in chemistry education was given to an article related to learning and assessment with mobile phone in chemistry for promoting chemistry education. That was the first time to give an award for the best article published on Chinese *Chemistry* journal in 2012.
- (3) It has been three years since the Madame Curie Chemistry Camp hosted by Chemistry Society, Academia Sinica, and National Tsing-Hua University in 2011. In 2013, the camp mainly for high school students will be held from July 7 to 12 in Taoyuan, Taiwan. Program includes lectures and discussion panel, chemical experiments, visits to research institutions/science parks/factories, meeting Nobel Prize Laureates, and Night Talk with Academician of Academia Sinica.

- (4) The Center of Chemistry Subject continuously conducts 「 **Chemistry Delivery – Hands-on Science for Fun** 」 since 2010. This Center trained seed high school teachers to develop interesting and innovative experiments and then disseminated around the Island. This has been well received by teachers and students.
- (5) The Center has been holding Creative Chemical Experiment Game for high school students since 2007. The goals were to (A) foster student interests in chemistry and problem solving skills, (B) train students to think critically and learn independently, and (C) promote teamwork. For instance, one of the games was that Preliminary Game Question1: Comparing Buckyballs, bead molecule model.
- (6) The Center helps chemistry teachers to design and videotape several creative experiments. This project of Video of the Creative Experiment starts in 2012. <https://www.facebook.com/media/set/?set=a.571597466206434.1073741827.100000685569812&type=1&l=5023ce250e>
- (7) Effective Instruction and Multiple Assessment Science Teachers' Workshops were carried out in 2013. There were two goals, namely, Goal 1: to assist subject teachers to better adapt to the new curriculum. Goal 2: to promote continuing learning among teachers.
- (8) The Third Annual 3M Science Camp which will be held on July 20, 2013. Each school can send 2 participants (must be accompanied by a teacher) (<http://www.green3m.com.tw/Third3MScienceCamp.pdf>) to join the camp.
- (9) 2013 Taiwan Semiconductor Cup – Youth for Science. Foster students' abilities in science through workshops, sci-talks, and teamwork.
- (10) Workshops about Young Ambassadors for Chemistry were carried in many elementary, junior, high schools as well as community colleges and public venues. Over one thousands of students, teachers, and public were beneficial from doing the pre-design low-cost and daily use cosmetic. It is meant to promote chemistry education to the public and school teachers and students. This project is sponsored by the National Science Council.

4. CV of the NR

Mei-Hung Chiu is a Professor of Science Education at Graduate Institute of Science Education of the National Taiwan Normal University. Currently, she is the Chair of Committee on Chemistry Education (CCE) of IUPAC and an Associate Editor of *Journal of Research in Science Teaching* (JRST, SSCI journal). She was a recipient of the Distinguished Contribution to Chemical Education Award from the Federation of Asian Chemical Societies in 2009. Her

research interests are in the areas of assessment and learning in science education.

Annual National Report on chemical education The Netherlands 2011/2012 for EuchemS.

Jan Apotheke, board member education KNCV

Martin Goedhart

Abstract: The results of the second experimental central examination in secondary education indicate that the new chemistry curriculum based on concept context approach is at least as successful as a more traditional approach. This new curriculum is to be implemented in September 2013. The KNCV is working on a database with local experts and will be organizing master classes for vocational chemistry education.

1. National educational policy

Secondary Education. September 2013 will herald the introduction of a new chemistry curriculum in secondary education. The programme is based on a context approach. After learning basic principles of chemistry students will apply their knowledge on subjects related to sustainability, energy, green chemistry. The Netherlands is the first country in which these subjects have been included like this in the regular formal curriculum. In the context of sustainability design principles like 'cradle to cradle' and life cycle analysis are included in the curriculum. Content knowledge and competencies tested in the central examination has been limited to about 60% of the teaching time. This gives teachers freedom to choose their own emphases and subjects and to use different pedagogies.

Tertiary Education. The universities have adopted a policy in which all teachers need to obtain a University Teaching Qualification (UTQ). In the analysis of the Dutch Flemish Accreditation Organisation this UTQ has become an important factor. In order to improve the discussion about university science teaching the Innovation Centres for Academic Science Education (www.ICAB.NL) have been started. ICAB aims at stimulating collaboration and exchange of good practices between universities. In the ICAB Chemistry network two projects have started, one about the quality of assessment and the other about the development of an adaptive learning environment for abstract subjects. Some years ago the SNS (sectorplan natuurkunde scheikunde) was launched to increase the enrolment (especially girls) and decrease the drop-out of students in university physics and chemistry programmes. During the last few years numbers of enrolling students gradually increase.

