Indian Science Culture Needs a Paradigm Shift

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Abstract There is a general impression in the scientific community in our country that the way science is taught, learnt and the work culture of research and management of academic and research institutions is not conducive to cutting edge research, innovation and making world leaders. Mentoring continues to be poor with some exceptions. Very often, senior scientists with long innings in science teaching and research express anguish at the status quo in spite of a number of policy documents and recommendations for change. Indian science culture (teaching, research as well as administration) is a matter of prime concern and the issues cannot be pushed under the carpet if we desire a qualitative change. Most of the institutions of higher learning churn out graduates and post graduates who are largely unemployable. There are concerns on the number of Ph.Ds and not on the quality of Ph.D. One major consequence of the weak post graduates and Ph.Ds is the non-availability of competent faculty. Weakness and lack of interest in science learning starts from school. Learning continues to be by rote which is the prime reason for our low global rank in science and mathematics competence. Teaching and research apart there are umpteen other issues in over all culture of institutions and universities engaged in science teaching and research. Few oases of excellence are exceptions in the vast pool of mediocrity. Some points which need prime attention are: adoption of a tenure track system on the pattern of US institutions; feedback on and evaluation of teaching and mentoring; bottom up approach for candid feedback on issues which

require long term solutions for efficiency and sound deliverables, cultivating the culture of working in front line areas, full transparency in working and an all out exit from culture of feudalism. This transformation needs commitment on the part of the politicians who man the respective departments of science education, research and human resource development. I am sure such a cultural change and paradigm shift from the status quo does not need extra funds and can be surely ushered in without money.

Keywords Indian science · Culture · Mentoring · Paradigm shift

There is a general impression in the scientific community in our country that the way science is taught, learnt and the work culture of research and management of academic and research institutions is not conducive to cutting edge research, innovation and making world leaders in science and technology [1–4]. Mentoring continues to be poor [5] with the exception of premier institutions like IISc, IITs and IISERs. Very often, senior scientists with long innings in science teaching and research express anguish at the status quo in spite of a number of policy documents and recommendations for change [6–8]. Scientific fraternity does express its trials and tribulations, concerns and even frustration in informal gatherings, often, off the record. Indian science culture (teaching, research as well as administration) is a matter of prime concern and the issues cannot be pushed under the carpet if we desire a qualitative change [7]. It has been rightly opined that “Indian Science needs something which money cannot buy” [1, 3].

We are globally competitive in atomic energy and space research but lag behind in most other areas [9]. Most of the institutions of higher learning churn out graduates and post

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graduates who are largely unemployable [10]. The criteria for the award of a Ph.D degree (except in few institutes of repute) are vague, subjective, and often mundane. Further, there are concerns on the number of Ph.Ds and not on the quality of Ph.D [11]. One major consequence of the weak post graduates and Ph.Ds is the non-availability of competent faculty. Most of the new IITs, IISERs and central universities lack faculty as per the mandated standards [12].

Weakness and lack of interest in science learning starts from school [13]. Science teaching has been reduced to theory only. With the sole emphasis on qualifying the entrance examination for engineering or medicine, students devote full time in the academics and there exist “ghost schools” where they enroll for eligibility of school attendance. Learning continues to be by rote which is the prime reason for low global rank in science and mathematics competence. India ranked second last among the 73 countries that participated in 2012 in the Program for International Student Assessment (PISA), conducted by OECD to evaluate education systems worldwide [14]. Our low rank of 66 in innovation also is a reflection of feudal culture in science learning and research which inhibits questioning and out of the box thinking [15]. During the last couple of decades those who come for scientific research are the ones who could not make to IITs, NITs, medicine or top business schools. Teaching and research apart there are umpteen other issues listed below in over all culture of institutions and universities engaged in science teaching and research. Few oases of excellence are exceptions in the vast pool of mediocrity.

