

**B3-X**

**Homi Bhabha Centre for  
Science Education  
(HBCSE)**





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### Homi Bhabha Centre for Science Education

1. Name of the Department : Homi Bhabha Centre for Science Education (HBCSE)

2. Year of establishment : 1974

3. Is the Department part of a School/Faculty of the university?

The HBCSE is a part of the Faculty of Science Education.

4. Names of programmes offered (UG, PG, M.Phil., Ph.D., Integrated Masters; Integrated Ph.D., D.Sc., D.Litt., etc.)

1. Ph.D.

Students may avail of an M.Phil. degree as an early exit option provided they have finished a specified set of requirements. However, there is no separate M.Phil programme.

5. Interdisciplinary programmes and departments involved

Science education as a domain is highly inter-disciplinary in nature, requiring inputs from not only science and mathematics, but also from varied disciplines such as education, social sciences, cognitive sciences and philosophy of science.

6. Courses in collaboration with other universities, industries, foreign institutions, etc.

The Ph.D. students of HBCSE normally do not take courses in other institutions (no such courses taken during 2011 – 2015). However the HBCSE faculty often teach in other institutions. A list of such courses is given below.

	Institution	Course Name	Taught to	Faculty member	Year
1.	UM-DAE CBS	Electromagnetism	Int Msc 1 <sup>st</sup> year & 2 <sup>nd</sup> Year	Anwesh Mazumdar	2013, 2014, 2015
2.	UM-DAE CBS	Classical Mechanics	Int Msc 2 <sup>nd</sup> Year	Anwesh Mazumdar	2013, 2014, 2015
3.	UM-DAE CBS	History of Science	Int MSc	G. Nagarjuna	2009-16
4.	UM-DAE CBS	Science and Ethics	Int MSc	G. Nagarjuna with H.C. Pradhan and M.C. Arunan	2012-16
5.	UM-DAE CBS	Astronomy and Astrophysics	Int MSc	Aniket Sule	2011, 2012
6.	UM-DAE CBS	Classical Mechanics	Int MSc	Aniket Sule	2012
7.	UM-DAE CBS	Introductory mathematics	Int MSc	Aniket Sule	2014, 2015, 2016
8.	Central University of Jharkhand	Introduction to History and Philosophy of Science	Int MSc	K. Subramaniam	2011

7. Details of programmes discontinued, if any, with reasons

There are no such programmes.

8. Examination System: Annual/Semester/Trimester/Choice Based Credit System

Students of HBCSE are offered coursework based on a mixture of Core Courses, choice- based Elective Courses and compulsory Field Project Work on topics of their own choice. The detailed structure is given in the table below.

Programme	Duration (years)		Core Credits	Elective Credits	Project Credits	Total Credits
	Overall	Course work				
Ph.D.	5	1.5	26	10	4	40

The Academic Session is divided into two semesters: the Autumn Semester (August – November) and the Spring Semester (January – April). In addition, there may be courses run during the Summer break (May – July).

Modular courses are run from time to time, by HBCSE or visiting faculty members. These are aimed at enrichment and/or enhancing research skills and knowledge in specific areas.

For each course, students are evaluated through the duration of the course. Evaluation modes typically have a combination of student work, which consist of assignments, term papers, essays, presentations and discussions, quizzes and examinations.

All students are required to do a minimum of 4 Credits of Field Project work as a part of the Coursework. The field project is mentored and evaluated by a faculty member.

Students are required to complete a take-home comprehensive written exam at the end of the first year covering the content of the first year courses. At the end of their field project, they are required to pass a viva-voce examination based on their field project and relevant coursework.

9. Participation of the department in the courses offered by other departments

HBCSE does not participate in courses given by other TIFR departments.

10. Number of faculty positions:

	Faculty Designation with DAE Grade	Abbreviation (Item 11)	Number
1.	Professor (H)	-	3
2.	Associate Professor (G)	Assoc. Prof. (G)	5
3.	Reader (F)	-	8
4.	Fellow (E)	-	-
		Total	16

11. Faculty profile with name, qualification, designation, area of specialization, experience and research under guidance

	Name	Deg*	Designation	Specialisation	Exp <sup>†</sup>	Stu <sup>‡</sup>
1.	Jayashree Ramadas	PhD	Centre Director / Professor (H)	Science Education	34	0
2.	K. Subramaniam	PhD	Dean, HBCSE Faculty / Professor (H)	Mathematics education	23	6
3.	Sugra I. Chunawala	PhD	Professor (H)	Gender in science and technology, Design and Technology education, Attitudinal studies	22	3
4.	Savita A. Ladage	PhD	Assoc. Prof. (G)	Chemistry Education Chemistry Olympiads, Chemistry Undergraduate Research Projects	20	1
5.	G. Nagarjuna	PhD	Assoc. Prof. (G)	Science Education, History and Philosophy of Science, Knowledge networks	19	4
6.	Jyotsna Vijapurkar	PhD	Reader (F)	Science education, Curriculum development, Teacher support	13	1
7.	K. K. Mishra	PhD	Assoc. Prof. (G)	Development of educational materials in Hindi, Science dissemination	17	1
8.	R. R. Vartak	PhD	Assoc. Prof. (G)	Biology education, Biology Olympiads, Biology Undergraduate Research Projects	15	0
9.	Anwesh Mazumdar	PhD	Assoc. Prof. (G)	Physics and Astronomy education, Asteroseismology, Astronomy and Physics Olympiads, Physics Undergraduate Research Projects	8	0
10	R. B.	PhD	Reader (F)	Physics Education, Physics	13	0

	Name	Deg*	Designation	Specialisation	Exp <sup>†</sup>	Stu <sup>‡</sup>
	Khaparde			Undergraduate Research Projects		
11	Aniket P. Sule	PhD	Reader	Astronomy education, History of Astronomy, Astronomy Olympiads, Astronomy Undergraduate Research Projects	9	0
12	P. K. Joshi	PhD	Reader	Junior Science Olympiads	19	0
13	Sanjay Chandrasekharan	PhD	Reader	Cognitive science, Learning sciences and educational technology	4	3
14	Karen Haydock	PhD	Reader	Science education, science epistemology, science and society, science and art	4	1
15	Prithwjit De	PhD	Reader	Mathematical Olympiads	6	0
16	Ankush Gupta	PhD	Reader	Chemistry education, environmental education	1	0

\* Highest degree obtained

† Years of Experience as a regular Faculty Member (TIFR and elsewhere)

‡ Ph.D. students guided within the last 4 years (including those joined, those graduated and those completing PhD but not on scholarship)

## 12. List of senior Visiting Fellows, adjunct faculty, emeritus professors

1. Prof. H. C. Pradhan, Raja Ramanna Fellow
2. Prof. D. P. Roy, INSA Senior Scientist
3. Prof. S. M. Roy, INSA Senior Scientist
4. Prof. M. C. Arunan, Consultant
5. Prof. Swapna Banerjee Guha, ICSSR Senior Fellow
6. Prof. B. J. Venkatachala, Consultant
7. Prof. C. R. Pranesachar, Consultant

## 13. Percentage of classes taken by temporary faculty – programme-wise information

- Ritesh Khunyakari, Visiting Fellow, taught a 4-credit course on “Thinking about Learning: Concepts, Theories and Paradigms” (2011-12).
- Arvind Jamkhandi, Visiting Fellow, taught a 2-credit elective course on “Philosophy of Technology” (2013-14).
- Gita Chadha, University of Mumbai, External guest faculty, taught a 4-credit elective course on Sociology of Science (2013-14)
- Roli Verma, University of New Mexico, Visiting Faculty at HBCSE, taught a 2- credit elective course on Science, Technology and Society (2013-14).
- Varadarajan Narayanan, Azim Premji University, Visiting faculty at HBCSE, taught a 1-credit elective course on “History of Education” (2015-16).
- Abhijeet Bardapurkar, Azim Premji University, Visiting faculty at HBCSE, partially taught “Philosophy of Education” - 4 credit course, 2016. (Dr. Bardapurkar taught about 30% of the course.)
- Shubhangi Bhide, Visiting Fellow, partially taught a 4-redit course on “Introduction to STME research” (Dr. Bhide taught about 40% of the ourse) (2015-16).

## 14. Programme-wise Student Teacher Ratio

	Programme	Students (S)	Faculty (F)	Ratio S/F
1.	Ph.D.	15	16	0.9

## 15. Number of academic support staff (technical) and administrative staff:

Scientific and Technical Staff	Administrative and Auxiliary Staff
27	27

## 16. Research thrust areas as recognized by major funding agencies

- Science, Technology and Mathematics Education
- National Initiative in Under-graduate Science (NIUS)



17. Number of faculty with ongoing projects from a) national b) international funding agencies and c) Total grants received. Give the names of the funding agencies, project title and grants received project-wise.

