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## USM SCHOOL OF CHEMICAL SCIENCES HELPS NURTURE YOUNGER GENERATIONS TO BASIC SCIENCE EDUCATION

PENANG, 10 October 2016 - Science is a core subject in the school curriculum from primary to secondary schools where students are provided basic scientific knowledge and science literacy skills in order to continue their science education at the upper secondary level, taught to apply scientific knowledge in decision making and problem solving in daily life and elective science subjects prepare them for the study of science at the post-secondary level.

According to Profesor Dr. Norita Mohamed from the School of Chemical Sciences, problems arise from the large number of students, constraints on time and resources allocated for laboratory sessions such that practical work is often conducted in groups rather than individually or in pairs and active work is limited to two to three students while the others are passive observers.

"An initiative by the school is Microscale chemistry experiments for secondary schools that can overcome problems related to practical work. Microscale chemistry can provide an enriching and meaningful laboratory experience. It is a safe, fast and economical way to conduct experiments. It is a laboratory-based and is an environmentally friendly approach using miniature labware and minimal amounts of chemicals.

"Our involvement in microscale chemistry started in 2004 when we participated in a microscale chemistry workshop during the 18th International Conference on Chemical Education in Istanbul, Turkey and thus we have developed microscale chemistry experiment modules according to the Form Four and Five Malaysian Chemistry syllabus. Our Form Four modules are available on UNESCO's Natural Sciences Sector, Division of Basic Sciences website.

Furthermore she said, these experiments use a microchemistry kit made up of plasticware and other smaller volume glassware. Experiments such as the reduction of copper(II) oxide by hydrogen can be safely done as the amount of hydrogen gas produced is minimised, thus reducing the risk of an explosion.

"Since students carry out experiments individually, the hands-on experience enhances their learning and understanding of chemical principles and motivates them to consider science and technology related careers. Students will have the opportunity to repeat experiments if necessary," she explained more.

Microscale chemistry experiments do not require a traditional lab setting, hence will allow students in rural schools without proper laboratory facilities the same opportunities in hands-on learning with their counterparts in the urban areas.

Funding by grants from MOSTI (eScience Fund), USM (short term and Division of Industry and Community Network), MOE, MOHE and UNESCO has allowed more than 30 workshops to be conducted to introduce teachers and students to microscale chemistry experiments on topics such as acid-base titrations, confirmation tests for cations and anions, electrolysis, reduction of copper oxide with hydrogen and production of various gases among other topics.

Norita added, they collaborated with teachers from Maktab Rendah Sains MARA Beseri, Perlis and Sekolah Berasrama Penuh Integrasi Gombak, Kuala Lumpur, our community partners in a MOHE Knowledge Transfer Program (KTP) grant (2011-2013), to implement microscale chemistry experiments at their schools (351 Form Four students) and we are wrapping up our MOE KTP flagship grant (2014-2016) with Jabatan Pendidikan Pulau Pinang involving ten Penang secondary schools (207 Form Four students).

Teachers have found this approach economical, student centered, interesting and time saving, stimulates enjoyment in learning chemistry and reduces waste.

Some of the students give positive feedback on doing microscale chemistry experiments because through experiments, they can understand the chemistry concepts better and they hope experiments can be carried out more frequently in schools.

“Using a microscale equipment is never complicated. It made me feel energized and focused. I hope more and more experiments will be carried my own in future” said some of the students.

Microscale chemistry experiments can provide meaningful laboratory experiences that result in better understanding and appreciation of chemistry and the aim is not to replace traditional experiments entirely but to integrate microscale chemistry experiments into the present curriculum where it would bring about the most benefits to the students.

This programme started out with Profesor Dr. Norita Mohamed, Dr Zurida Hj Ismail (retired from School of Educational Studies USM) and their PhD student, Dr Mashita Abdullah but now includes Dr. Lee Hooi Ling, Dr. Lim Gin Keat and Dr Noor Haida Mohd Kaus from School of Chemical Sciences.

PPSF have conducted Microscale Chemistry Workshops for Villa International High School, Maldives students visited to our school, Summer Camp for Nagaoka University students, Summer Camp for Kazakhstan National University students, Youth Industry Bootcamp for selected secondary school students around the region in conjunction with the Engineering, Science & Technology Youth Program in collaboration between [sains@usm \(mailto:sains@usm\)](mailto:sains@usm), CREST and Akademi Sains Malaysia and will be having exhibitions in the coming Penang International Science Fair workshops for teachers and students during the 24th IUPAC International conference on chemical education in Kuching (16-18 Aug 2016).

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