Report of Chemistry Olympiad Exposure Camp

CESME, HBCSE

(Under PMMMNMTT scheme of MHRD)

Date: November 21 - 24, 2019

Homi Bhabha Centre for Science Education

Tata Institute of Fundamental Research

November 2019

As a part of Centre of Excellence in Science and Mathematics Education (CESME-HBCSE), the teacher development (TD) workshop for chemistry teachers teaching at secondary and higher secondary level was organized at HBCSE, from November 21 – 24, 2019.

Background

The Chemistry Olympiad Exposure Camp, conducted as part of CESME (HBCSE) activities under PMMMNMTT scheme of MHRD at HBCSE aimed at presenting teaching-learning experiences on chemistry to in-service teachers by engaging them with problem-solving, both in the theoretical and experimental domains. The culture of problem-solving is an inherent part of the International Chemistry Olympiad program both in theoretical and experimental domains which cultivates a rich habit of solving problems for a learner. These problems (both at national and international levels) have relevance for chemistry education at school and colleges much beyond the competitions. The Olympiad problems often present unknown contexts to a learner, where one needs to identify relevant concepts and apply them to the given context to arrive at solutions. This process helps a student relate the concepts to actual situations and instils confidence in them regarding the significance of knowledge gained as a part of her/his education process. Currently, problem-solving is not integral to our curricula and the teaching-learning process in the schools.

At the higher secondary level, laboratory experiments which are important components of the school curricula often lack contextual reference and are conducted in a mundane manner. As a result, learners fail to develop deeper insights about experimental practices integral to chemistry and their utility in real scenarios.

Brief description of the workshop

The workshop consisted of problem-solving sessions in- a) theory and b) experimental domains; interactive lecture session on chemical bonding and atomic structure, workshop session based on Process Oriented Guided Inquiry Learning (POGIL) approach to teach organic concepts, use of Multiple Choice Questions for assessment of conceptual understanding of concepts in chemistry and discussion session about learning resources in chemistry.

Theoretical problem-solving at the workshop involved discussing and solving two problems selected from past Indian National Chemistry Olympiad (INChO) examinations. One problem was related to the chemistry of organic compounds responsible for the sweet earthy smell coming from the soil after the first rain (titled *When Rain meets the Soil*) and the other was related to hydrogen bonding and water of crystallization.

The experimental sessions at the workshop consisted of experiments related to i) synthesis of an antibacterial compound and ii) analysis of an abrasive powder sample by titration. The first experiment which is an organic synthesis used the concept of hydrolysis for synthesizing the compound using relatively easily accessible reagents. The second experiment was related to the analysis of an abrasive powder sample using the concept of acid-base chemistry. The main aim of these sessions was to create opportunities for discussion about the design of the experiments, comprehend the underlying concepts and procedural understanding through the post-laboratory questions. The participating in-service teachers conducted the experimental trials in the laboratory and also discussed the difficulties and challenges faced while performing the trials. The data obtained by the teachers were pooled together for arriving at appropriate inferences.

Some representative feedback from participants

"Honestly, we were following the practical syllabus without applying much thought. Now we will carry out the experiments in the way that it encourages students to think about all alternatives of doing the experiment without actually worrying about getting the correct answers or readings. The essence of experimentation will be the inquiry/inquisitiveness."

"I learned that ideas can be deducted from logical reasoning not just by memorizing the facts."

"This camp emphasizes on the concept of science. Practical problem solving is done very nicely. I understood the history and basic concepts of science very nicely and clearly."

"POGIL programme was one of the best activities we did in camp and would like to work on that with friends/colleagues."

"I learned how I can plan an experiment beforehand with minute detailing, to get the best result."

"Those who are willing to learn should attend these types of programmes. As there is no much advertisement in print media, I will definitely suggest this to interested friends."