**a) National**

	<b>Agency</b>	<b>Project Title</b>	<b>Total Grant (Rs. lakhs)</b>	<b>Duration</b>	<b>Faculty</b>
1.	DST, Cognitive Science Research Initiative	The cognitive mechanisms underlying model-based discovery and learning	40.3	Oct 2013 - Oct 2016	Sanjay Chandrasekharan

**b) International**

	<b>Agency</b>	<b>Project Title</b>	<b>Total Grant (Rs. lakhs)</b>	<b>Duration</b>	<b>Faculty</b>
1.	International Atomic Energy Agency	Nuclear Data Sheets project	Euro 8000	2010-2016	Paresh Joshi (collaboration with IIT Roorkee)

## 18. Inter-institutional collaborative projects and associated grants received

## a) National

	Collaborating Institutions	Project Title	Total Grant	Duration	Faculty
1.	CIET, NCERT	National Repository for Open Educational Resources	N.A. (under MoU)	2012-17	G. Nagarjuna
2.	TISS	National University Students Skill (NUSSD) Development Project	N.A. (under MoU)	2013-16	G. Nagarjuna
3.	TISS	Connected Learning Initiative (CLIX) Project	N.A. (under MoU)	2015-	G. Nagarjuna
4.	YCMOU	YCMOU Post-Graduation Research Programme	(under MoU)	Ongoing from several years	Sugra Chunawala

## 19. Departmental projects funded by DST-FIST; UGC-SAP/CAS, DPE; DBT, ICSSR, AICTE, etc.; total grants received.

	Agency	Project Title	Total Grant (Rs. lakhs)	Duration	Faculty
1.	DAE	Science, Technology and Mathematics Education	437	2012-2017	All HBCSE faculty
2.	DAE	National Initiative on Under-graduate Science	516	2012-2017	Several HBCSE faculty
3.	BRNS (DAE)	National Science Olympiad	348	2012-2017	Several HBCSE faculty
4.	DAE	National Science Olympiad (Annual Grant)	170	2015-16	Several HBCSE faculty

5.	DST	National Science Olympiad	50	2015-16	Several HBCSE faculty
6.	MHRD	National Science Olympiad	34	2015-16	Several HBCSE faculty
7.	DoS	National Science Olympiad	23	2015-16	Several HBCSE faculty
8.	NBHM (DAE)	National Mathematical Olympiad	56	2015-16	Prithwijit De
9.	DAE	XII Plan Project-Science Education	1375	2012-17	All HBCSE faculty

20. Research facility / centre with

- state / national / international recognition: **None**

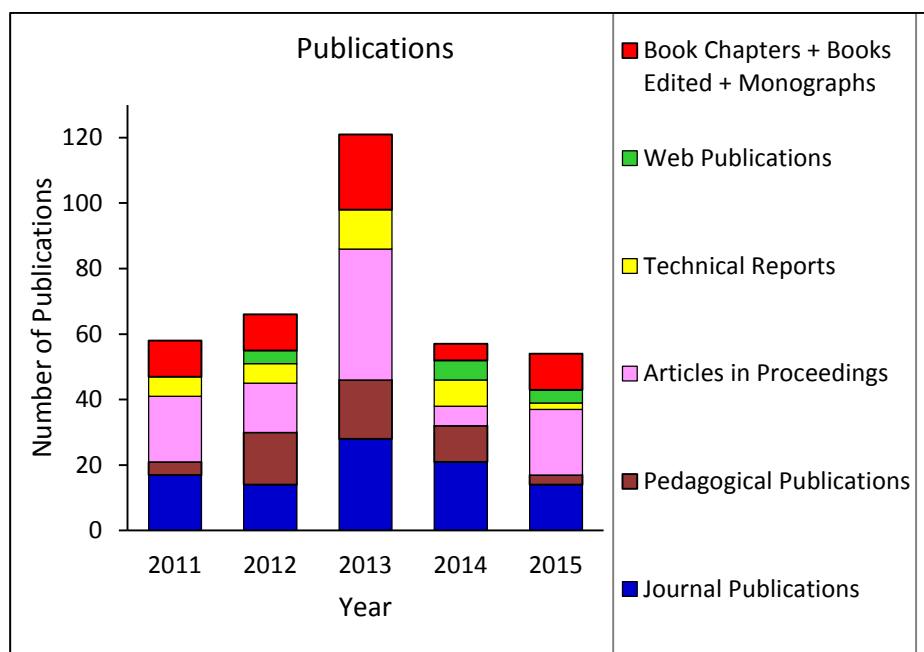
21. Special research laboratories sponsored by / created by industry or corporate bodies

**N.A.**

22. Publications:

HBCSE	Journal Publications	Pedagogical Publications*	Articles in Proceedings	Technical Reports	Web Publications	Book Chapters	Books Edited	Mono-graphs
<b>2010-11</b>	17	4	20	6	0	3	8	-
<b>2011-12</b>	14	16	15	6	4	4	7	-
<b>2012-13</b>	28	18	40	12	0	10	13	-
<b>2013-14</b>	21	11	6	8	6	4	1	-
<b>2014-15</b>	14	3	20	2	4	3	8	-
<b>Total</b>	<b>94</b>	<b>52</b>	<b>101</b>	<b>34</b>	<b>14</b>	<b>24</b>	<b>37</b>	<b>-</b>

\* Pedagogical publications include articles for teachers and students, science popularization articles, expository articles, mathematical problems and solutions, etc. published in both journals and magazines. This category is important for the work done at HBCSE.



\* Citation Index – range / average

Total number of citations: 742 (Source: Google Scholar)

Number of citations per faculty: 46

23. Details of patents and income generated

Not Applicable

24. Areas of consultancy and income generated

	Faculty Member	Project Name	Company Name	Duration	Income
1.	K. Subramaniam	Review of Maths Chairs Programme, South Africa	Khulisa Management Services, South Africa	July-Dec 2013	Rs 99298

25 Faculty selected nationally / internationally to visit other laboratories / institution/industries in India and abroad

(Visits include talks, lectures, presentations at workshops, seminars and conferences, consultative meetings, etc. Relatively unimportant visits have been excluded.)

### National

	Name of Faculty member	Place visited	Date (MM/YYYY)
1.	Savita Ladage	Marathwada University Aurangabad	10/2011
		National Convention of Chemistry Teachers – 2011, Patna	10/2011
		S. P. College, Pune	12/2011
		Modern College, Pune	02/2012
		Vaze College, Mumbai	09-10-2011, 11/2011
		Guwahati University, Guwahati	11/2012
		Refresher courses for teachers, Amravati University	12/2012
		Rayat Science Conference on Science Education, Satara	01/2013
		Inspire Programme, Satara	03/2013
		Annamalai University, Chennai	11/2013
		Institute of Chemical Techonology, Mumbai	03/2014
		IIS University, Jaipur	10/2014
		SRM University, Chennai	08/2014
		Ruia College, Mumbai	02/2015
2.	K. K. Mishra	Teacher Training Program for Chemistry Teachers of Allahabad, Vigyan Parishad Prayag	08/2011
		Heavy Water Board, BARC, Mumbai	01/2012
		INSPIRE (DST) Program fro Bihar State, Chapra, Bihar	08/2011
		Institute of Physics, Bhubaneswar	11/2011
		Indira Gandhi National Open University, New Delhi	03/2012

	Name of Faculty member	Place visited	Date (MM/YYYY)
		International Conference on Role of Communication Media in Creating Scientific Temper, Pusa, New Delhi	05/2012
		National Workshop on Science Communication in Hindi through Digital Media, New Delhi	03/2012
		Jagdam College (J.P. University), Chapra, Bihar	07/2012
		AERB, Mumbai	05/2013
		DRDO, New Delhi	12/2013
		National Hindi Science Conference, Bhopal	08/2014
		Regional Science Centre, Lucknow	03/2015
		National Workshop on Development of Educational E-materials in Hindi, Vidyan Parishad Prayag	11/2014
3.	G. Nagarjuna	National Institute of Rural Development, Hyderabad	05/2010
		International conference on Public Sector Software and FOSS in Education, Kochi	05/2010
		National Institute of Technology, Calicut	09/2010
		Sahrdaya College of Engineering and Techonology Kodakara, Kerala	10/2010
		Sreenidhi Institute of Science and Technology, Hyderabad	04/2010
		Mumbai University, Kalina, Mumbai	2010-11
		Computer Society of India CSI 2010, Taj Ends, Mumbai	11/2010
		Marvell India Technology Day, Taj Mahal Hotel, New Delhi	12/2010
		TISS, Mumbai	04/2011
		NISTADS, New Delhi	06/2011
		Global Education and Skill Summit, Pragati Maidan	09/2011

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Bardhwan University	12/2011
		Dr. B. R. Ambedkar National Institute of Technology, Jalandhar, Punjab	03/2011
		Shah and Anchor Kutchhi Engineering College, Chembur, Mumbai	01/2012
		K. J. Somaiya Comprehensive College of Education, Training and Research, Mumbai	03/2012
		ISI Kolkata	03/2012
		NCERT, Delhi	10/2011
		IISER, Mohali	03-04/2012
		Tata Institute of Social Sciences, Mumbai	2012
		St. Teresa's Institute of Education, Santa Cruz, Mumbai	07/2012
		CHM College	08/2012
		Usha Mittal Institute of Technology, SNDT University	10/2012
		NCERT, Silvassa, Dadra and Nagar Haveli	12/2012
4.	K. Subramaniam	JNU, New Delhi	12/2010
		Zonal Institute of Training of the Kendriya Vidyalaya Sangathana, D. Y. Patil School, Mumbai	09/2010
		D. Y. Patil School, Mumbai	11/2010
		Rajya Shiksha Kendra, Bhopal	03/2011
		IGNOU, New Delhi	12/2011
		National Initiative on Mathematics Education: Eastern Regional Conference, Patna Science College	12/2011
		TISS, Mumbai	10-11/2011
		Central University, Jharkhand	09/2011
		Acharya Marathe College, Mumbai	12/2011
		National Meet on Year of Mathematics, NCERT, Delhi	12/2012
		IISER, Pune	12/2011
		Regional Institute of Education, Ajmer	12/2013

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Azim Premji University, Bangalore	05/2014
		Central Institute of Education, University of Delhi	07/2014
		Regional Institute of Education, Bhopal	12/2014
		Government College of Education, Panvel	01/2015
		Department of Education, University of Mumbai	03/2015
		Azim Premji Foundation, Dehradun	09/2014
		PVDT College, Mumbai	02/2015
		IIT Bombay, Mumbai	03/2015
5.	Jayashree Ramadas	Indian Institute of Technology, Indore	08/2012
		National Institute of Advanced Study, Bangalore	09/2012
		Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore	11/2012
		Navi Mumbai Science Foundation, Vashi	02/2013
		Yashwantrao Chavan Institute of Science, Satara	03/2013
		SCERT, Patna	03/2013
		Shree Shivaji Vidnyan Parishad, Amravati	12/2013
		Centre for Excellence in Basic Sciences, University of Mumbai	03/2014
		TIFR Centre for Interdisciplinary Sciences, Hyderabad	05/2014
		BARC, Mumbai	03/2015
		University of Hyderabad, Hyderabad	05/2014
6.	Dr. Aniket Sule	University of Mumbai, Mumbai	05/2010, 02/2011
		Mathematics Workshop for School Teachers, Bombay Association for Science Education (BASE)	07/2010
		UM-DAE CBS, Mumbai	03/2011
		Careers in Science, Shanmukhananda	06/2010