2. Events in chemical education

There are two major conferences on chemistry education in the Netherlands. About 350 secondary teachers attended the two-day Woudschoten Conference in November 2012. About 300 teachers and technical assistants attended the one-day event in Nijmegen in April. Focus in both conferences was on the renewal of the chemistry curriculum. The technical teaching assistants had a separate conference in Leeuwarden with about 250 attendants.

The national meeting of the KNCV in 2012 was combined with the yearly meeting of the NNV, the Dutch Physics Society. This gave the possibility to have discussions and lectures about the interface between the two subjects. More specifically nanoscience was a big subject. Together a session dedicated to education was organized. In the chemistry session Gerard van Koten and Albert Pilot, who have played a major role in the revision of chemistry education in the last ten years, gave a presentation and were honoured.

We are very proud that the IGEM(The [International Genetically Engineered Machine competition \(iGEM\)](http://www.igem.org) team of the University of Groningen won the golden medal this year.

3. Activities of the Royal Dutch Chemical Society

Education is still one of the focal points for the KNCV. Together with the physics society, the biology society and the mathematics society work was done to start support centres for secondary education in which universities, higher vocational education and secondary education teachers work together. These centres have received financial support from several sources. Each centre will receive around 300.000 euro to develop a lasting sustainable support centre in the coming three years.

Together with the chemical industry and teacher associations, the KNCV supports C3 foundation, which popularizes chemistry and stimulates students to choose a chemistry career.

The golden teacher award in 2012 was awarded to Merel Hoogvliet, a teacher in Schagen North Holland, who will attend the 23rd ICCE in Toronto in August 2014.

The KNCV works on several projects that aim to improve the relationship between the job market and education. One of them is to organize master classes for teachers in secondary and higher vocational education. In these master classes attention is given to new developments in industry. Subjects in 2012 were Algae and Biodiesel. The KNCV is developing a database with members acting as local chemistry experts which is available for primary and secondary schools.

4. Publications

Apart from the biweekly magazine C2W, C2W information on chemistry teaching is disseminated by a number of websites:

www.nieuwescheikunde.nl www.scheikundeinbedrijf.nl, www.feelthechemistry.nl, www.c3.nl, www.kncv.nl/onderwijs new is www.chemievandiefde.nl

5. Chemical Industry

The KNCV cooperates closely with the VNCI on chemical education. VNCI and KNCV both support C# (see above). The support centres at universities (<http://www.betasteunpunten.nl>) will play a role in contacts between industry and education.

6. International or European activities

The KNCV supports several international organizations, which are active in the promotion of chemistry and chemistry education, including several Olympiads like EUSO, ICYS, IJSO, and the International Chemistry Olympiad.

The KNCV is member of ECTN, the European chemistry network for universities and chemical associations.

7. Other events or activities

The KNCV is represented in the Committee on Chemistry Education of IUPAC

8. Brief resume or CV of the delegate.

Jan Apotheker is a lecturer in chemistry education at the University of Groningen since 1998. After taking a degree in biochemistry in 1977 he taught chemistry for 25 years in a secondary school in Groningen. He is board member for education of the Royal Dutch Chemical Society. He is also a secretary of the committee on chemistry education of IUPAC. He is involved in the teacher-training department of the University of Groningen.

Martin Goedhart is professor in mathematics and science education at the University of Groningen. He is director of the master degree programme in science education and communication. He is involved in several organisations focused on research in science education both in the Netherlands as well as internationally.

REPORT TO IUPAC COMMITTEE ON CHEMISTRY EDUCATION

Morton Z. Hoffman

National Representative of the United States to CCE

At the end of 2012, the American Chemical Society (ACS) released the report of the Presidential Commission on “Advancing Graduate Education in the Chemical Sciences;” the term “chemical sciences” was understood to encompass chemistry, chemical engineering, biochemistry, molecular biology, materials science, polymer science, nanoscience, and other activities that focus on molecules, chemical reactions, and chemical properties. The Commission, appointed by ACS President Bassam Shakhshiri, consisted of distinguished chemists and other scientists from academia, industry, and governmental and non-governmental organizations. The work of the Commission was supported by a grant from the National Science Foundation and the ACS, mainly through its Presidential Discretionary Fund, and is available online at <www.acs.org/gradcommission>.

Charges to the Commission

- What are the purposes of graduate education in the chemical sciences?
- What steps should be taken to ensure that important societal issues are addressed as well as the needs and aspirations of graduate students?