Theoretical and Problem-Solving sessions

Teachers conducting trials of experiments in the lab

Annexure A: List of Teacher Participants

Sr.No	Name	Gender	School/College
1	Alok Kumar Jha	M	Mother India Public School, Nandgram, U.P
2	Arundhati Badhei	F	Town Boys High School, AT- Hatishalpara, Odisha
3	Ashish Mishra	M	Gram panchayat Public High School, Jharani, Odisha
4	B Jasmine Jolly	F	Govt. UP Graded High School, Mirdhapali, Odisha
5	Beena A Bedekar	F	Sant Kabir School, Vadodara, Gujarat
6	Bijaya Kumar Dhir	M	Nehru High School, District- Angul, Odisha
7	Bipul Kumar Sarma	M	Pavoi High School, Sonitpur, Assam
8	Deepmala Pandey	F	Kiddy's Corner Sr Sec School, Gwalior, M.P
9	Heena N. Butani	F	J B and Karp Impex Vidyasankul, Surat, Gujarat
10	Hunaina Faruqi	F	J. B & KARP Impex CBSE Eng medium school, Laskana-Surat
11	Indula Mishra	F	Bal Bharati Public School, Noida, U.P
12	Khundongbam B. Singh	M	Sacred Heart School, YairipokLaimanai, Imphal East, Manipur
13	Kumari Nimisha	F	Govt Women's College, Patna, Bihar
14	Madhu Sharma	F	SRML HSS Parade, Jammu, J&K
15	Madhurima Panigrahi	F	S D S Government High School, Badabazar, Sambalpur, Odisha
16	Manish Singla	M	Aarohi Model Senior Secondary school Geong Kaithal, Haryana
17	Monika Bagchi	F	BGS National Public School, Bengaluru, Karnataka
18	Mousumi Nayak	F	Govt. UP Graded High School, Karlapita, Odisha- 767024
19	Nirkesh Sharma	M	Kashi Ramratan Public School, Gwalior, M.P
20	OinamIbochou Singh	M	St. George High School, Imphal East, Manipur
21	Omprakash Mishra	M	Government High school, Jeypore, Odisha
22	Pratik Pansuriya	M	Aryam Educational Academy, Ta: Olpad; Dist: Surat, Gujarat
23	P Venkateswara Rao	M	Natco High School, Rangapur,Telangana.
24	Pushparaj Bhuyar	M	Nabira Junior College, Nagpur, Maharashtra
25	Rachna Verma	F	The Brigade School, Bangalore, Karnataka
26	Raj Kumar Dhakal	M	Gandaki Boarding School, Pokhara City ward no 16, Nepal
27	Rajesh K Singhdeo	M	Govt High School Turekela, At/Po – Turekela, Balangir, Odisha
28	Ramgopal K.Sharma	M	Prithwiraj High school Balangir, Odisha
29	Ranjana Sharma	F	HSS Nowabad, Jammu and Kashmir
30	Ratna De	F	Sri Venkateshwar International School, Dwarka SEC-18, Delhi
31	Ravinderjeet Kaur	F	Salwan Boys Sr. Sec. School, Old Rajinder Nagar, New Delhi
32	Samiran Kalita	F	The Little Stars Senior Secondary School, Digboi, Tinsukia Assam.
33	Shiba Sankar Sathua	F	Govt High School Sundargarh, Odisha
34	Shiva Prasad Paudel	M	SOS Hermann Gmeiner School Sanothimi Bhaktapur Nepal
35	Sumita Patri	F	Govt High School, Burla, Odisha
36	Sunil Kumar Bhat	M	HS Ritti, Village Ritti Udhampur (J&K)
37	Thotla Sateesh Kumar	M	Vasaviolympiad school, Nirmal, Telangana
38	Vibha Jain	M	Bal Bharati Public School, Sector -21, Noida, U.P.
39	Weerasiri Kushan	M	College of Chemical Sciences, Sri Lanka

Annexure B: Timetable

Homi Bhabha Centre for Science Education
Tata Institute of Fundamental Research
Chemistry Olympiad Exposure Camp -November 21 to 24, November 2019

Date	Time	Session
21/11/19 Thursday	9:30 - 10:30 am 10.30 - 10:45 am 11.00 am - 1:00 pm 1.00 - 2.00pm 2.00 - 2.30 pm 2:30 pm - 4:30 pm *(with a tea break in between)* 4.30 pm - 5.30 pm	Brief Introduction to Indian Science Olympiad programme–(AM) Tea Break Theory Problem-Solving Session 1 (SK) Lunch Break Pre-Lab Discussion (Expt 1: Synthesis of an antibacterial compound) - (IDS) Lab Session (Expt 1) (IDS, SM, KS, MS) Post Lab Discussion of Expt. 1 (IDS)
22/11/19 Friday	9:00 - 10:30 am 10:30 -10:45 am 10.45 am – 12.30 pm 12.30 - 1:30 pm 1:30 – 3.00pm 3.00 – 3.15pm 3.15 – 5.30pm	Understanding our conceptions in acids and bases **and** Pre-Lab Discussion (Expt 2: Analysis of an abrasive sample) - (AG) Tea Break Lab Session: Expt 2 (SMN, IDS, KS, SM, MS) Lunch Break Process Oriented Guided Inquiry Learning (POGIL) approach - Electrophilic Aromatic substitution (LR and SAL) Tea break Concepts in chemical bonding and atomic structure (SKG)
23/11/19 Saturday	9.30 - 11:00 am 11:00 – 11:15 am 11:15 – 1:00 pm 1:00 – 2.00 pm 2:00 pm to 5.30 pm	Post Lab Discussion of Expt. 2 (AG) Tea Break Discussion on Experimental Pedagogy (AG) Lunch break Theory Problem-Solving Session 2 - Cont. (AG)
24/11/19 Sunday	9:30 – 10:30 am 10:30 – 10:45 am 10:45 – 11:30am 12:30 pm onwards	Using MCQs for understanding misconceptions (AG) Tea Break Quality learning resources for Chemistry Teaching online – (IDS) TIFRvisit

Venue:
G1, Olympiad Building
Homi Bhabha Centre for Science Education, (TIFR)

Annexure C: List of Resource persons at the workshop

Resource Persons outside HBCSE	**Resource Persons from HBCSE**
Swapan K Ghosh, UM-DAECEBS	Indrani Das Sen
Sujata Kale, *formerly*, Abasaheb Garware College, Pune	AnkushGupta
Swapna M. Narvekar, *formerly* HBCSE	Savita Ladage
Lakshmy Ravishankar, KET Vaze	Shreyank Mandavkar
	Anwesh Mazumdar
	Mursaleen Shaikh
	Krupa Subramanian