	Name of Faculty member	Place visited	Date (MM/YYYY)
		Auditorium, Mumbai	
		Making use of General Knowledge, Chetna Institute of Management Studies, Mumbai	07/2010
		Magalatai Abhyankar Memorial Lecture, Khagol Mandal, Mumbai	10/2010
		Careers in Science (Marathi), CKP Mandal, Mumbai	10/2010
		Seminar by Indian Planetary Society, Surat, Gujarat	12/2010
		Careers in Astronomy, UGC Seminar, Surat	01/2011
		D. G. Ruparel College, Mumbai	02/2011
		Certificate Course in Astronomy and Astrophysics, Centre for Extra Mural Studies, University of Mumbai, Mumbai	01/2012
		Refresher Course for UG Teachers, Department of Computer Science, University of Mumbai, Mumbai	01/2012
		Astronomy Workshop for NCSM Personnel, NCSM Headquarters, Kolkata	09/2011
		St. John's School, Goregaon, Mumbai	04/2011
		Kelkar College, Mulund, Mumbai	10&12/2011
		Open question and answer session with an astronomer, Nyass Trust, Dombivali	01/2012
		Carrer Opportunities in Pure Science, Chief Guest's address, Bhayandar, Thane	01/2012
		Carrer Opportunities in Pure Science, Chief Guest's address, Podar International School, Aurangabad	02/2012
		Carrer Opportunities in Pure Science, Chief Guest's address, Saraswati Vidyamandir, Mahim, Mumbai	02/2012
		UM-DAE CBS, Mumbai	01-04/2013, 10/2012
		IIT, Mumbai	09/2012
		M. P. Birla Institute of Fundamental Research, Bangalore	05/2012
		SIES College, Mumbai	07/2012

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Marathi Vigyan Parishad, Thane	09/2012
		D. Y. Patil International School, Worli	09/2012
		Marathi Vigyan Parishad, Mumbai	11/2012
		SMG English School, Diva	07/2012
		INSPIRE camp, Rajur, Ahmadnagar, Maharashtra	01/2013
		Telescopes of the future, Rotary Club, Chembur	01/2013
		Nehru Science Centre, Mumbai	06/2013
		Nehru Planetarium, Mumbai	07/2013
		BEST planning Workshop, Tamilnadu & Pudducherry Science Forum, Pudducherry	08/2013
		Guwahati Planetarium, Guwahati	08/2013
		Khalsa High School, Kolkata	04/2013
		Comets (Marathi), Maharashtra Sewa Sangh, Mulund (West)	11/2013
		KTHM College, Nashik	03/2013
		IIT-Bombay, Astronomy Club	10/2013
		UM-DAE CBS	08-11/2014, 01-04/2015
		D. G. Ruparel College, Mumbai	09/2014
		S.N.D.T. University, Mumbai	03/2015
		IISER, Mohali	03/2015
		Nehru Science Centre, Mumbai	04/2014
		Telescopes of the future (Marathi), Aseemit Astro Club, Pune	08/2014
		Telescopes of the future (Marathi), Skywatchers Astro Club, Pune	12/2014
		John Cannon School, Mumbai	10/2014
		Astronomy, astrology and scientific temper, Kaivalya Hospital, Thane	
7.	Rajesh Khaparde	2nd National Workshop on Preparation of Question Bank, Association of Indian Universities and SGBA University, Amravati	08/2010
		St. Xavier's College, Ahmedabad	03/2014
		Shri Shivaji Science College, Amravati,	06/2014

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Maharashtra	
		Indian Women Scientist's Association, Navi Mumbai	12/2014
8.	Sanjay Chandrasekharan	Amrita University, Kollam, Kerala	12/2014
		Indian Institute of Management, Kozhikode	2015
9.	Sugra Chunawala	Rajiv Gandhi National Institute of Youth Development, Sriperumbudur, Chennai	03/2011
		University of Mumbai, Mumbai	10/2011
		Western Regional Consultation on Women and Science & Technology, Mumbai	12/2011
		K. J. Somaiya Comprehensive College of Education, Mumbai	12/2012, 02/2013
		National Meet of Science Communicators in Indian Languages,	12/2012
		Kendriya Vidyalaya Sangathan School, Mankhurd	09/2013, 02/2014
		K. J. Somaiya College of Science and Engineering, Mumbai	12/2013
		Gokhale Education Society's Shri Bhausahab Vartak Arts, Commerce and Science College, Mumbai	01/2015
		Navi Mumbai Science Foundation (NMSF)	02/2015
		K. J. Somaiya Comprehensive College of Education, Training and Research, Vidyavihar	01/2015
		KV-ZIET, Mumbai	03/2015
		Annual Peer Learning Meet – 3, Bhopal, Panchmarhi, Hoshangabad, Madhya Pradesh	03/2015
		Council for Teacher Education (CTE) Seminar, Bengaluru	06/2014
10.	Anwesh Mazumdar	G.N. Khalsa College, Mumbai	07/2011
		Navy Children's School, Navy Nagar, Mumbai	2012, 2013, 2014

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Indian Institute of Geomagnetism, Panvel	02/2013
		K. J. Somaiya College, Mumbai	09/2013
		Fergusson College, Pune	01/2014
		K. J. Somaiya College of Science and Commerce, Mumbai	02/2015
		IISER, Mohali	03/2014
11.	J. Vijapurkar	Muktangan Exploratory Science Centre, Pune	04/2012
12.	R. Vartak	Nehru Science Centre, Mumbai	06/2013
		Zonal Institute of Education and Training (ZIET), Mumbai	12/2014
13.	P. K. Joshi	AEES School, Anushaktinagar	05/2013
		Junior Science Olympiad, Satara	10/2014
		Junior Science Olympiad, Bhuj	11/2014
14.	K. Haydock	TISS, Mumbai	11/2012
		Science, Ethics and Evolution, Centre for Excellence in Basic Sciences	02/2013
		Assessment and Teaching Ideas, DIET Nadia	12/2012
		Workshop on Small Science, Sri Sri Ravishankar Vidya Mandir, Mulund	07/2012
		Evolution – 2 day workshop on evolution for teachers, Eklavya, Indore	06/2012
		IISER, Mohali	2012
		IISER, Pune	08/2012
		Jhunjhunwala College, Ghatkopar, Mumbai	09/2012
		Chandibai Himathmal Mansukhani College, Kharghar	11/2012
		IIT-Bombay, Mumbai	11/2012
		University of Mumbai, Mumbai	01-04/2014
		ZIET, Powai, Mumbai	07/2014
		St. Xavier College, Mumbai	01/2015
15.	P. De	UM-DAE Centre for Excellence in Basic Sciences (CEBS), Mumbai	08-12/2012
		Nehru Science Centre, Mumbai	09/2012

	Name of Faculty member	Place visited	Date (MM/YYYY)
		Lecture Course for First Year students, CEBS	10-11/2014
		Lecture course for second-year students, CEBS	01-14/2015
		Lecture course for third-year students, CEBS	01-14/2015

### International

	Name of faculty member	Place visited	Date (MM/YYYY)
01.	Rajesh Khaparde	New York University, Abu Dhabi Campus, UAE	10/2010
		International Conference on Physics Education, Prague, Czech Republic	08/2013
		45th International Physics Olympiad, Astana, Kazakhstan	07/2014
02.	Jayashree Ramadas	International Conference on Physics Education, Prague, Czech Republic	08/2013
		7th International Astronomy and Astrophysics Olympiad, Volos, Greece	07-08/2013
03.	K. Subramaniam	University of Goteborg, Sweden	06/2010
		International Programme Committee meeting for ICME-12 in South Korea	02/2011
		International Congress of Mathematics Education (ICME-12) in South Korea	07/2012
		Conference of the International Group on Psychology of Mathematics Education (PME), Turkey and Taiwan	07/2011; 07/2012
		Eighth Swedish Mathematics Education Research Seminar; Matematikbiennalen 2012, Umea University, Sweden	01/2012

	Name of faculty member	Place visited	Date (MM/YYYY)
		Community of Practice Forum, FirstRand Foundation Mathematics Chairs, Johannesburg, South Africa	07/2013
		2015 SAARMSTE Doctoral Research School, Johannesburg, South Africa	06/2015
		University of Witwatersrand, Johannesburg, South Africa	08/2015
04.	Aniket Sule	Astronomy Olympiad training programme, Dhaka, Bangladesh	04/2010
		4th International Astronomy and Astrophysics Olympiad, Beijing, China	09/2010
		Network for Youth Excellence (NYEX), Jerusalem, Israel	03/2011
		Asia-Pacific Regional IAU Meeting (APRIM) 2011, Chiang Mai, Thailand	07/2011
		5th International Astronomy and Astrophysics Olympiad, Krakow and Katowicw, Poland	09/2011
		International Astronomy and Astrophysics Workshop, Dhaka,	03/2012
		6th International Astronomy and Astrophysics Olympiad, Rio De Janeiro and Vassouras cities, Brazil	08/2012
		Cox's Bazaar, Dhaka, Bangladesh for organisation of 8th Asia-Pacific Astronomy Olympiad	11-12/2012
		International Astronomical Union (IAU) General Assembly, Beijing, China	08/2012
		7th International Astronomy and Astrophysics Olympiad, Volos, Greece	07-08/2013
05.	Savita Lavadge	43rd International Chemistry Olympiad, Ankara, Turkey	07/2011
		44th International Chemistry Olympiad, Washington, USA	07/2012

	Name of faculty member	Place visited	Date (MM/YYYY)
		45th International Chemistry Olympiad, Moscow, Russia	07/2013
		8th International Astronomy and Astrophysics Olympiad, Suceava, Romania	08/2014
05.	Sugra Chunawala	Pamukkale University, Turkey	06/2011
		The University of South Africa (UNISA)	10/2011
		NARST-2012, Indianapolis, USA	03/2012
		Singapore and Kuala Lumpur, Malaysia in connection with Science Education for Diversity project	2012-2013
		University of Antwerp, Belgium	2015
7.	Jyotsna Vijapurkar	The University of South Africa (UNISA)	10/2011
		Ministry of Education, Govt. Of Timor- Leste, Dili, Timor-Leste	09-10/2013
8.	Anwesh Mazumdar	Observatoire de Paris at Meudon, France	05-06/2011
		Second CoRoT Symposium, Marseille, France	05/2011
		5th International Astronomy and Astrophysics Olympiad, Krakow and Katowicw, Poland	09/2011
		HELAS Conference, Obergurgl, Austria	05/2012
		University of Cologne, Germany	05-06/2012
		Catholic University of Leuven, Belgium	05-06/2012
		5th Workshop of the Kepler Asteroseismic Science Consortium, Balatonalmadi, Hungary	06/2012
		IAU General Assembly Special Session 13, Beijing, China	08/2012
		Astronomical Institute Anton Pannekoek, University of Amsterdam, Netherlands	05-06/2013
		Max Planck Institute for Solar System Research in Gottingen, Germany	05/2014

