

etc. though hardly cited, are major research resources for life sciences. Innumerable remedies are waiting to be pharmacologically investigated and developed; molecular phytopharmacology is emerging globally as a major discipline.

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On the quality of students' seminars: The singer or the song?

While discussing the syllabus for M Sc degree the need most often expressed relates to being scientific or how to teach students to be scientific. Various ideas are explored; the two major ideas being presentation of research papers and courses on scientific writing and/or scientific method (We have given up the latter since, over the years these courses had no discernible impact whatsoever on the students). Here I narrate briefly some intensive discussions about seminars with the students and faculty. Something needs to be said about the purpose of these seminars, which is so obvious that it appears to be the least understood. It relates to the fact that *it is a group activity*. (Whatever has been said here is of equal relevance to research seminars and symposia as well. That a seminar is primarily a group activity which dictates its own ethos and purpose has been, by and large, ignored. Dilute meetings are a direct consequence of a heavy dose of non-serious and trivial science.)

A seminar course with 3–4 seminars per student in a batch of some 15 students was conducted last year and I evaluated the course. Opinions ranged from the course being useless to it being excellent. The seminar course was considered to be useful because some students had mentioned that it helped them to improve their final presentation. One or two students who performed very poorly the first time did better in subse-

quent seminars. Other than the anecdotal, there is no other means by which we could consider the course useful or not. The marks were normative: the students agreed that there was wide variation in the talks, but the marks (wherein students also participated for daily assessment) remained nearly the same for most students.

The students had the following reasons (of decreasing importance) as to why a seminar is necessary: (i) to share knowledge; (ii) to clarify doubts; (iii) to seek clarifications from teachers, postdocs, etc.; (iv) as a better way of learning rather than from classes alone; (v) to learn to be scientific in a practical way.

The postdocs who help in teaching reacted very much in the same manner. Both the students and postdocs agreed to a hierarchy of knowledge: teachers > postdocs > students, etc. All agreed that discussions are good.

Then came the turn for searching questions. Has the course served the overall purpose? The best answer we received was that the students would have done much worse had the course not been there. The postdocs helping with the course were emphatic that it was useful. Then they were asked: 'How many students actually participated in the discussions if these are indeed good?' Apparently less than 10% of the talks had any significant discussion. So we are confronted with a course in which discussions were good and they

learnt a lot and yet not more than 10% of the talks had any discussion at all and not even one presentation was shot down logically or for its presentation. This lack of participation included those who were supervising too.

The focal question soon developed. *If one person talked and twenty listened, what is the role of these twenty people?* The first answer was that they learn. If they were to learn, would they not do so by taking a xerox copy of the paper and reading it? Why listen? In fact neither the faculty nor the students were clear as to why one should listen to research papers. It is not a ritual offered at all meetings? What is the role of the listeners?

It then became clear to the students that personal reading is superior to mass listening if one wants to master details. The students were quite confused as to what they should discuss and why. So were the faculty. The dilemma started as follows. Who selects the paper? The students mostly argued that they need to choose their own. Doubts began to surface as some students argued that there is no point in their selecting a paper: if it is for a presentation which does not have sharing of knowledge as the *primary* purpose, to what end do they select a paper? The common idea was that the occasional doubts expressed by the students were to be clarified by the omniscient faculty/postdoc combine so that clear minds simply walk away into the

sunset brimming with knowledge at the end of the day. It never happened.

Then the next question was about how the performance should be marked. In fact, the most important concern for the students and postdocs alike was the marking. One extreme suggestion was that it would be only fair if all of them presented the same paper for 15 min each and the presentations were marked accordingly. Is it the fault of the student if he/she does not choose a good paper? Fortunately some of the students took a position that listening once is bad enough but to listen to the same stuff 15 times would be more than what their fragile nerves could bear! By this time, the pervading influence of catatonic stupor, so diagnostic of 'seminaritis', is realized by every student. That, in itself, was an achievement.

Another suggestion was that one should take a few classes on how to give a scientific talk, and how to break-up the talk. This has brought us back to the earlier courses on scientific writing which were given up for the simple reason that they did not make any difference to the students.

What is being scientific? There was no agreement nor was there a consensus on who is best qualified to say so. The only way to resolve the problem was to argue that a seminar has something to do with a group of people discussing it.

Any goal that is not taken explicitly into account activity by the group has no value in a seminar. Marking, learning, knowledge acquisition, being scientific, etc. all went through the window since they could not be defined as an obligatory 'group' activity.

The discussion was not getting anywhere as the students claimed that they were confused. The postdocs, on the other hand, were convinced that the matter was really clear and that there was no need for discussions. When the choice of papers and structuring came up, it was suggested that even the daily practicals could be taken up as seminars since a lot of detail could be discussed. The practicals are actually supposed to have a large slot for discussion of results, right and wrong, which obviously was not being utilized. The students decided that we will not discuss the practicals during the seminars.

The follow-up took place by individual discussions with the students. The students who opened up privately were clear that they did not want to trouble their classmates and therefore did not ask questions. Politeness has a stranglehold on the students; no one wanted to inconvenience others, such that the whole seminar course died that year. They themselves knew what they were doing. Also it was clear that 50% of the class was very Sicilian in their outlook,

observing Omerta (silence) as sacred. Classes were merely a spectator sport, not to indulge is recklessly by actually participating.

Two weeks following these arguments with all the students, the first seminar was given by a first year student as part of the seminar course. The paper was from *Current Science*. Strangely, nearly every one argued their heads off. A major argument was, how can these authors jump from circular dichroism data to Alzheimer's? Would that be correct to extrapolate? Can conclusions be reached? Is that being scientific? Which is better, to jump to a conclusion or to withhold a judgement or conclusion? Debate raged. I kept quiet (There is merit in the observation of Ernest Hemingway that only a fool looks for the beginning and the end in the same story). We do not know why these discussions took off. It did not recur too often subsequently. My idea that all the students should read the paper before coming to a seminar so that anyone may be asked to present randomly was however vetoed by the entire department unanimously.

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The wrong policy at the right time

In the era of globalization and free market economy the country is in need of development of indigenous technology which would benefit and promote symbiotic growth with the industries. The need of the hour is therefore to develop technology that is cost effective, competitive and global. This requires dedicated efforts from the scientists and technocrats of the nation to work together. The government policy in this regard should be to encourage highly funded R&D institutes such as IITs to come forward with new ideologies. Needless to say, the stress should be on experimental research rather than incremental theoretical research that can only benefit the developed nations.

Unfortunately, the focus on experimental research at the IITs is on the decline. The reasons for this are many. The primary one is the lack of an adequate and supporting environment conducive to experimental research. The researcher has to overcome a number of physical and administrative hurdles. The sophisticated testing equipments are not properly maintained and also not operated to their capacity. The lack of work culture among the supporting staff, non availability of consumables, spare parts of the sophisticated equipment and the general administrative apathy often make these instruments inoperative for several months. An avid researcher who waits for months to even

carry out the preliminary tests or measurements on his samples under these circumstances gets demoralized and demotivated to proceed further. This results in a shift of focus among the researchers from experimental to theoretical pursuits. This shift in the research orientation is palpable among the scientific community in India. Moreover, such shifts get reinforced by the lack of research students with good experimental skill who would not be tempted by the relative ease of conducting theoretical research in this information age!

The problems get compounded because of the diverse facilities offered to the young researchers at the various