

research work of this kind, funds and in many cases, adequate laboratory facilities would be required and students cannot be expected to manage this on their own. This would only lead to unnecessary pressure on aspiring Ph D candidates, loss of academic years and even unethical means.

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Response:

I wrote about summer schools where discussion, solving simple problems and interactions with teachers are the pattern. Listening to invited lectures passively, which the commentators assume, is another matter. Members of the audience should have a measure of their abilities and interests before attending these lectures.

In case the commentators include the summer school lectures, let me point out,

on the basis of the reactions stated, that it is the fault of the lecturers in assessing the receptive abilities of the audience. But overwhelmingly, it is the deficit of training in the students and junior teachers. Please allow me to narrate briefly an example from my personal experience. At IIT we ran for a few years an M Tech one-year diploma course in geochemistry, and admission was open to those with M Sc degree in geology from other universities, of course with good grades. In my course in physical geochemistry, I started with elementary thermodynamics. In my second lecture, when I wrote $dP/dT = \Delta H/T\Delta V$, the faces of more than half the students showed signs of uneasiness. Enquiry revealed that they had not learnt calculus at all. One of the students showed interest in doing a small 'thesis' with me. For him I chose Karnataka (near his home), where there was variation in rock chemistry within short spans and asked him to map it first. He told me that they were not taught geological mapping. So how can you expect him to follow guest lectures? He had not been taught elementary mapping, neither advanced analytical tools. Who is to blame – the student or his Alma Mater?

All parents know that normal children in 2/3 to 5/6 age range ask too many questions. Is this curiosity meant to be snuffed out in their schools? My suggestion was that up to class VII or so, they should be taught basic skills of arithmetic, grammar, writing, etc. but after that

teachers should orient pedagogic style towards enhancing the students' thinking ability at a slow pace.

I did not suggest that school teachers should be researchers. But at the class XI/XII levels, the students should be made aware of the new developments in science – the source being computers and newspapers/magazines.

At college levels, especially during postgraduate teaching, students should be urged to go beyond textbooks.

For selecting Ph D research problems amenable to solution, scholars can suggest several problems, consult their guides and discuss the facilities available in the department or outside, and also the tractability of the problem before finalizing.

Every student need not go for a Ph D, and as I have pointed out, neither do we need so many doctorates, most of whom are not employable. So there must be a fair method of cut-off. This can be done by asking them to publish a single-author paper in a respected journal, or through elaborate tests on the progress of their research after 1–1.5 years. If you think that it will be cruel on the candidates and a nearly impossible task, sit on the shore and watch from a safe distance the streaming flow of international progress of science.

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