	Name of faculty member	Place visited	Date (MM/YYYY)
		45th International Physics Olympiad, Astana, Kazakhstan	07/2014
9.	G. Nagarjuna	FOSST@KACST, Riyadh, Saudi Arabia	04/2010
		CONSEGI 2010, Brasilia, Brazil	08/2010
		Mozilla Drumbeat, Barcelona	10/2010
		6th Open Knowledge Conference, Berlin, Germany	06-07/2011
		University of Cape Town, South Africa	11/2011
10.	Paresh K. Joshi	International Junior Science Olympiad, Abuja, Nigeria	11/2010
		8th International Junior Science Olympiad, Durban, South Africa	12/2011
		9th International Junior Science Olympiad, Tehran, Iran	12/2012
		11th International Junior Science Olympiad, Mendoza, Argentina	12/2014
11.	Rekha Vartak	21st International Biology Olympiad, Changwon, Korea	07/2010
12.	Prithwiji De	52nd International Mathematical Olympiad, Amsterdam, The Netherlands	07/2011
		55th International Mathematical Olympiad, Cape Town, South Africa	07/2014

## 26. Faculty serving in

## a) National Committees

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
1	Prof. Jayashree Ramadas	Project Advisory Committee of the National Council for Science Technology Communication (NCSTC), Department of Science and Technology	Chair	2012-13
		Central Advisory Board on Education	Member	2012-14



	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		(CABE) Committee for developing a framework and processes of the National Mission on Teachers and Teaching		
		Committee of experts to oversee and mentor programmes of the National Council for Science & Technology Communication (NCSTC), DST	Member	2012-13
		Consultation group of the Justice J. S. Verma Commission on Teacher Education appointed by the Hon'ble Supreme Court	Member	2010-13
		National Advisory Committee and National Scientific Committee for the Kishor Vaigyanik Protsahan Yojana (KVPY), DST	Member	2011-13
		Expert Committee for the "Rajat Jayanti Vigyan Sancharak Fellowship" of DST (NCSTC Division)	Member	2011-13
		Governing Council of the Atomic Energy Education Society (AEES)	Member	2011-15
		Governing Council, Vigyan Prasar, Department of Science and Technology	Member	2013-14
2	Prof. Sugra I. Chunawala	Executive Council, Peoples Council of Education	Member	2012-2015
		Departmental Advisory Board, Department of Gender Studies, NCERT	Member	2014-
		Sub Committee constituted to draft regulations and norms and standards for Open and Distance Learning (ODL) Teacher Education Programmes, NCTE	Member	2014-15
		Board of University Teaching and Research, YCMOU	Member	Ongoing from several years
		Revision of Syllabus for B.Ed. Course on Gender, School & Society, University of Mumbai	Member	2015
		Board of Studies, SNDT University, Mumbai	Member	2013-
		Indian Educational Review, NCERT, New Delhi	Reviewer	Ongoing

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		EpiSTEME-4 Conference	Convener	2010-11
		K. J. Somaiya Comprehensive College of Education, Training and Research, Mumbai	LMC, Member	2015-
3	Prof. K. Subramaniam	Curriculum and Syllabus Committee (Class 1 to 8) for Mathematics of the Maharashtra State	Chair	2011-2012
		The National Conference on Mathematics education held at HBCSE under the NIME initiative, January 2012.	Convener	2011-2012
		The Steering Committee for the National Initiative in Mathematics Education (NIME 2011-12)	Member	2011-2012
		National Council for Teacher Education	Member	2013-
		Textbook Committee for Mathematics Textbook, Balbharti, Maharashtra	Member	2013-14
		Executive Committee of National Mission of Sarva Shiksha Abhiyan (SSA)	Member	2013-
		Educational Research and Innovations Committee, NCERT	Member	2012-
		NCTE sub-committee on developing guidelines for Teacher Eligibility Test	Member	2013-14
		NCTE sub-committee on teacher education through ODL mode	Member	2013-14
		NCTE sub-committee on developing norms for faculty for B.El.Ed. Programme	Member	2013-14
4	Prof. Savita Ladage	Executive Council of Association of Chemistry Teachers (ACT)	Member	2001-07, 2014-16
		West Zone, Association of Chemistry Teachers, ACT	Vice-President	2008-13
		International Conference on Education in Chemistry, Jointly organized by HBCSE and Association of Chemistry Teachers	Convener	2010, 2014
		National Initiative on Undergraduate Science (NIUS)	National Co-ordinator	2012-
		Course committee, PG diploma course in Analytical Techniques, Garware Institute of Career Education and Development,	Member	2016-

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		University of Mumbai		
5	Prof. G. Nagarjuna	Free Software Foundation of India	Chairperson	2004-
		EpiSTEME-5 Conference	Convener	2012-13
		Technical Committee, LITDC, Bureau of Indian Standards, Delhi	Member	2008-11
		Institutional Advisory Board, Central Institute of Educational Technology, NCERT, New Delhi	Member	2012-
		Board of Software Freedom Law Centre of India, New Delhi	Member	2011-
		Joint Board of Paper Setters for the Proficiency Test in Science & Mathematics held by the Central Board of Secondary Education in July 2011.	Member	2011-12
		Advisory Board, K. J. Somaiya College of Engineering, Mumbai	Member	2007-15
		Web Server Committee, National Board of Higher Mathematics	Member	2012-
		Departmental Advisory Board, Department of Computers and Technological Aids, NCERT, New Delhi	Member	2012-
		6	Prof. K. K. Mishra	People Council of Education, Allahabad
Vigyan Parishad Prayag, Allahabad	Member			2006-
Executive Council, Lok Vigyan Parishad, New Delhi	Member			2014-
National Academy of Sciences, India	Member			2008-
Advisory Committee, Vikramshila Science Academy, Patna	Member			
7	Prof. Rekha Vartak	Interview Board of Kishore Vaigyanik Protsahan Yojana	Member	2014
		Executive Committee, Association of Teachers in Biological Sciences (ATBS)	Member	2006-
8	Dr. Anwesh Mazumdar	Joint Board of Paper Setters for the Proficiency Test in Science & Mathematics held by the Central Board of Secondary Education in July 2011.	Convener	2011-13
		Kishore Vaigyanik Protsahan Yojana Paper-setting Committee	Member	2011, 2013, 2014

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
		The Committee for National Innovation Scholarships under the Office of Adviser to Prime Minister on Public Information, Infrastructure and Innovations	Member	2012-13
		Science Olympiad (Biology, Chemistry, Junior Science and Physics)	National Coordinator	From August 2014
9	Dr. R. B. Khaparde	Board of Studies in Physics, University of Mumbai	Member	2010-2015
		Physics advisory group on laboratory programme (M.Sc.) of the Central University of Tamil Nadu	Member	2008-2011
		Advisory Committee for the Jawaharlal Nehru National Science, Mathematics and Environment Exhibition (JNNSMEE), NCERT, New Delhi	Member	2014-
		The Academic Advisory Committee for 'The Story of Light' Science Festival, January 14-18, 2015, Goa, India	Member	2014-15
10	Dr. Aniket Sule	Astronomy Sub-Committee of the academic committee for International Earth Science Olympiad 2013 organised by Geological Society of India at Mysore	Chair	2013
		Coordination Committee for National Entrance Screening Test (NEST)	Member	2008-
		Academic Programme Committee, UM-DAE CBS	Member	2007-11
		Academic Review Panel for Science activity kits for Vigyan Prasar	Member	2011
		Scientific Organising Committee 2nd Pro-Am meeting in Astronomy, organised by Astronomical Society of India and held at Nehru Planetarium, Delhi	Member	2012
		Scientific Organising Committee, Day Time Astronomy: Transit of Venus 2012 Workshop organised by HBCSE and Vigyan Prasar	Member	2012
		Project Approval Committee for NCSTC Ramanujam – Chandrasekhar centenary celebrations (DST)	Member	2013

	Name of the Faculty Member	Name of the Committee	Role in the Committee	Term of Service
11	Dr. P. K. Joshi	Bombay Association of Science Education (Since 2008)	Chairman	2008
		Indian Physics Association	Life Member	2005-
12	Dr. Sanjay Chandrasekharan	EpiSTEME-6 Conference	Co-Convener	2013-15
		Conference Programme Committee of Technology for Education (IEEE), 2014, Kollam, India.	Member	2014
13	Dr. Karen Haydock	Course Package for 'Teaching Science: the Upper Primary Years' to develop course materials for teacher education -at Azim Premji University.	Independent Reviewer	2013-14
		For The Rishi Valley Education Centre, in collaboration with Azim Premji University.	Independent Reviewer	2013-2015
14	Dr. Jyotsna Vijapurkar	Continuous and Comprehensive Evaluation Committee, NCERT	Member	2013
		Curriculum Reform Committee, SCERT, Andhra Pradesh	Member	Up to 2012

**(b) International Committees :**

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
1	Prof. Jayashree Ramadas	The IUPAP International Commission on Physics Education (ICPE)	Member	2011-2013 and 2014-2016
2	Prof. K. Subramaniam	International Programme Committee for the International Congress of Mathematics Education – 2012	Member	2009-2012
		India representative to the International Commission for Mathematics Education	Country Representative	2013-
3	Prof. Savita Ladage	International Steering Committee for International Chemistry Olympiad	Co-opted Member	2012-2013
4	Prof. G. Nagarjuna	International Workshop on Conceptual Structures Learning	Co-Chair	2011

