

Excellence in science education and research*

It is widely expected that India will invest more funds in education and research in science and technology in the coming 5–10 years to enable the country to move from service economy to knowledge economy. However, while more funds are essential for these advances, a rejuvenation of the existing undergraduate and postgraduate science education system together with an integration of teaching with high-quality research is also desperately needed.

India's colleges and universities are responsible for undergraduate, postgraduate and doctoral studies in diverse subjects. However, the infrastructure, quality of faculty and the research capacity of the higher educational system as a whole have been steady declining for the past three decades. A discussion meeting was held recently to address these key issues and seek solutions that might help catalyse steps towards excellence in science education and research.

Three main issues with a focus on the university system were discussed: (i) creating reward systems for promoting excellence in science education and research, (ii) recruiting new faculty to the universities and (iii) the relative merits and problems associated with building new universities versus revamping the old. The meeting was attended by selected members of faculty from several state and central Universities, a few past and present Vice-Chancellors, representatives of IISERs, INSA and funding agencies/regulatory bodies. In addition, three leaders associated with the university system in USA and who are deeply aware of the Indian situation, helped consider the problems of the Indian system in a global perspective.

The introductory session set the theme of the meeting and introduced the three main issues that were discussed in the

subsequent three sessions. Each session started with an overview of the issue, followed by intense discussions in three small groups. Each group discussed the same theme independently to come out with suggestions, which were again discussed in a common meeting to finalize a list of implementable recommendations.

One of the major concerns was that the impact of a large number of schemes, awards and recognitions for teachers and researchers in the university system is diminished by their poor dissemination and/or execution. For example, although many young researchers have already been selected for the award of INSPIRE Faculty Fellowship, a large proportion of them are still looking for a place to start their career because many universities are either unaware of the programme or have not evolved flexible recruitment systems to facilitate joining of INSPIRE Faculty Fellows. Likewise, many candidates are unaware of INSPIRE and other opportunities, such as UGC-Faculty Recharge Programme, and hence the number of high-quality applicants is low. In order to overcome these limitations, the meeting recommended setting up of an independent liaison office to run a web portal devoted to universities and colleges, which will post information on all available schemes and awards, provide updates on application deadlines, and announce new initiatives that become available. The liaison office should maintain a searchable-database to which all prospective faculty candidates may upload their CVs so that job candidates can more quickly be matched to open faculty positions in the university system. It was suggested that the staff of this liaison office (potentially 2–4 individuals with strong academic background and communication skills), may travel to different parts of the country to educate the academic community about the various new initiatives for promoting education and research in the university/college system in India. This agency, besides disseminating information and educating the different stakeholders about the opportunities in universities and colleges, would also help showcase the achievements and opportunities in the university/college system in India, and

foster teaching–research connection between research institutes and universities. It would, therefore, be working for the benefit of the university system as a whole.

We view the implementation of an independent university liaison office and website as an important achievable goal in a short time. In addition, the meeting made several other significant recommendations, many of which are implementable within the existing system. These are summarized below. Some of the recommendations do not involve any additional financial commitment but only a change in working culture and mindset, while a few others need additional funds. Some recommendations relate to policy changes and administrative reforms.

General recommendations

Reward system for promoting excellence in education and research

In spite of the limited resources and other constraints, many university faculty members are involved in high-quality research, are good mentors to students through their guidance and inspiring lectures and remain committed to the future of their university. Such committed and outstanding members of faculty constitute the university system's greatest asset and also represent its greatest hope for improvement. They need to be given better resources and recognition, so that they can work beyond the status quo. Furthermore, many faculty who are under-performing could do better, if given the right opportunity. This population, which could be identified through assessment of teaching quality by the students and determination of quality of research through good external peer review, could be provided with better resources and encouragement so that they get enthused and act as the catalyst for the desired change.

Recruiting new faculty

There is an urgent need to attract motivated and capable teachers and research-

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ers in the university system. Despite the growing enrollment of students, the number of young faculty at most universities and colleges is low and in many places is actually declining. This trend is particularly worrisome since these recruitment difficulties are occurring at a time when rapidly growing numbers of fresh PhDs and postdocs, trained abroad or within India, are interested in pursuing academic careers in India. Universities must consider replacing many of their restrictive guidelines with more progressive hiring procedures so that they can be competitive in hiring young scientists for faculty positions. In conjunction with changes in the selection/hiring system, the job conditions for junior faculty need to improve so that university positions become attractive and young aspirants feel enthused to be part of the higher education system.

Building new universities versus revamping the old

Opportunities for higher education must expand to keep up with the growing demand of young people seeking advanced academic training in India. During the past few years, several new universities and other institutions of higher learning (like the IISERs) have been established with much better facilities and working conditions. However, the existing university system continues to decline in its infrastructure, facilities/amenities, and teaching and research performance. This meeting discussed how to strike a balance between building completely new campuses for higher education versus revamping the old. It was unanimously felt that the existing universities and colleges still provide significant physical infrastructure which can be crafted at much less cost and in much less time to become reasonably competitive education centres.