Major Conclusions

- 1) Current educational opportunities for graduate students, viewed on balance as a system, do not provide sufficient preparation for their careers after graduate school.
- 2) The system for the financial support of graduate students, as currently operated by private, institutional, state, and federal funds, is no longer optimal for national needs.
- 3) Academic chemical laboratories must adopt best safety practices; such practices have led to a remarkably good record of safety in the chemical industry and should be leveraged.
- 4) Departments should give thoughtful attention to maintaining a sustainable relationship between the availability of new graduates at all degree levels and genuine opportunities for them; replication in excess is wasteful of resources and does injustice to the investment made by students and society.
- 5) Postdoctoral training and education is an extension of graduate education that is important for success in a variety of career paths, particularly for faculty appointments; a postdoctoral appointment should be a period of accelerated professional growth that, by design, enhances scientific independence and future career opportunities.

Recommendations for Each Conclusion

1) Preparation for careers

- Departments are encouraged to undertake greater oversight over the progress and opportunities of individual graduate students.
- Graduate programs should be more active in diagnosing and remediating deficiencies in the preparation of first-year students.
- Beyond core academic competency, additional skills are critical for a future career; specific

activities should be offered that would enhance students' abilities.

- Four years should be the target for completion of the Ph.D., with the departmental median time less than five years.
- Every department should constitute a doctoral committee for each student composed of several faculty who will be intimately involved in the student's graduate education, and make an individual development plan a standard part of every doctoral student's experience.
- Departments should require at least two original research proposals, one with a focus outside the student's immediate field of study.
- Faculty should encourage students to engage in projects requiring collaboration that broadens the student's field of study, especially interdisciplinary and multidisciplinary team approaches to complex problem solving.
- Students interested in entrepreneurship should have access to a curricular option providing an introduction to relevant topics; one or more formal courses should be developed for the more explicit preparation of students who intend to seek academic employment.
- ACS is encouraged to undertake an extensive survey of representative graduate programs at selected major universities to ascertain requirements, expectations, and organizational structures that best facilitate the educational goals of the Commission.

2) Financial support of graduate students

- Public and private funding agencies and universities should take steps toward the uncoupling of student-support funds from specific research projects by experimenting with a new strategy for "graduate program grants" to support graduate students.
- The U.S. Department of Education should make the GAANN (Graduate Assistance in Areas of National Needs) Program more generally useful.
- Faculty members should view work by graduate students as teaching assistants much more strategically as an opportunity – and an obligation of the program – to enhance the professional development of the student.
- Government sources should rebalance fellowship programs to make more awards available to students in the second year of graduate school and beyond, rather than primarily in the first year.
- Many of the nations that send graduate students to the U.S. have strengthened financially; departments and programs should place increased emphasis on having international students supported by their home countries.
- The timetable for graduate work should include support for all students for two months during the summer before the start of courses to receive initial training in professional skills, including instructional skills, and to begin exploring research opportunities.

3) Best safety practices

- Safety as a *culture* must be consistently led by example in all graduate programs in the chemical sciences.
- A natural supporting step would be to establish a safety performance partnership between industry and academic institutions, whereby corporations share best practices with students and faculty on a regular basis.
- Leadership from the top of an institution is essential for a sound safety culture to take root and thrive, and faculty members in the chemical sciences can and should take the lead toward best practices, advocating for support at the highest institutional levels.

4) Availability of new graduate students

- Given that the employment opportunities for new Ph.D.s are and will continue to be uncertain, departments are urged to adjust their program sizes to reflect those opportunities for graduates that are truly attractive.
- Faculty members and other academic leaders in every graduate program, whether at the master's or doctoral level, are urged to reassess and to focus the program distinctively toward its competitive advantages.
- To encourage and help guide needed changes, it is recommended that the ACS collect and publish aggregated, privacy-protected data, organized by graduate program, on post-degree outcomes for all graduates, including time-to-degree, types of job placements, salaries, and overall student satisfaction with the graduate experience and employment outcome.
- Programs should build the domestic fraction of their graduate enrollments as a high priority; at the same time, the great contributions that have historically been made in our graduate programs and in our national technical enterprises by international citizens who were first attracted to the U.S. as graduate students are recognized.
- To take advantage of the nation's whole talent pool, graduate programs must place an emphasis on attracting and empowering students from underrepresented groups.
- Communications to undergraduates should point out that not only is graduate education in the chemical sciences free to them, but that they will receive a stipend, as well.