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
		Teaching and Assessment Derby, 25th July 2011		
		20th International Conference on Conceptual Structures	General Chair	2013
		Academic Council, Free Technology Academy, Amsterdam, Netherlands	Member	2008-13
5	Dr. Anwesh Mazumdar	Scientific Organising Committee for Lorentz Centre Workshop on Red Giant Stars, Leiden	Member	2012
		The International Astronomical Union	Member	2015-
		International Physics Olympiad 2015	Convener, Member of Academic Committee, Co-ordinator of Theory Component	2014-15
		International Junior Science Olympiad 2013	Member, Academic	2013
6	Dr. Aniket Sule	Academic Committee, 8th Asia Pacific Astronomy Olympiad, Cox's Bazaar, Bangladesh	Chair	2009
		Asia-Pacific, for the International Olympiad in Astronomy and Astrophysics (IOAA)	Regional Coordinator	Jan. 2012 to Dec.
		The International Astronomical Union	Member	2015-
7	Dr. P. K. Joshi	International Junior Science Olympiad Executive Committee	Vice-President	2012-15
		International Junior Science Olympiad Executive Committee	President	2015-18
8	Dr. Sanjay Chandrasekharan	Conference Programme Committee of Annual Meeting of the Cognitive Science Society, 2015, Pasadena, USA	Member	2015
		Conference Programme Committee of Model Based Reasoning Conference, Sestri, Levante, Italy, 2015	Member	2015
		Conference Programme Committee of The 15th IEEE International Conference on Advanced Learning Technologies,	Member	2015

	Name of the Faculty Member	Name of the Committee	Role of the Committee	Term of Service
		2015, Hualien, Taiwan		
		Conference Programme Committee of The 23rd International Conference on Computers in Education, Hangzhou, China	Member	2015
		Conference Programme Committee of Technology for Learning of Thinking Skills, The 22nd International Conference on Computers in Education, 2014, Nara, Japan	Member	2014
9	Rajesh Khaparde	International Physics Olympiad 2015	Member of Academic Committee, Co-ordinator of Experimental Component	2014-15

**(c) Editorial Boards :**

	Name of the Faculty Member	Name of the Journal	Impact Factor	Term of Service
1	Prof. K. Subramaniam	Advisory Board, International Sourcebooks in mathematics and science education, Information Age Publishing	N.A.	2012-
		Journal Editorial Board, Contemporary Education Dialogue as a Member.	-	2010-
		Journal Editorial Board, At Right Angles as a Member.	-	2011-
2	Prof. G. Nagarjuna	International Journal of Conceptual Structures and Smart Applications (IJCSSA), an Official Publication of the Information Resources Management Association as a Associate Editor.		2013-
3	Prof. K. K. Mishra	Editorial Board, Vidgyan Prakash, a quarterly Hindi Science magazine, World Hindi Foundation, New York, USA as a Member.		2004-
		Advisory Board of Vigyan Ganga, a Science journal of BHU, Varanasi as a		2012-

		Member.		
4	Dr. R. B. Khaparde	Physics Education, a journal published by University of Pune in association with IAPT as a Associate Editor.		2011-

27. Faculty recharging strategies (UGC, ASC, Refresher / orientation programs, workshops, training programs and similar programs).

All HBCSE faculty members regularly participate in national and international research- oriented symposia, conferences, workshops and schools. Further, they lead several intervention programmes targetted at students, teachers and teacher educators, which provides a first hand knowledge of issues in science education. The intervention programme are highly sought after since the Centre's expertise in science education is widely recognized.

The Centre encourages faculty members to participate in teaching in other institutions. The Centre has signed an MoU with IIT Bombay, by which students of the Interdisciplinary Programme in Education Technology at IIT Bombay take courses at HBCSE, and faculty from HBCSE teach in the programme. Faculty members of the Centre also teach in the Centre for Excellence in Basic Sciences, Mumbai University and in the M.A. (Education) programme at Tata Institute of Social Sciences. Individual modular courses have also been taught at other universities such as Central University, Jharkhand and IISER, Pune. By participating in teaching in other institutions, the faculty get valuable experience in teaching diverse groups of students and enrich their own teaching skills and perspectives by interacting with the faculty of other institutions closely. Similarly teaching by visiting professors enhances the quality and diversity of course offerings at HBCSE.

28. Student projects

- percentage of students who have done in-house projects including inter- departmental projects

ALL (100%) HBCSE students are required to do at least one field work project as part of their coursework.

Under the National Initiative on Undergraduate Science (NIUS)



programme, undergraduate students from various institutions attend training camps at HBCSE and also carry out a research project under guidance from a mentor. About 108 NIUS camps have been held since 2004 and about 170 projects in physics, astronomy, chemistry and biology have been completed.

- percentage of students doing projects in collaboration with other universities / industry / institute

Some HBCSE faculty members have active collaborations with researchers in India from institutions such as IIT, Mumbai and TISS, Mumbai with researchers in other countries. Students of these faculty members participate in the research collaboration or make extended visits to Centres abroad to strengthen their research skills and expertise. The percentage of students involved in such projects is about 30%.

#### 29. Awards / recognitions received at the national and international level

- Faculty Members:**

##### a) National Awards

Year	Name of the Awardee	Name of the Award
2011	S. C. Agarkar	Sanjeevray Sarma Award by the Ramanujan Foundation (Andhra Pradesh)
2009-2010	K. K. Mishra	Homi Jehangir Bhabha Award of the 'Maharashtra Rajya Hindi Sahitya Academy'
2012-2013	K. K. Mishra	Shatabdi Samman, Vigyan Parishad, Prayag
2012-2013	Vijay Singh	Navbharat Times UDAAN Award
2014	K. K. Mishra	Bharatiya Bhasha Pratishthan Samman Patra
2006	Savita Ladage	Best Chemistry Teacher Award, Chemical Research Society of India

	2015	K. K. Mishra	Rajbhasha Gaurav Award, Department of Official Language, Ministry of Home Affairs, Government of India
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### International Awards

Year	Name of the Awardee	Name of the Award
2011	J. Ramadas	The Third World Academy of Sciences Regional Prize

- Students, Postdocs, Scientific Staff and Others:**

### National Awards

Year	Name of the Awardee	Name of the Award
2009	V. C. Sonawane	Dr. N. R. Tawade Prize for Outstanding Marathi Literature of Govt of Maharashtra
2010-	A. D. Ghaisas	Raja Kelkar Award for "Durbini Ani Vedhasala"
2013-2014	A. Ghaisas	Yedunath Thatte Puraskar for Marathi Book "Akash Kase Pahaave", Government of Maharashtra.
2014	A. Ghaisas	Prof. M. V. Chiplonkar Memorial Award, Indian Physics Association, Pune

30. Seminars/ Conferences/Workshops organized and the source of funding (national / international) with details of outstanding participants, if any.

Year	Name	Funding Agency	Faculty members
2010	Fourth Asian Science Camp, HBCSE	DST & DAE	H. C. Pradhan

Year	Name	Funding Agency	Faculty members
2011	epiSTEME-4, Fourth international conference to review research in Science, Technology and Mathematics Education, HBCSE	DAE	All faculty members
2011	Second Indo-Swedish Meeting on mathematics education, HBCSE	NBHM	K. Subramaniam
2010	First International Conference on Education in Chemistry, HBCSE in collaboration with Association of Chemistry Teachers	DAE, DST & CSIR	Savita Ladage
2011	Second Annual Research Meet, HBCSE	HBCSE	All Faculty members
2010	Wikipedia Workshop, HBCSE	HBCSE	G. Nagarjuna
2011	Open Video Conference, HBCSE	HBCSE	G. Nagarjuna
2010	Development of E-materials in Hindi, Allahabad	HBCSE	K. K. Mishra
2011	Science Education and Diversity project, India Meet, HBCSE	Univ of Exeter, From SED	Sugra Chunawala & Chitra Natarajan
2012	National Initiative in Mathematics Education (NIME) National Conference, HBCSE	NBHM	K. Subramaniam
2012	Collaborative Approach to Develop Science Teaching Methods Suitable for Addressing Diversity in Classrooms, HBCSE (Two Teacher Workshops)	Australia India Council	Sugra Chunawala & Chitra Natarajan
2011	Towards Science Education for Diversity: A Teacher Researcher Collaborative Workshop, HBCSE	SED Project Funding	Sugra Chunawala
2012	Day Time Astronomy: Transit of Venus 2012 Workshop, HBCSE	Vigyan Prasar	Aniket Sule
2012	Third Annual Research Meet, HBCSE	HBCSE	All faculty members
2011	Interfacing simple science experiments with computer using Expeyes/Phoenix system,	HBCSE	G. Nagarjuna
2012	Asian Physics Olympiad, New Delhi	DAE, DST & NCERT	H. C. Pradhan, Vijay Singh, Rajesh Khaparde, Anwesh Mazumdar

Year	Name	Funding Agency	Faculty members
2013	epiSTEME-5, Fifth international conference to review research in Science, Technology and Mathematics Education, HBCSE	HBCSE	All faculty members
2013	20th International Conference on Conceptual Structures, HBCSE	BRNS	G. Nagarjuna
2012	2-Day Seminar on Responding to Changing Educational Paradigms, HBCSE	HBCSE	Jayashree Ramadas & K. Subramaniam
2012	3rd National Workshop on Development of Educational E-Materials in Hindi, HBCSE with Vigyan Parishad Prayag	HBCSE	K. K. Mishra
2013	10th International Junior Science Olympiad 2013, Pune	DAE, NCERT	P.K. Joshi, Anwesh Mazumdar, Aniket Sule
2013	Refresher Course on Statistical Mechanics for College Teachers, HBCSE	HBCSE, CBS & TIFR	Praveen Pathak
2013	3rd Pro-Am Meeting in Astronomy, HBCSE (in collaboration with Astronomical Society of India)	Astronomical Society of	Aniket Sule
2013	Eyes on Comet ISON National Campaign Brainstroming Workshop, HBCSE (in association with All India People's Science Network)	Vigyan Prasar	Aniket Sule
2014	4th National workshop on development of educational e-materials in Hindi , Allahabad	HBCSE	K. K. Mishra
2014	2nd International conference on education in chemistry (ICEC-2014), HBCSE (in collaboration with Association of Chemistry Teachers )	DAE, DST, INSA	Savita Ladage
2014	4-day Workshop for science teachers educators of Uttarakhand at HBCSE during February 5-8, 2014	SCERT, Uttarakhand	K. K. Mishra

**WORKSHOPS FOR STUDENTS(Only for the years 2013-14 and 2014-15):**

2013	2-day workshop on Socio scientific Issues	HBCSE	Aswathy Raveendran
2013	First NIUS Workshop on Introductory Computational Science (HBCSE)	HBCSE	A. Mazumdar
2013	Workshop on Chemical Thermodynamics (HBCSE)	HBCSE	Savita Ladage
2013	Seven workshops of YCMOU for Post-graduate students	YCMOU	Sugra Chunawala
2013	Consultative meeting for Building Educators for Science Teaching (BEST) project	DST	Chitra Natarajan & Narendra Deshmukh
2014	Open-Beginninged Workshop for Grade VIII students, HBCSE	HBCSE	Karen Haydock
2014	An experimental workshop with Class VII students from Nutan, HBCSE	HBCSE	Several HBCSE members
2014	Nurture Camp for Grade VI and IX students, HBCSE	Mumbai Science Teachers' Associatio	Narendra Deshmukh
2014	CUBE Summer Workshops for college students (Vivekanand Education Society's College, Chembur; Chandibai Himatlal Manshukhani College, Ulhasnagar; Royal College, Bhayandar; KBP college)	HBCSE and Host colleges	G. Nagarjuna, M.C. Arunan
2014	Three-day Workshop on decimal learning and maths lab (with Eklavya), Hoshangabad	HBCSE	K Subramaniam
2014	A workshop- 'Decoding DNA: Model building & Model dissection' for biology undergraduate students, HBCSE	HBCSE	Jayashree Ramadas & Anveshna Srivastava
2014	Four-day Workshop for students and teachers on 'Fun with Ratio and Proportion!' and 'Learning to Teach Mathematics', St. Xavier's Institute of Education, Mumbai	HBCSE	Shweta Naik
2014	Seven workshops of YCMOU for Post-graduate students	YCMOU	Sugra Chunawala

2015	Phylogenetic Analysis: A One Day Workshop –facilitated by Prof. R. Geeta, Department of Botany, University of Delhi) CUBE Lab, HBCSE.	HBCSE	G. Nagarjuna, M.C. Arunan
2015	Ten workshops of YCMOU for Post-graduate students	YCMOU	Sugra Chunawala
2015	Design and Technology workshop	HBCSE	Sugra Chunawala
2015	Summer Camp for Grade 3 Students	HBCSE	Jayashree Ramadas, Sugra Chunawala and SSRD Team

**WORKSHOPS FOR AND PRE/ IN-SERVICE TEACHERS (Only for the years 2013-14 and 2014-15):**

2013	POGIL workshop for chemistry teachers (HBCSE)	HBCSE	Savita Ladage, Kelly Butler
2013	‘Exposure cum Preparatory Workshop for Teachers’ at undergraduate level	HBCSE	Rajesh Khaparde
2013	Three workshops, each of three days’ duration, were organized at HBCSE for secondary science teachers, secondary mathematics teachers and for a group of primary science and maths teachers respectively of the Kendriya Vidyalaya Sangathan	Kendriya Vidyalaya Sangathan	K Subramaniam
2013	Two workshops (3-day + 4-day ) for science teachers from Pandharpur taluka in collaboration with SVERI Education society	SVERI Education Society	Narendra Deshmukh
2013	2-day workshop for over 43 science teachers from Zilla Parishad schools in Chandrapur	Ambuja Cement Foundatio	Narendra Deshmukh
2013	2-day workshop for science teachers from Nashik organized in collaboration with Nashik Education Society	Nashik Education Society	Narendra Deshmukh
2013	1-day workshop for 90 science teachers from Mahad Taluka in collaboration with People's Education Society	People’s education society	Narendra Deshmukh

2013	3-day workshop on constructivist teaching approaches, for 45 science teachers in collaboration with Shri Shivaji Science College, Amravati	Shri Shivaji Education Society	Narendra Deshmukh
2014	3-day workshop for 42 science teachers from Goa on activity based learning organized in collaboration with SCERT Goa	SCERT, Goa	Narendra Deshmukh
2014	Tata Capital organized science teacher's workshop at Vikramgad School in July 2014	Tata Capital	Narendra Deshmukh
2014	Activity based workshop was organized for Udayanchal High School (Vikroli)	Udayanchal High School	V. C. Sonawane
2014	NIUS Workshop on Designing Undergraduate Physics Curriculum (with University of Mumbai) HBCSE	HBCSE	Rajesh Khaparde
2014	Workshop of Mathematics Problem Solving (HBCSE)	HBCSE	Shweta Naik
2014	Workshop with Jidnyasa Trust (Ganit Yatra Programme) on making of mathematics laboratory activities (HBCSE, July 2014; Aurangabad, August 2014; Nashik and Dhule, September 2014);	HBCSE	K. Subramaniam, Shweta Naik
2014	One-day Workshop on 'Learning to Demonstrate Mathematics Laboratory' for in-service teachers (HBCSE)	HBCSE	Shweta Naik
2014	One-day workshops on 'Learning to Solve Mathematical Problems' for pre-service teachers (St. Xavier's Institute of Education, Mumbai)	SXIE	Shweta Naik
2014	Workshop for IWSA teachers: 'Becoming a resource person' (HBCSE)	IWSA	Shweta Naik
2015	Workshop for teachers on Module Development for KV-ZIET (KV-ZIET, Mumbai)	Kendriya Vidyalaya Sangathan	Shikha Takker
2015	Two Workshops for Science Teachers on Implementing Small Science Curriculum (Al Qamar Academy & Vedavalli Vidyalaya, Chennai)	HBCSE & Vedavalli Vidyalaya	Jayashree Ramadas

2010-2015	About 70 Resource Generation Camps in Physics, Chemistry, Biology, Junior Science and Astronomy Olympiads, each involving, on average 10 teachers	DAE, DST, DoS	Savita Ladage, Rekha, Vartak, Anwesh Mazumdar, Aniket Sule, Paresh Joshi, Anand Ghaisas
2010-2015	About 20 Exposure Camps in Physics, Chemistry, Biology, Junior Science and Astronomy Olympiads, each involving, on average 50 teachers	DAE, DST, DoS	Savita Ladage, Rekha, Vartak, Anwesh Mazumdar, Aniket Sule, Paresh Joshi, Anand Ghaisas
2014	Four Preparatory Resource Generation Camps for IPhO 2015 (about 80 teachers)	DAE, DST, MHRD	Vijay Singh, Anwesh Mazumdar, Rajesh Khaparde
2015	Preparatory Workshop for Experimental component of IPhO 2015 (about 50 teachers)	DAE, DST, MHRD	Anwesh Mazumdar, Rajesh Khaparde
2014-15	Three Preparatory Workshops for Theoretical component of IPhO 2015 (10	DAE, DST, MHRD	Vijay Singh, Anwesh Mazumdar

**WORKSHOPS FOR RESOURCE PERSONS/ TRAINERS/ TEACHER TRAINERS (Only for the years 2013-14 and 2014-15):**

2013	Workshop on topics of Algebra for field level mathematics subject experts of Azim Premji Foundation (APF)	APF	K Subramaniam
2013	Workshop on topics of Functions for field level mathematics subject experts of Azim Premji Foundation	APF	K Subramaniam
2013	A workshop for Master Trainers in Chemistry (with Royal Society of Chemistry) (HBCSE)	Royal Society of Chemistry	Savita Ladage
2013	Three workshops for resource persons of "Akhil Bharatiya Andhashraddha Nirmulan Samiti" from Konkan region, Mumbai and Pune (in collaboration with ABANS)	NCSTC	Anand Ghaisas



2014	3-day workshop for mathematics teacher educators from DIETs in Uttarakhand and Karnataka, faculty from SCERT and resource persons from Azim Premji Foundation	MHRD	K Subramaniam
2014	4-day workshop for science teacher educators of Uttarakhand DIETs and SCERT faculty (HBCSE)	MHRD	N. D. Deshmukh
2014	Workshop on Chemistry Education Research (HBCSE)	HBCSE	Savita Ladage
2014	Workshop for Course Developers NUSSD (HBCSE)	TISS	G. Nagarjuna
2014	A one-day workshop on visuospatial reasoning in astronomy education (HBCSE)	HBCSE	Jayashree Ramdas
2014	STEAM: Integrated Learning Modules, First meeting and workshop (HBCSE)	HBCSE	Chitra Natarajan
2014	Digital Literacy Master Trainer's Workshop (TISS, Mumbai)	TISS	G. Nagarjuna
2014	Workshop to Review Course on Science Education (for D.Ed. syllabus, developed by RV Education College, Bangalore, SCERT Karnataka) , HBCSE	RV Education College	Sugra Chunawala
2014	Digital Literacy Trainer's Workshops (Bhilai Institute of Technology, Durg, Chhattisgarh, September 27; Narayan Guru College, Chembur, Mumbai, October 11 – October 13; Kejriwal Institute of Management, Ranchi, Jharkhand, November 9 – November 11)	TISS	G. Nagarjuna
2014	Two 5-day workshops for teacher developers (with Royal Society of Chemistry, RSC-UK) (Workshop I- September 29-October 3; Workshop II: November 24-28)	Royal Society of Chemistry	Savita Ladage, V. D. Lale
2014	6-day workshop for teacher educators was conducted in collaboration with Azim Premji Foundation, Jaipur, on "Evolution: IV Capacity Enhancement Workshop	APF	Karen Haydock
2014	Teacher Training Programme for Mumbai Science Teacher Association (MSTA) teachers at HBCSE.	MSTA	P. K. Joshi

2014	Teacher Training Programme at New Delhi	Local organizers + HBCSE	P. K. Joshi
2014	Teacher Training Programme for Atomic Energy School Teachers at HBCSE	Local organizers + HBCSE	P. K. Joshi
2015	Special Session on Challenges for Education in Modern India (for 102nd Indian Science Congress) (University of Mumbai)	Indian Science Congress	Aniket Sule
2015	State Level Workshop on Blended Learning & Pathways to Student Success (along with Chembur Comprehensive College of Education, Chembur) (HBCSE)	Chembur Comprehensive College of	Narendra Deshmukh
2015	Workshop on Turtle Blocks (facilitated by Walter Bender, MIT Media Lab) (CUBE Lab, HBCSE)	HBCSE	G. Nagarjuna
2015	Kendriya Vidyalaya – Inquiry based learning workshop	KV	Many faculty members
2015	Kendriya Vidyalaya – ZIET Project Based Learning workshop	KV-ZIET	Many faculty
2015	Teacher Training Programmes at Goa, Vapi, Pal (Jalgaon dist.), Majihira (Purulia Dist., West Bengal), HBCSE, Dombivili, Guwahati	Local organizers + HBCSE	P. K. Joshi

31. Code of ethics for research followed by the departments

HBCSE follows the TIFR Guidelines on Academic Ethics

32. Student profile programme-wise:

Numbers are **summed over 2011 – 2015** batches.