Specific recommendations

Implementable by universities/colleges within their existing framework

1. Filling the vacant faculty positions in a planned but rapid mode through a proactive and fast process involving rolling advertisement and online application

system. There should be a greater involvement and participation of existing faculty, including junior faculty, in the process of selection of new faculty. The search process also must be more proactive to find the right people. Appointments may be through invitation (generally avoiding internal hires or former students) as well as through the advertisement and selection process. Spousal issues may be considered while making new appointments.

2. Incentives for new faculty through generous start-up funds, housing, childcare facility and other support together with a reduced teaching load during the first two years for newly appointed Assistant Professors. There should be a structured mentoring programme for the young faculty.

3. Universities should be proactive in attracting INSPIRE Faculty/Ramanujam/Ramalingaswamy/UGC-FRP Fellows and also promoting adjunct and joint appointments within and outside university.

4. Administrative reforms at local level to provide greater autonomy to academic units together with curricular changes to provide 'liberal arts' system of holistic and inter-disciplinary learning.

5. New teaching/evaluation methodologies should be adopted, keeping a balance with the conventional classroom teaching.

6. Websites for departments should be updated and user-friendly, so that the research and educational programmes are clearly visible and the new opportunities are highlighted.

7. Mentoring of PhD students about future prospects in the university systems and to encourage them to become educators as well as researchers.

8. Identify teachers and researchers (based on student feedback and other reliable parameters) to recognize their quality performance by issuing certificates, honouring them in public functions within the university, and highlighting their work in university publications and website.

9. Recognize good teaching practices and development of open-ended laboratory work/research projects by students by providing additional financial support to faculty to develop and participate in such courses.

10. Increase student intake in universities/colleges through optimization of existing facilities.

Recommendations requiring separate/additional funding

1. Setting up a 'Research and Development Fund' in the university for supporting competitive grant applications from good performers (with teaching and research both taken into consideration). Every university should have an external board of reviewers of research for the faculty. Based on their recommendations, additional funding for research, travel and book grants may be provided to some faculty.

2. Establishment of special major grants (5 years duration) by the funding agencies on the pattern of HHMI grants (USA)/J. C. Bose Fellowship, to investigators (irrespective of age) in regular universities/colleges (excluding research institutes, IITs, IISERs, etc.) whose research contributions are of high quality. These grants should provide substantial support and autonomy to the PI for utilization of funds. Grants should be rigorously evaluated and monitored. Grants for university and college teachers may be managed separately.

3. Teaching grants, on the same lines as HHMI Professorship in USA, to develop new pedagogical skills, tools and dissemination of the same to larger community.

4. Massive upgradation of infrastructure (classrooms as well as general amenities and teaching infrastructure) of existing universities/colleges, especially those performing competitively.

5. Additional funds for increasing the student uptake through creation of new physical infrastructure (if space permits) and teaching positions at select universities/colleges.

6. Setting up of a separate web-portal of consortium of desiring universities to showcase the strengths and attainments of the university system and to act as an independent and purely academic liaison office for posting information on all available schemes and awards, and also to constantly update on application deadlines, etc. and the new initiatives that become available.

Recommendations relating to policy issues

1. UGC/MHRD should devise a system of Accelerated Career Advancement Promotions as a reward for those who

perform very well in their teaching and research activities, akin to practices in several advanced countries.

2. Ceiling on the number of increments that can be provided by the Selection Committees should be substantially raised from the present five.

3. An experiment of building new research Institutes within the walls of an existing university to promote interdisciplinary research and education may be initiated. Existing and newly hired faculty would be members of both the institute and university.

4. Academically strong colleges should be made autonomous and the autonomous colleges with proven track record may be converted to universities, if their physical infrastructure provides for handling of the larger number of students.

5. Administrative reforms should be made to allow functional and financial autonomy.

6. Private universities may be encouraged, but these should not be for 'profit' and their quality of education must be monitored and ensured.

The various participants (faculty, Vice-Chancellors and funding agencies) in this meeting were optimistic that the state of higher science education could improve dramatically in the near future. However, the status quo is not acceptable and it is time to focus on the quality of education and quality of research. The suggestions, as briefly described here, must be followed with detailed planning and co-operative efforts between various universities and governmental agencies. Many of the above suggestions do not require major structural changes in the existing system, but only need a change in the local culture and the way we do business. Other suggestions will require careful investment of new resources. We also

feel that if a few forward-looking universities begin to adopt changes and demonstrate success, others will follow. The need for better training in science in India is urgent. We cannot drag our heels because the stakes are too high. Importantly, in addition to financial resources, we need the involvement of motivated individuals to rebuild our system of higher science education.

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