5) Postdoctoral training and education

- Institutions and departments, as well as faculty mentors, should take greater responsibility for ensuring that postdoctoral associates develop professionally.
- All funding agencies should require general mentoring plans of applicants seeking support for postdoctoral associateships.
- Foundations and other funding agencies should re-explore programs for "teaching postdoctoral associates," so that trained professional instructors become an alternative to the current reliance on doctoral students for so much of a department's undergraduate teaching responsibility.
- A feedback mechanism linking the size of Ph.D. programs to job availability is needed to minimize bulges in the career pipeline at the postdoctoral level.

Summary Statements

- Overall, the Commission hopes to free departments and programs from feeling the need to be practically identical. There is room for greater variation in program design than has been recently typical in American graduate education in the chemical sciences. It is believed that the field would benefit from more venturesome design and greater experimentation.
- The Commission explicitly discourages any form of checklist for graduate programs or any analogue to the ACS Committee on Professional Training, which serves usefully to approve undergraduate chemistry programs.
- The Commission's charge certainly includes master's level education. The distinctive role that the M.A. degree level fulfills in our society suggests that there is room for fuller use of it in the development of the professional workforce. The master's degree needs to be reconsidered as the diversity of opportunities in the chemical sciences increases.
- The Commission also understands that progress on several of the dimensions addressed among its conclusions and recommendations will require modifications to the reward structure for faculty members participating in doctoral programs.
- The Commission has focused on the goal, rather than the path toward improving graduate education in the chemical sciences. The emphasis on experimentation is an acknowledgement that many new paths will need to be explored as progress is sought along various dimensions of graduate education.

- In the effort to improve and reform, the Commission expects that there will be successes and successive stages. Pioneering departments and practices will emerge and become exemplars. Subsequent commissions and task forces will be needed to address topics in greater depth or broader imagination than has been possible here, or to revisit strategies in the light of results from actual trials. Its most earnest hope is that our field will brilliantly renew its vigor and intellectual strength.

Royal Society of Chemistry Education Activities

This document provides a summary of the work undertaken by the Royal Society of Chemistry in Education in line with IUPAC's *Long-range Goal* to utilize its global perspective and network to contribute to the enhancement of chemistry education and the career development of young chemical scientists.

Over the last few months the RSC has been reviewing its strategy, and has defined a number of education-related goals, including influencing UK the UK government, and university and school leadership, such that:

- every primary school in the UK has a science specialist teacher;
- all post-14 chemistry students are taught by a chemistry specialist;
- the chemistry undergraduate population demographic reflects that of the wider population;
- All UK students and their employers have sufficient and appropriate provision for vocational education.

The majority of the work below is supported by the RSC's Education Division, which supports the study and dissemination of knowledge of chemistry education at all levels. The Division has 9 Regions that organise regionally-based education activities based on local initiatives and interests, and 4 Specialist Interest Groups. The Education Division Council reports directly to the RSC Science Education and Industry Board and in turn has the Committee for Schools and Colleges reporting to them.

Enhancement of chemistry education

Supporting recruitment and retention of school teachers through training and scholarships

Starting this year, the RSC is managing and allocating around 100 £20,000 tax-free Initial Teacher Training Scholarships on behalf of the English Department for Education. In addition, the RSC is providing a package of support for these exceptional new teachers.

The RSC also has an extensive programme of Continuing Professional Development (CPD) courses for teachers. From Developing Expertise in Practical Chemistry for newly qualified teachers, through Chemistry for Non-Specialists for those teaching chemistry but without a chemistry degree, to our new "twilight" courses focusing on hard to teach/learn topics such as Quantitative Chemistry. Online CPD courses will be launched later this year.

The RSC supports teachers throughout their career by facilitating networking, events, and providing teaching resources, see below. This is supported at a local level by our network of Regional Coordinators.

Supporting university teaching through networking events and resources

The first Teaching Fellows networking meeting and Directors of Teaching policy meeting were held in 2013 and were well received. The RSC will support of each of these meetings per year, with the Teaching Fellows networking meetings being held at different higher education institutions and each meeting being organised and chaired by the host institution. The RSC's work with Heads of Chemistry UK also supports university teachers from a policy perspective.

Several online resources designed for teaching in higher education have been provided through HE Learn Chemistry (see below) and will continue to be expanded.

Developing teaching methods at all education levels through a programme of events

The Education Division supports the *Variety in Chemistry Education* annual conference, which will be held at the University of Liverpool on August 29-30 2013, and the *EuroVariety: Smarter Teaching, Better Learning* conference at the University of Limerick July 3-5 2013.

