

**Report of NIUS-TD workshop on Experimental modules for  
Undergraduate Chemistry Laboratory  
CESME, HBCSE  
(Under PMMMNMTT scheme of MHRD)**

(Conducted at Gogate Jogalekar College, Ratnagiri)

Date: November 3-8, 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 NIUS-TD workshop for chemistry teachers teaching at undergraduate level was organized at Gogate Jogalekar College, Ratnagiri from November 03–08, 2019. This activity is a part of the National Initiative on Undergraduate Science (NIUS) programme of HBCSE at the centre.

### Background

The chemistry laboratory courses are central to chemistry education at the undergraduate level. However, the existing chemistry laboratory courses (especially in state colleges) are often performed in a mechanical manner and thus, what is being learnt in these laboratory courses is unclear and questionable. The NIUS-TD workshop conducted as part of CESME (HBCSE) activities under PMMMNMTT scheme of MHRD at Gogate Jogalekar College, Ratnagiri was aimed at providing opportunities to in-service teachers from state colleges to reflect about this issue by engaging them with investigatory experimental modules. The main objective of the workshop was to expose teachers to some of the possible ways that can help in generating more learning opportunities in the existing chemistry laboratory.

### Brief description of the workshop

The participants of the workshop were divided into three major groups and each group was given an experimental module consisting of experiments in organic, inorganic and analytical chemistry. The experiments in organic chemistry were- i) Identification of functional groups in naturally occurring flavouring and perfumery compounds by using qualitative tests, and ii) Identification of two aldehydes by synthesising and analysing their hydrazones. The analytical chemistry module was about investigating the reactions of Ca (II)/Mg (II) with different metallochromic indicators using a visible spectrophotometer. The inorganic module involved the synthesis of a coordination complex (Fe-oxalato) and determining its formula using redox titrations. Besides, participants investigated the ligand binding strength with Fe (III). Most of these areas are an integral part of the chemistry laboratory course at the undergraduate level.

The design and the post-laboratory questions in these modules provided opportunities to discuss conceptual, procedural and pedagogical aspects related to experiments. The participating in-service teachers conducted the experimental trials in the laboratory and developed the first-hand experience about the experimental data. Safety aspects were highlighted in the write-up and teachers are provided with a link to GHS safety symbols. They discussed the difficulties and challenges faced while performing these trials. The gathered data was reflected upon to arrive at inferences. Also, detailed discussions were conducted about how to assess such experiments when adapted for the chemistry laboratory courses. Each group presented their experiences in the form of a poster. In addition, three experiments from the experimental course (University of Mumbai) were given to participants to frame pre-lab and post-lab questions.

The written feedback was collected at the end of the camp from participating teachers, external resource persons and the coordinator from Gogate Jogalekar College.

### Some representative Feedback

From Teacher Participants

*It was enriching. It gave insights to think about experimental modules in a broader scale, covering multiple aspects which are not included in practical manuals...*

*I would like to share- the key idea behind pre and post-lab questions. To look at a small experiment with multiple*

*dimensions....*

*Freedom for diverse, creative thinking and sharing....*

#### Impressions of the external resource persons

*Overall the workshop was well organized. The participants were very receptive,.....enjoyed doing the tasks, came up with very interesting observations, interactive in the groups during discussions.*

*..... This was my first time as a resource person in TD workshop. I myself attended the NIUS teacher workshop at HBCSE (TIFR), Mumbai last year, organized one such workshop at Pune University in collaboration with HBCSE.....I personally learnt a lot and will continue to learn through such experiences. ....*

#### Impressions of the coordinator at Gogate Jogalekar College

*Comprehensive and clear communication from HBCSE made it possible for the host institute to organize the workshop in proper way.....Participants presented their views about experiments performed in the form of poster. Discussions with resource persons and discussion among group enriched the individuals' understanding about the experiment. These sessions helped the participants to learn how conceptual learning can be done through experiments. Assessment schemes for experiment, designing pre lab and post lab questions were discussed keeping students' understanding as central point. Participants also tried their hands on setting pre lab and post lab questions.....*

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Annexure A: Details about teacher participants (23 teachers across Maharashtra)

Annexure B: Timetable

The experimental modules used for the workshop are uploaded on following link

<https://cesme.hbcse.tifr.res.in/nius-td-workshop-for-chemistry-teachers/experimental-modules/>

