The distribution of relevant abilities

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Remember the day when we first met the Department Head in the Institute – most likely, the day we joined? Did it include pleasantries, welcome, formalities, assigned office and lab spaces with some basic infrastructure including a basic computer and a printer – the first day ideals which give one a happy and wanted feel? It would have happened if the Department was enlightened enough to realize that undergraduate courses can be handled by any suitable faculty member and had stopped hiring for teaching, and was hiring for research instead; hence it could afford to give a new faculty member a semester or more to settle down in research before beginning the challenging process of facilitating student learning. It would have happened if the Head was a nice person, and strong enough to handle a colleague who was looking to palm off a UG course to a gullible, new faculty member. But, we live in the real world, and in addition to the above first-day ideals list being incomplete, the Head may have added, `you have been assigned to teach the UG course, xxx, which begins in a couple of weeks – good luck!'. There begins our life-long learning process to facilitate learning in our students (`teaching', in common parlance) for which almost all of us are not trained when we begin.

Most of us are in this profession because we prefer a certain lifestyle with good, independent work-style sans `big money'. Further, we are here because we had done academically well, probably throughout our student days. That makes us myopic toward the high performers in class when we begin our teaching careers, without much guidance. The others in class just don't seem to matter. However, quite early in our career, we begin to realize that there is a distribution (approximately normal) of relevant student abilities in every class. The relevant student abilities are many, including knowledge in a domain, and high learning, analysis, application and synthesis skills. But, only a few of us fully accept the existence of the distribution even after years of practise, and fewer decide to do something about it, especially for students who are on the left side of the distribution. The distribution in elective classes could be different, especially in its width; let us focus on the core courses here.

I too began my teaching career in a similar fashion as above, with a minor exception. I had read a good book, Teaching Engineering by Wankat and Oreovicz (McGraw Hill College Publishers, 1992) in summer 1993 at IIT Bombay before my first teaching semester. That significantly helped in at least being conscious of the average student in class, and the need to pitch my lectures to that average student. I had always been interested in the facilitation of student learning. My initial attempts toward that interest were focussed to improve the high performers. The feeling, probably erroneous, was that these high performers had the highest possibility of making meaningful contributions in the field, and hence let me strengthen them.

After some years with that focus, which included the design of an effective exercise that I still use (some of my past students fondly recall that exercise even after 15 years), a certain level of satisfaction on that front made me focus more on the average student. Clarity in

delivery, a good story-line (organization), employing proven techniques of learning (e.g. active learning), and listening to the feed-back of the learning are all crucial to be effective in facilitation of learning of the average student. Many of us have these skills, which are further honed with experience. If not, we can pick up these by attending the teaching learning centre (TLC) programs.

After about seventeen or more years (out of which about nine were time-constrained because they were done with significant time spent in administrative activities) of teaching, I realized that I had not seriously considered doing something to improve the students who were in the left extreme of the distribution (`left-students' or LS). I talked to senior professors who interacted with us in the TLC, for a means to effectively address this population, and surprisingly drew a blank. Statements from highly regarded and experienced teachers, such as `Don't worry about them – you cannot do much; it is an unfortunate situation' and the like left me surprised. Somehow, I felt I was responsible for them too, and their numbers are not small anymore – about 10 to 15 in my UG classes of about 60 now. The learning literature, which spans some centuries (yes! Learning/Education is a vast, old field of study), also seems to be relatively sparse on that front, based on my limited search thus far.

Initial work in the past three years made me realize that improving LS is highly complex and challenging to address. Some reasons for the very low performance by students could be difficulties in: possessing the needed concentration ability, possessing the ability to retain, understand, or apply the appropriate knowledge, managing study time, understanding the language, or adjusting to life on campus. These usually lead to the lack of self-confidence, fear of failure, inability to write exams, multiple anxieties, and worry about the future. Some of the above are also found in medical students (Vijaya V. Mysorekar. 2012. Need for mentorship to improve learning in low performers. National Medical Journal of India, 53, 291 – 293).

The key to being effective in improving the LS seems to be early identification (possibly by the end of the first month through the first quiz), followed by spending some time with them, in as unobtrusive a manner as possible – many of the students are highly sensitive. Certainly, they should not be exposed in front of their classmates – that would push them into a deeper hole. Further, they may be reluctant to meet us even when asked. Many times, the academic difficulty would be in understanding/knowing things that they are expected to know as necessary background (e.g. solution to integrals or even derivatives/algebraic operations/vector algebra/etc., or application of Newton's laws of motion, sometimes). These can be remedied to a certain extent with the appropriate counsel and direction to review.

The psychological aspects play a dominant role to suppress the student, and hence they need to be carefully addressed. It becomes imperative to clearly, albeit intuitively, know when we are out of our depth to handle the issue, and at those times could gently goad the student to seek professional help.

Interestingly, in undergraduate laboratory courses, the results of the attempts to improve LS have been encouraging from the first lab course I taught 15 years ago, although I realized the significance only four years ago. That is possibly because co-operative learning can be employed most effectively in well-designed lab course (please see the CEE website for a paper). In a co-operative learning mode, the LS are significantly benefitted; their confidence levels during and at the end of the course seem much higher than earlier. But, I am still learning to understand and help the LS in a theory course. The results were encouraging in the undergraduate theory course that I handled last year – out of the 10 identified, 8 cleanly passed the course with some of the above interventions. I continue to learn.

Overall, if we can cause the following change in the distribution, I think we are in the right direction to do justice/dharma to one of the major aspects of our job, the facilitation of student learning: