

Annual Quality Assurance Report (2018-19):

Tata Institute of Fundamental Research, (Deemed-to-be-University)

Two Best Practices by the Institute

Best Practice 1: Regular independent international reviews of research activities of Departments/Centres

1. Title of the Practice

Regular independent international reviews of research activities of Departments/Centres

2. Objectives of the Practice

The objective of the international peer review is to evaluate the performance of the department/centre vis a vis similar research units across the world. The basic principle is to have an independent external committee that is composed of leading experts in the field from across the world review the performance of the unit (across all metrics, including student training, quality and impact of research, etc.). Rather than focusing on quantitative metrics alone, the review committees are encouraged to conduct thorough reviews which take several months and include detailed inputs from faculty, staff and students. The outcome is to identify strengths and weaknesses, to prioritize research areas, and to ensure scientific excellence.

3. The Context or challenging issues

Given TIFR's excellent standing internationally, there were no major challenges in designing and implementing this practice. Leading experts from across the world have generally been willing to put in the effort to do a detailed review and have provided insightful and useful suggestions regarding the way forward. However, since TIFR is a large multidisciplinary research institution, with its Departments and Centres operate within their own unique context, care has to be taken to set the terms of reference carefully for each unit, to accommodate the unit's specific character, while at the same time ensuring that the overall review process across TIFR adheres to consistent and high standards.

4. The Practice

Review panels are appointed by the Director TIFR. The review panel is provided with extensive reports on the department, including details of student and teaching related issues, research, profiles of each member, management structure, plans for the future etc. prior to their visit. During the visit the panel also has detailed discussions with all sections of the department/centre. Following this, the committee submits a confidential report to the Director. At each stage the integrity of the process is maintained by removing or addressing any potential conflicts of interest, and ensuring confidentiality of the final reports. This allows the committee to be candid, and provide both positive and negative feedback. Such detailed reviews are highly unusual in the context of Indian higher education organizations. In general

these institutions are reviewed only during an accreditation or some such similar process. A review which does not lead to any formal certification is very unusual. Nor is it common for an Indian institution to be reviewed against international yardsticks. As mentioned above there have not been any major constraints or limitations in carrying out this process.

5. Evidence of Success

The success of this process is demonstrated by multiple lines of evidence: (a) that international research leaders are willing to provide a significant amount of time to participate in the process; (b) that the process has now gone on for multiple decades; (c) that the committee recommendations have been used to make important changes to the research practices of Departments and Centres; (d) that TIFR's international reputation for excellence in student training and research has been maintained for the last several decades.

6. Problems Encountered and Resources Required

No major problems have been encountered, and the resources required are modest. However such reviews do require substantial investment of time and manpower on the part of TIFR. It is important that reviews are initiated and completed in a timely manner, as the comments must be kept up-to-date relative to the rapid movement of each scientific discipline. By its very nature this process is time consuming, both for the committee as well as the department. It must be supported by efficient administrative staff, confidential processes, rapid response times to any committee requests. This requires the institution to plan years in advance and dedicate appropriate resources and manpower to the process.

7. Notes (Optional)

None.

Best Practice 2: TIFR Frontiers of Science**1. Title of the Practice**

TIFR Frontiers of Science

2. Objectives of the Practice

The annual “Frontiers of Science” programme, provides a unique opportunity for 9th/10th standard students and teachers from selected schools to visit TIFR on a Sunday, for an interesting mix of laboratory visits, engaging lectures and science demonstrations. A wide cross section of schools, especially those from a rural or under-served background are invited to this inclusive event.

3. The Context or challenging issues:

The Science Popularization and Public Outreach Committee (SPPOC) of TIFR endeavours to convey the exciting developments in science and technology to the general public with a special emphasis on showcasing research being done in TIFR. An important focus of this effort is to reach out to school/college students and teachers, especially in under-served communities, and to inspire students to pursue a career in basic sciences.

A major problem is that most high-school students have almost no exposure to the real-world research environment. At best, they are limited to the experience of their school laboratory. In most schools, the science laboratory class, if it exists, is a routine boring ritual that does not excite students about science. Unfortunately, students have to choose an academic stream after class X, and many of them drop science. Hence, an effort to showcase modern research labs to a high school audience and permit them to engage with young researchers is important.

4. The Practice

The Frontiers of Science event is specially curated event specifically aimed at high school students, with a carefully chosen combination of visits to many of TIFR's state-of-the-art research laboratories and facilities, lectures by graduate students, and exciting science demonstrations. A key feature of FoS is that it is mainly a student managed event, with a lot of interaction between the TIFR graduate students and the visitors. The visiting groups are welcomed and guided through the day, and through the campus by students, the lectures/demonstrations are mainly given by students, and in most labs, the visits are also conducted by student researchers. This engagement with young ambassadors of TIFR's science significantly encourages interaction and questions without the typical inhibition of open discussions with older teachers that is often seen in school students.

In recent years, about 40 labs and facilities are open for visits. Each visiting group gets to visit 3-4 labs, listen to two lectures on different topics in mathematics and science by students, attend a “How to become a scientist?” talk by a young faculty member, and participate in an interactive science demonstration. The selection of speakers, local hosts for each visiting group, volunteers for demonstrations etc. is carefully done to ensure an

equitable gender balance in all the activities. We also ensure a gender balance in the students invited for the programme.

A key feature of our programme is the inclusion of schools from various locations across Mumbai, both English and vernacular medium, as well as from schools from under-served rural areas, e.g. FoS 2019 saw representation from talukas like Niphad, Mangaon, Shahapur, Wada, Sillod, Paithan, Shirvardhan, Bhiwandi, Palghar etc. Apart from traditional school groups, we also invite students in the local community – e.g. children of employees in the local police station, fire brigade, post office, banks etc. as well as those of our own employees.

5. Evidence of Success

The requests for participation at FoS have steadily increased over the years, and we have expanded from a small exploratory programme with only about 100 students in 2003 to an large event with 2400 visitors in 2019 with multiple batches of students participating in different activities in parallel. This growth is summarized below.

| Year | Visitors at TIFR Frontiers of Science |
|------|---------------------------------------|
| 2010 | 650 |
| 2011 | 760 |
| 2012 | 760 |
| 2013 | 1400 |
| 2014 | 1400 |
| 2015 | 1500 |
| 2016 | 1700 |
| 2017 | 1700 |
| 2018 | 2100 |
| 2019 | 2400 |

A key aspect that has helped us fine-tune the programme is the detailed feedback, both quantitative metrics and qualitative evaluation that is sought from the participants. This is routinely analysed to identify areas of improvement for future editions of the programme.

6. Problems Encountered and Resources Required

Over the years we have encountered several problems, mostly logistical, that have been tackled to manage an event of this scale successfully.

1.Ensuring equity and diversity: Making sure there is a representation of schools across the geography of the city, ensuring that the different schools get a chance each year, different language mediums are represented, almost equal number of boys and girls attend the programme. A good database is needed.

2.Ensuring that the level of explanation in labs and lectures is suitable for the 9/10th standard level. Requires significant mentoring in scientific outreach and public speaking skills etc.

3. Arranging for logistics of 2000+ visitors on a single day. From transport arrangements from local train stations to the adequate availability of rest-rooms or trash cans on campus.

7. Notes (Optional)

Our experience has shown that given some effort and mentoring, even the most complex experimental setups can be made accessible to high school students and the ability to engage with real scientists-in-the-making and practicing researchers is an enriching and inspiring experience for most students.