Name of the Programme (refer to question no. 4)	Application received	Selected		Joined		Pass	
		Male	Female	Male	Female	Male	Female
Ph.D.	2887	11	12	8	7	75	100

## 33. Diversity of students

## a) Geographical

Students	Ph.D.		Integrated-Ph D		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
From the state where the university is located	4	3	--	--	--	--	7
From other states of India	4	4	--	--	--	--	8
NRI students	0	0	--	--	--	--	0
Foreign students	0	0	--	--	--	--	0
<b>Total</b>	<b>8</b>	<b>7</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>15</b>

## b) Undergraduate Institute:

	Ph.D.		Integrated M.Sc.-Ph.D.		M.Sc.		Total
	Male	Female	Male	Female	Male	Female	
From Universities	5	4	--	--	--	--	9
From premier science institutions	1	1	--	--	--	--	2
From premier	2	2	--	--	--	--	4
From others*	0	0	--	--	--	--	0
<b>Total</b>	<b>8</b>	<b>7</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>--</b>	<b>15</b>

† Science institutions, e.g. CBS, NISER, etc.

# IITs, NITs, etc.

## 34. How many students have cleared Civil Services and Defense Services examinations, NET, SET, GATE and other competitive examinations? Give details category-wise.

	Examination	No of students who cleared
1.	UGC-NET	3
2.	CSIR-NET	1

3.	GATE	2
4.	ICMR-JRF	1
5.	DBT-JRF	1
6.	CTET	2
7.	Punjab Civil Services	1

## 35. Student progression

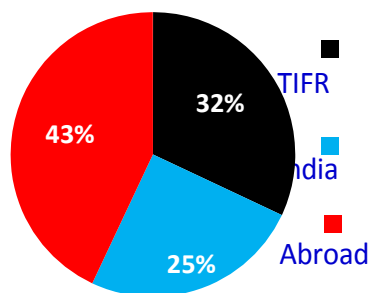
- Ph.D. programme : On completing their coursework, students register towards their PhD dissertation. A few students have left before completing the coursework. Most students, who have registered for PhD have gone on to complete the dissertation. After obtaining the PhD degree, most students have secured post-doctoral or faculty positions at other institutions. Some students have secured teaching or other positions before completing the PhD and have continued to work towards their dissertations externally.

## 36. Diversity of staff

## Number of faculty who are Ph.D.'s

from TIFR :	5
from other institutions in India :	4
from institutions Abroad:	7
<b>Total No</b>	<b>16</b>

## Faculty Ph.D.s



## 37. Number of faculty who were awarded M.Phil., Ph.D., D.Sc. and D.Litt. during the assessment period

The minimum eligibility criteria for selection as a member of the TIFR faculty is a Ph.D. degree. Thus, this number is not relevant.

38. Present details of departmental infrastructural facilities with regard to

a) Library

The HBCSE library houses over 25000 books, about 2300 bound volumes of journals, 133 print journals and provides access to about 1000 journals online. Details regarding the library are presented in B2, section 4.2.

b) Internet facilities for staff and students

HBCSE has a central computer facility that maintains computers, as well as access to LAN-WAN and the internet. Wireless is enabled across the campus including in the hostels and students can access high-speed internet from anywhere on campus.

c) Total number of class rooms

HBCSE has 3 large gallery style classrooms (60-80 seating) and 4 small classrooms (20-30 seating). It also has an auditorium with a capacity of 180. (see Section B1, Item no 12)

d) Class rooms with ICT facility

All the classrooms listed above have ICT facilities like overhead projectors, Wi-Fi, etc.

e) Students' laboratories

- HBCSE has a range of laboratories which are used in its educational programmes to train students and teachers. These include the Olympiad and NIUS laboratories in physics, chemistry, biology, astronomy and junior science. The integrated science laboratory, the Design and Technology laboratory and the mathematics laboratory are aimed at school students. The Collaborative Undergraduate Biology Education (CUBE) laboratory is aimed at college as well as school students and teachers.

- In addition, HBCSE has laboratories focused on research, which are listed in (f) below.

## f) Research laboratories

	Name of Laboratory	Fac *	PDF <sup>†</sup> + Scientific staff	Stu <sup>‡</sup>	Brief description of research activity
	CUBE Lab	1	1	2	Developing models for collaborative research as part of science education
	Chemistry Lab (NIUS)	2	2	(visiting students)	Undergraduate research projects
	Biology Lab (NIUS)	1	2	(visiting students)	Undergraduate research projects
	Physics Lab (NIUS)	2	2	(visiting students)	Undergraduate research projects
	Learning sciences lab	1	0	3	Investigates the role of media in learning using distributed cognition perspectives
	Knowledge Lab	1	1	1	Investigates the structure of knowledge as a network
	Design and Technology Lab	1	2	3 plus Visiting students	Research and development in "Design and Technology Education"

\* no of faculty members using the laboratory

† no of postdoctoral fellows and scientific staff using the laboratory

‡ no of graduate students using the laboratory

## 39. List of doctoral, post-doctoral students and Research Associates

	Doctoral students	Post-doctoral fellows
1.	Rafikh Shaikh	Dr. Rutwik Thengodkar
2.	Prajakt Pande	Dr. Shubhangi Bhide
3.	Gurinder Singh	

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4.	Rosemary Varkey	
5.	Himanshu Srivastava	
6.	Rossi D'Souza	
7.	Geetanjali Date	
8.	Deborah Dutta	
9.	Kanchan Mishra	
10.	Shubhayan Kabir	
11.	Durgaprasad Karnam	
12.	Sujatha Varadarajan	
13.	Charudatta Navare	
14.	Mihika Shah	
15.	Ratna	

40. Number of post graduate students getting financial assistance from the university.

ALL the students of HBCSE are in doctoral programmes, and hence they are all given TIFR fellowships.

41. Was any need assessment exercise undertaken before the development of new programme(s)? If so, highlight the methodology.

HBCSE instituted a PhD programme in science education in 1974 under affiliation to the University of Poona. This was a new area of research in the country. Although this field is well- established in many other countries, it continues to be an emerging area in the country. The programme has continued under the TIFR deemed university. There is a demand for PhD holders from HBCSE in a variety of innovative educational programmes, as well as the variety of workshops for in-service teachers offered at HBCSE, which indicates the relevance of the programme in addressing the problems confronting science education in India. The experience of HBCSE faculty and scientific staff in leading field-based programmes with teachers and students feeds into the PhD programme giving it an organic connection with the realities in the field. The PhD programme has been reviewed both internally and externally and changes have been made to the structure of the coursework and the

programme as a whole.

42. Does the department obtain feedback from
- a. faculty on curriculum as well as teaching-learning-evaluation? If yes, how does the department utilize the feedback?

The six-member Subject Board of science education continuously reviews the curriculum on the basis of feedback, which is obtained from the students and instructors on the courses. A two member internal committee reviewed the PhD programme in 2013-14, held discussions with all PhD students and provided inputs for restructuring the curriculum, which was then carried out. The subject board introduced new courses (Philosophy of education; Teaching practice and school internship; Education, society and Education policy in India). Groups of faculty members also redesigned the content for individual courses.

- b. students on staff, curriculum and teaching-learning-evaluation and how does the department utilize the feedback?

Anonymous feedback on every course is collected from the students in a form specifically designed for this purpose. The feedback is processed by the Convenor, subject board and relevant portions are communicated to the Instructors, for modification and improvement of the courses.

- c. alumni and employers on the programmes offered and how does the department utilize the feedback?

Currently no such feedback is collected on a formal basis.

43. List the distinguished alumni of the department (maximum 10)

	<b>Name of the Alumnus</b>	<b>Reason for Distinction</b>
1.	Prof. Arvind Kumar	Padma Shri, Raja Ramanna Fellow, INSA distinguished teacher award
2.	Prof. H.C. Pradhan	Raja Ramanna Fellow
3.	Prof. Vijay Singh	Raja Ramanna Fellow



44. Give details of student enrichment programmes (special lectures / workshops / seminar) involving external experts.

As Item No 30 shows, HBCSE regularly holds conferences, seminars, talks and workshops, to which eminent educationists and researchers are regularly invited, which are attended by doctoral students. These expose students to current issues in education as well as on going research that seeks to address these issues in India and elsewhere.

HBCSE is identified by the Govt. of India as the nodal centre for the International Olympiads in the subjects of physics, chemistry, biology, astronomy, mathematics and junior science. Every year HBCSE holds the Indian National Olympiad examination in these subjects and conducts camps for students who pass this examination. These camps train students to participate in the highly challenging and exciting international olympiads and select a team of 4-6 students to represent India. Besides the camp for students, teachers are also invited to exposure camps where they are exposed to the culture of experimental investigation and problem solving. Teachers are also invited to the resource generation camps where they participate in designing problems and experiments.

The National Initiative on Under-graduate Science (NIUS) holds camps every year for students with a flair for science. The camps lead to the student taking up a research project of 1-2 years duration. The student is mentored through the research project by a research scientist. Several research projects have led to publications in research journals and conference proceedings. Another major activity is the holding of summer camps in experimental physics for students in the 2<sup>nd</sup> year of their Bachelor's or Integrated Master's programme in science participate in this camp.

45. List the teaching methods adopted by the faculty for different programmes.

HBCSE Faculty members adopt a range of teaching methods in their courses. Besides the component of lectures, all courses require active

participation by students in the form of student reading and presentations, discussions, short field investigations and a variety of written assignments. Assignments include essays and term papers. Assessment take into account students' participation in the classroom besides assignment, quizzes and examinations. Other innovative assessment modes include contribution to wikipedia and online encyclopedias, teaching school students, field studies, which form a part of some courses. Some courses use platforms such as Moodle and G-studio for managing learning resources and online discussion fora.

46. How does the department ensure that programme objectives are constantly met and learning outcomes are monitored?

The Subject Board in Science education constantly monitors the progress of the students and obtains feedback from faculty and students alike.