- There is intense jockeying and lobbying for position of academic and research management. The winner has to have some godfather and continued blessings of some or other political master in order to retain his/her position and complete the tenure. Very often there is a lack of moral and professional authority in people occupying positions of science management.
- The moment a person assumes a position of science management (with few exceptions), starts giving the impression of being the wisest of the lot, others quietly acquiesce. Such a culture fosters feudalism. The team downstream hesitates giving opinion in order to avoid possible displeasure on account of difference of opinion with the boss. Thus, faculty as well as scholars prefers to remain in the comfort zone of routine. Such a culture leads to excessive reverence to the extent of “yes sir” for everything and obsequiousness.
- Reporting and monitoring is too much bureaucratic which measures neither output nor outcome but puts immense pressure on the nodal officers at different levels. Under such circumstances workforce, often resorts to hyperbole in scientific claims.
- Presentations on projects for funding or assessments are often nightmares. Some of the experts in the committees are intimidating, egoistic and treat the PIs with disdain rather than providing a critique which is the sole purpose of such meetings. This reminds us of what Albert Einstein said:
Ego = 1/Knowledge.
- The move towards transparency is too slow. Globally we stand as low as 76 in transparency/corruption index.
- Entry into science of individuals below threshold level of curiosity driven personality, without fire in the belly and not being “brain hungry”, is a long term liability. There is no sieving mechanism for inefficient faculty. Once the probation is cleared which normally does happen except in rarest of rare cases, they continue till retirement irrespective of the quality of output. Thus, there is a vast cesspool of “bread and butter” academics scientists. We find professors in every nook and corner whose work is not known beyond the precincts of the universities or institutes.
- Purchase procedures are too cumbersome. We find scientists and scholars running around with the purchase files. Funds of RE (revised budget estimates of the institutes) are released at the fag end of financial year (say in February end or March beginning). This puts immense pressure on the management to use funds within the financial year. Everybody feels the pain but there is no policy initiative to make things smooth and fast so that researchers concentrate only on science.
- Mentoring of graduate students continues to be far below the international norms [5]. Moreover, there is no system of feedback from the mentees. The communication between the mentor and the mentees is weak. Very often faculty is poor in human relations and soft skills.
- Research plans are often aimed at publications, not for making basic discoveries or innovation and there is rarely a seamless algorithm for research to revenue.
- There is a lack of transparency and objectivity in research funding. General impression is that only networking and coteries work.
- Numerical scores for evaluation and promotions often rely heavily on sundry and mundane activities. The credit for hard science in some organizations is rather low.
- Some organization have their own impact factors which has made scientists veer to comfort zone of publishing quickly in lower grade journals rather than strive for publishing in the topmost journals of their area of specialization.

As a consequence of this scenario, it is no surprise that we had no Raman, Bose, Saha or Ramanujan in the post independence science. Contrariwise, our compatriots, Khorana, Chandrashekhar, and Ramakrishnan achieved the Holy Grail of science off shores. This reinforces premise that our institutions certainly lack the academic ambience to nurture exceptional talent. An ideal science culture for creativity and innovation has been revealed for Medical Research Council (MRC) Laboratory of Molecular Biology (LMB) in Cambridge [16]. LMB has been nicknamed “The Nobel Prize Factory”. Some notable features of this factory are: bright young workers, US style tenure system, informal work culture with tea-break triumphs, big ideas; and encouragement to risky, and long-term collaborative research [16]. Ambitious institutions around the world are trying to replicate the LMB culture. However, before aiming to emulate LMB in our science institutions, the following action plan needs urgent attention.

- Caesar’s wife must be above suspicion. So, transition into full transparency is the first step. All hiring decisions including positions of management must be by the international norms and procedures. It is important that a tenure track system on the pattern of US institutions is adopted for filtering out non-performers.
- Feed back on and evaluation of teaching and mentoring is needed to stem the rot of mediocrity [17].
- Appraisals by outside experts are no substitute for daily rigor of critique and dispassionate discussion within the research group. It is germane to recall what Francis Crick said in his book, *What Mad Pursuit*: “Neither Jim nor I felt any external pressure to get on with the problem. This meant that we could approach it intensively for a period and then leave it alone for a bit. Our other advantage was that we had evolved unstated but fruitful methods of collaboration, something that was quite missing in the London group. If either of us suggested a new idea, the other, while taking it seriously, would attempt to demolish it in a candid but non hostile manner. This turned out to be quite crucial”.
- Bottom up approach for candid feedback on issues which require long term solutions for efficiency and sound deliverables.
- Cultivate the culture of working in front line areas rather than “also ran guys”. This responsibility solely lies with mentors, divisional heads and research and academic managers.

This transformation needs commitment on the part of the politicians who man the respective departments of science education, research and human resource

development. I am sure such a cultural change and paradigm shift from the status quo and learning lessons from LBM does not need extra funds and can be surely ushered in without money.

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