Discussions about Experimental modules



Teachers conducting trials of experimental



Poster presentations by teachers



### Annexure A: List of Teacher Participants

Name of Participant	Gender	Designation	Institution
Aparna Kulkarni	M	Assistant professor	Gogate Jogalekar College, Ratnagiri
Dattatray Baburao Yedage	F	Assistant professor	Willingdon College, Sangli
Meghana Mhadaye	F	Assistant professor	Gogate Jogalekar College, Ratnagiri
Nivedita Singh	F	Assistant professor	CHM College Ulhasnagar
P. P. Kulkarni	M	Associate professor	Gogate Jogalekar College, Ratnagiri
Sadik Jamil Sayyed	M	-	B.U.N.Raisoni English Medium School, Jalgaon
Satish Manjare	M	Assistant professor	University of Mumbai-Ratnagiri sub-centre MIDC Mirjole, Ratnagiri
Satishkumar Patil	M	Assistant professor	C.T.Bora College, Shirur, Pune
Sidram pujari	M	-	D.B.F Dayanand College of Arts and Science, Solapur
Swaminath Bhattar	M	Assistant professor	Gogate Jogalekar College, Ratnagiri
U. B. Sankpal	M	Assistant professor	GogateJogalekar College, Ratnagiri
Uday Bamne	M	-	D.B.J College, Chiplun
Udaysinha Patil	M	Assistant professor	Shri Pancham Khemraj Mahavidyalaya, Sawantwadi
Valsamma Wilson	F	Associate professor	V.K.Krishna Menon College, Bhandup
Vijay Gurav	M	-	University of Mumbai- Ratnagiri sub-centre MIDC Mirjole, Ratnagiri
Yogini Bambardekar	F	Assistant professor	CHM College, Ulhasnagar
Vishakha Satish Salvi	F	Assistant professor	Gogate Jogalekar College, Ratnagiri
Ankit Anil Surve	M	Assistant professor	Gogate Jogalekar College, Ratnagiri
Sagar Suresh Chavan	M	Assistant professor	Gogate Jogalekar College, Ratnagiri
Nikita Powar	F	Assistant professor (on contract)	Gogate Jogalekar College, Ratnagiri
Ajit Kanshinde	M	Assistant professor	Sant Rawool Maharaj College, Sindhudurg
Pramod Chavan	M	Assistant professor	Yashavantrao Chavan Institute of Science, Satara
Mayur Desai	M	Assistant professor	Gogate Jogalekar College, Ratnagiri

### List of Resource Persons for the workshop

Resource Persons outside HBCSE	Resource Persons from HBCSE
Asha Datar	Ankush Gupta
Sujata Kale	Shreyank Mandavkar
Anupa Kumbhar	Savita Ladage
Swapna Narvekar	
Gomathi Shridhar	

Ms. Indrani Das Sen, Mursaleen Shaikh and Krupa Subramaniam were involved with the development of experimental module in Analytical chemistry.

Aparna Kulkarni, Chemistry Department, Gogate Jogalekar College was the local coordinator for the workshop. The chemistry laboratory assistants were involved with technical preparations for laboratory sessions. In addition, several members of the Chemistry Department were involved with various local organization/ arrangements of the event.

## Annexure B: Timetable

NIUS TD Workshop- Experimental modules for undergraduate chemistry laboratory

November 3-8, 2019

Venue - Gogate Jogalekar College, Ratnagiri

Date	Time	Session
Day 1 3/11/19	1.00 – 1.15 pm	Introduction of the participants
	1.15 – 2.00 pm	Introduction to camp Session I - Reflection on type of experiments done in undergraduate (Mumbai and other universities) - template will be given
	2.00 – 3.30 pm	Session II – Conceptual learning from experiments
	3.30 – 4.00 pm	Tea break
	4.00 – 5.30 pm	Session III - Reading of modules + preparation for lab work (brief informal discussion about the module)
Day 2 4/11/19	10.00 am-1.00 pm (11.15 – 11.30 am Tea)	Lab Session I
	1.00 to 2.00 pm	Lunch Break
	2.00 - 5.30 pm (3.30 – 4.00 pm Tea)	Lab session II – Continuation (each group should ensure that adequate data is collected for reflections) (data collation + what worked and what did not work + planning for next day)
Day 3 5/11/19	10.00 am -1.00 pm (11.00 –11.30 am Tea)	Lab Session III – continuation + Final trials
	1.00 – 2.00 pm	Lunch Break
	2.00 – 5.30 pm (3.30 – 4.00 pm Tea)	Lab Discussion Session – Data Collation + Discussion / Reflections about the completed lab work
Day 4 6/11/19	10.00 – 11.30 am	Session IV - Understanding role of Pre lab/ Post Lab questions/activities
	11.30 am– 12.00 pm	Tea break

<b>Date</b>	<b>Time</b>	<b>Session</b>
Day 4 6/11/19	12.00 – 1.30 pm	Session V - Designing assessment schemes for the experimental module
	1.30 – 2.30 pm	Lunch break
	2.30 – 5.30 pm (3.30 – 4.00 pm Tea)	Session VI – Continuation + Preparation of presentation in form of posters-Pointers will be provided)
Day 5 7/11/19	10.00 – 11.30 am (11.30 am– 12.00 pm Tea)	Session VII - Poster Presentation of the experimental modules. During the presentation, questions/suggestions asked/given by other group members should be noted.
	12.00 – 1.30 pm	Session VIII – Re-writing of experiments for the following - Designing Pre / Post lab questions
	1.30 – 2.30 pm	Lunch Break
	2.30 - 4.00 pm (3.30 – 4.00 pm Tea)	Session continued
	4.00 – 5.30 pm	Presentations about redrafted aspects of the experiments
Day 6 8/11/19	9:30 – 11.30 am	Presentations about redrafted aspects of the experiments
	12.00 – 1.00 pm	Lunch Break
	1.00 – 2.30 pm	Session IX - Conclusion + Feedback