47. Highlight the participation of students and faculty in extension activities.

HBCSE undertakes a range of intervention programmes with students, pre-service and in-service teachers and teacher educators. Students participate in these programmes, often as resource persons. As part of their research, they visit urban and rural schools and interact with students and teachers. The research often involves a component of teaching students or orienting teachers. Schools catering to disadvantaged groups of students are a major group in these interventions. Students also actively participate in science popularization programmes.

As described above, HBCSE conducts camps for students and teachers as part of its Olympiad programmes.

48. Give details of "beyond syllabus scholarly activities" of the department.

Students at HBCSE are encouraged to participate in national and international conferences and seminars. A substantial amount of money is made available to support the students' participation in at least one major conference outside India, or a visit to an internationally acclaimed research group. Seminars and conferences are regularly held at HBCSE, which students participate in. The

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Annual Research Meet is a research conference organized by students and attended by faculty and other staff members. Students present their research work and obtain feedback from the audience as well as from discussants who have read the paper beforehand.

49. State whether the programme/ department is accredited/ graded by other agencies? If yes, give details.

The PhD programme in science education was recognized by UGC at the time of according Deemed University status to TIFR in 2001.

An external review of all aspects of HBCSE was carried out in 2014. The review committee comprised of Prof. N. Sathyamurthi (Director, IISER, Mohali), Chair; Jill Adler (University of Witwatersrand South Africa); Sibel Eruduran (University of Limerick, Ireland); Paula R. L. Heron, (University of Washington, USA), B. Phondke (ex-Director, National Institute of Science Communication) and T. S. Saraswathi (Retd. M. S. University, Baroda). Prior to the external review the HBCSE faculty carried out a detailed internal review, the outcomes of which were made available to the external review committee.

The committee carried out a comprehensive review of the work of HBCSE and submitted its report containing assessments and recommendations in December 2014. In regard to the research in science and mathematics education and the PhD programme specifically, the committee observed that “HBCSE is a unique institution, one of its kind in the country.” In regard to the specific role of HBCSE in the overall education scenario, the committee remarked that “while India has done an excellent job in education by producing Bachelors and Masters in education degree holders (B Ed and M Ed), it has lagged behind in science education. HBCSE can, in principle, fill this gap...”

Commenting on the impact of the research done at HBCSE, the committee observed that “the work done by the centre towards science education and mathematical education has put India on the world map.... Science and mathematics education researchers at HBCSE have contributed to... providing a presence for India in the international community. For example, they have

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published in *the International Journal of Science Education, and in Educational Studies in Mathematics* and participated in international conferences such as NARST and IGPME annual conferences.”

50. Briefly highlight the contributions of the department in generating new knowledge, basic or applied.
- About 165 journal articles in science, technology and mathematics education research and about 85 journal articles in science research have been produced by HBCSE members as part of the NIUS initiative. In addition, a large number of articles have been authored in journals and magazines for science dissemination, for teachers and students at the school and college level, and in conference proceedings.
  - HBCSE has organized about 18 International and 11 National STME research conferences, seminars and workshops. Many smaller workshops and meetings have also been held.
  - A total of 10 PhD dissertations have been accepted for the award of the PhD degree of the TIFR deemed university. (Of the 10 HBCSE alumni, 7 hold faculty positions in leading universities and institutes, one holds a post-doc position in the U.S., one is a freelance education consultant and one is a teacher.)
  - HBCSE members have authored 50 curricular books (including textbooks and teacher books), over 100 co-curricular and popular science books, about 50 technical reports, and 13 Conference proceedings and reviews. These books have had a combined sales of about 9.5 Lakh copies.
  - HBCSE is the National nodal centre of the Government of India for participation in the International Olympiads in Physics, Chemistry, Biology, Astronomy, Mathematics and Junior Science. Over the years, Indian students have secured over 400 medals and about 25 honourable mentions at the International Olympiads. A large number of problems and experiments have been developed at HBCSE for purposes of selection and training in the Olympiad programme.
  - As part of the NIUS initiative, undergraduate students have completed about 170 proto-research projects mentored by research scientists. Nearly 140 research and

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conference papers have been published. Over a 100 exposure and enrichment camps for students, and several workshops for teachers have been held.

- A large number of workshops for school teachers and teacher educators have been conducted by HBCSE members. These workshops are focused on inputs that combine subject knowledge with pedagogy, which is a type of specialized knowledge that is not typically available to teachers

51. Detail five major Strengths, Weaknesses, Opportunities and Challenges (SWOC) of the department.

### **Strengths**

- Since the time of its inception, HBCSE has had a commitment to the improvement of science education for all sections of society and has targeted many of its programmes at disadvantaged students. A majority of its programmes have been with Government schools in urban, rural and tribal areas. Thus, the Centre, enriched by many intensive field contact programmes conducted over the decades, has long-standing experience of the ground-level challenges and possible solutions in delivering science education of a high quality for all students.
- The Centre has sound expertise in the content areas of science and mathematics given its well-qualified and capable faculty and the strength of its parent institution, TIFR. Further, programmes like the science and mathematics olympiads offer an opportunity to continuously strengthen content expertise. Thus, HBCSE is a unique institution in the Indian context, which combines expertise in science and mathematics with expertise and engagement in education.
- HBCSE has been a pioneer in research in the fields of science and mathematics education since it initiated a research programme several decades ago. It is recognized for its research both in India and internationally. The research in STME carried out at HBCSE is published in leading international peer-reviewed journals and has had a reasonable impact on the field in terms of citations received. Faculty members at HBCSE have links and collaborations with leading researchers across the world. The synergy between research, material development and intervention programmes gives added strength to the institution.

- The Centre has an excellent infrastructure and ambience, with members free to pursue their work along several dimensions of science education, unfettered by paucity of resources. Doctoral students are encouraged take up ambitious research projects driven by their interests and passion. The work culture, characterized by sustained effort, co-operation and willingness to take on challenges, permeates all levels of staff at HBCSE.
- The Centre has vast experience and credibility with Government bodies, both for its expertise in and commitment to science education, and for its integrity in deploying public funds effectively. HBCSE members are part of several national and state level committees policy making and regulatory bodies in education.

### **Weaknesses**

- The Centre carries out a large number and variety of programmes for students, teachers and teacher educators. This has the danger of defocusing the efforts and attention of members. The organizational demand of these programmes, especially of the time-bound, multi-stage Olympiad programmes is heavy, reducing the time available for research.
- The groups in the Centre led by faculty members tend to work in relative isolation. Collaboration between faculty members is infrequent. Faculty members who lead the Olympiad and NIUS programmes do not, in many cases, play an active role in the Graduate School. The HBCSE review committee has emphasized the need for increased team work among the faculty.
- The dissertation work towards the PhD extends well beyond the expected time of 5 years in most cases. While the reasons for the extended length are several, there is a need to address this problem.
- In recent years, there has been an attrition of faculty strength due to super-annuation of many of its senior members. It has been difficult to find suitable replacements.

- The Centre has constraints of space given its small campus. It especially lacks faculty housing, which is needed to attract capable young faculty members to the Centre located in the city of Mumbai.

### **Opportunities**

- There is growing importance given to STEM education at all levels in the country by not only scientists, technologists and industry leaders, but also by political leaders. This is reflected in the interest in science and related subjects among a large section of the student population. This is also reflected in the popularity of science- focused special programmes like the Olympiads, which in turn propagate the excitement and challenge of doing science and mathematics.
- There are several new high-profile institutions including the IISERs, CBS and NISER, charged with the mandate of science education starting from the undergraduate level, that have the resources and capacity to implement innovations in science education. Collaborative links with such institutions hold a great potential for HBCSE.
- There is a strong climate of reform in education and teacher education at the school level, which is reflected in the new curriculum frameworks for school education and teacher education. The NCF 2005 and its aftermath have shown the relevance of the contributions made by HBCSE. HBCSE's strong capacity in designing assessment tools for science and mathematics education is especially relevant, where reform in assessment is a growing concern.
- There is growing recognition for HBCSE's work by the international science and mathematics education community, evidenced in the links that faculty members have established. Collaborations with established international groups are beginning to take shape, and present an opportunity to further integrate the Centre with the international community.

### Challenges

- There are very few peer institutions in the country that have expertise in science and mathematics education. This has several negative consequences for HBCSE: a thin research base in STME and a resulting incomplete understanding of the situation, fewer post-doctoral and faculty positions for PhDs from HBCSE, reduced motivation and peer checks for HBCSE's work, and reduced overall health of the Centre as well as the field of STME.
- The regulatory norms in teacher education have not recognized the track taken by a majority of HBCSE's PhD degree holders as eligible for faculty appointments in teacher education institutions. (While the PhD degree in science education is recognized as a relevant qualification beyond an MEd, an MSc followed by a PhD in science education, is not recognized as sufficient qualification.) This has implications for a possible change in the entry qualifications for the PhD programme, or for some restructuring of the programme.
- The PhD in science education degree is currently not well recognized for entry into science teaching and research positions at the college level. Efforts to bring the attention of the scientific community to the importance and relevance of the degree in science education need to be strengthened.
- The curricular and related materials developed by HBCSE are not widely known and used in the country, largely because schools are required to follow textbooks produced by statutory bodies. This can be addressed by focusing efforts on developing support materials and also by strengthening the publicity and reach of materials produced by HBCSE.
- The bulk of the outreach work done by HBCSE is in the area of in-service teacher development. While this is a large and active domain in the country, it is not regulated and remains un-recognized. HBCSE's efforts should also be directed at developing standards and regulatory mechanisms for such programmes.



## 52. Future Plans of the Department

- Build greater coherence and synergy between research and the outreach programmes for students and teachers. Extend research into undergraduate science education.
- Build stronger research teams consisting of faculty, scientific staff, PhD students and post-docs working on sustained long-term research programmes.
- Encourage two-way exchanges and visits of faculty, scientific staff and research scholars between HBCSE and leading STME Centres
- Strengthen HBCSE published resources through review processes. Greater publicity and reach of materials produced at HBCSE.
- Forge better links with mainstream teacher education institutions. Explore possibility of joint offering of M.Ed. in science education
- Develop and disseminate resources developed around the Olympiad programme
- Strengthen teacher development, laboratory development and development of learning materials in undergraduate science education.