The Education Division has supported the transition to a new mode of working of the Royal Society of Chemistry journal *Chemistry Education, Research and Practice*, which has led to increasing its impact factor from 0.855 to 1.1.

The *Chemistry Education: Activating Research* bursary scheme funds three early career researchers per year to travel to and give a paper at a pedagogic research conference in the USA. In 2013, this was the Gordon Research Conference: Chemistry Education Research and Practice, Salve Regina University, Rhode Island, USA on June 9–14 2013.

The *Getting started in pedagogic research in higher education* workshop is organised annually and this year was held on 28th March 2013, focussing on qualitative and quantitative research methodologies in higher education pedagogy.

Education resources and competitions

Learn Chemistry, the RSC's award-winning online education platform caters to teachers and learners from primary education through to higher education and includes free-to-use teaching materials, including experiments, worksheets, podcasts, videos, simulations, games, the Visual Elements Periodic Table, context and problem-based learning resources and the online discussion forum Talk Chemistry.

Through *Spectroscopy in a Suitcase* (SIAS), universities bring portable spectrometers to schools to provide students with hands-on experience of spectroscopic techniques through practical, context-based learning.

Chemistry at Work events bring together businesses and schools to offer local organizations the chance to demonstrate how they use their chemistry skills at work and show the breadth of career options open to chemists.

The Mole is the RSC's student magazine covering cutting-edge research, news, events and careers, and is published in print and online 6 times a year. *Education in Chemistry* is the RSC's magazine written by teachers and provides support for all chemistry teachers across the secondary, further and higher education sectors. It aims to strengthen the community by providing high quality content, tools and resources that promote innovative teaching and sharing of best practice.

The RSC organises and supports several competitions every year designed to inspire and challenge chemistry students of all ages, including the *Bill Bryson Prize* for science communication (primary and secondary students), the UK delegation of the *International Chemistry Olympiad* (>16 years), *Top of the Bench* to test chemistry knowledge through written and practical tests (14-16 years) and the *Schools Analyst Competition* for 16-17 year olds to undertake practical analytical determinations. In 2013, the RSC is sponsoring the Northwest regional heat of the *Biotechnology YES* competition for postgraduate and postdoctoral scientists raising awareness of the commercialisation of ideas from the biosciences.

Policy

The RSC actively engages with and positively influences governments on education policy matters, sometimes independently and sometimes in collaboration with sister science societies. The English education system is going through a period of unprecedented change, with reform of every aspect of the school system. Wales and Northern Ireland are considering further separation from the English systems. Scotland is continuing to implement the new "Curriculum for Excellence".

Career development of young chemical scientists

Widening participation in chemistry careers

[The RSC will work with relevant partners, including Athena SWAN and the Daphne Jackson Trust, to identify and remove barriers to a successful research career that disproportionately affect young chemical scientists \(e.g. maternity/paternity breaks\) by providing fellowships for those who have taken a career break for any reason and wish to return to work.](#)

[The RSC will further support young chemical scientists through overseas-UK research exchanges for PhD students and early career researchers in academia and industry, a national professional development framework facilitated by the RSC and run by universities, and in partnership with other bodies, a Permeability and Linked Exchange Fellowship scheme support research and skills mobility.](#)

There will also be a focus on gender diversity and will run an annual series of Irène Joliot-Curie conferences called 'Establishing an independent career in chemistry' from 2014 onwards.

Transferable skills for chemists and continuing professional development

The Education Division will support research into the current provision of transferrable skills teaching for undergraduates and postgraduates at UK HE institutions to identify any gaps in provision. A selection of business skills resources and an interactive Health and Safety resource are already available on HE Learn Chemistry at www.rsc.org/HEresources.

A *Skills for Industry Programme* will be established with learning packages (online, face-to-face and practical courses) focussing on analytical science, formulation science, process chemistry and medicinal chemistry. The packages will be aimed at industry members who are within the first five years of their career and also at those who are seeking re-training.

A *Vocational Education Grant Scheme* will be developed to help those in small companies wanting to study a part-time vocational course at the Qualifications and Credit Framework (QCF) level 4 and 5. This will help to stimulate supply and demand for these types of courses and will be given to 15 different companies a year for one of their employees.

The RSC's online careers platform will be launched in 2014 and will help boost careers support and advice for members from age 14 to mid-late careers. Every RSC member will have a customisable careers space on their home page with their preferences, whether they are in industry, academia or a ChemNet member.

Professor Tina Overton, President, Education Division
July 2013