

Inspired Teaching and Learning at the Educational Institution and in Industry – Experiments, Experiences and Inferences

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Abstract: The teacher can teach well only when he also takes up his own continuous learning as his mission. In modern times resource availability has widened enormously to the teacher as well as to the student. For example, in addition to several articles published on the internet, video lessons are available on the YouTube. Students remember those teachers who were setting an example, who emphasised on student centred learning, cooperative learning and problem based learning. For the student, the teacher is also the mentor, the friend, philosopher and guide. The task of the teacher is to develop the student's capacity for research and enquiry, capacity for creativity and high technology, entrepreneurial and moral leadership. The private industry needs to play a proactive role by opening their doors wider for student trainees and interns. College managements have to be more concerned about the problems faced by the teachers and students and support them in their endeavour. The industry needs to open its doors wider for student apprentices and collaborate with engineering colleges for technical issue resolution. The colleges in turn, may provide flexible educational opportunities to industry employees.

Keywords: autonomous learning, cooperative learning, interns, conscientious student, empowerment

1. Introduction

As teachers, our mission has two goals: (1) to facilitate acquisition of knowledge in an age of information explosion in a demanding environment of increasing complexity and competition. (2) to reinforce enterprising and ethical attitudes of an enlightened society. For the first goal, a lot of published literature is available [1-17, 19-25], Inspiring leaders have emphasised the second goal [18]. The industry too has a multitude of teachers for making the new recruits industry-ready and to retrain the older employees. This author has a unique combination of experience from the industry as well from educational institutions. He intends to draw the attention to some aspects of the teaching learning processes from his own experiences as a student, as a factory worker and as a teacher.

2. Student as a conscientious citizen

From the time of birth and during growth, a child keeps asking, "Give me". The aim of education is to transform the student in such a way that he stops demanding and instead, asks "What can I give?" The mission of the engineering educator is to develop in the student five capacities: 1. The capacity for

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research and inquiry. 2. The capacity for creativity and innovation. 3. The capacity for high technology. 4. The capacity for entrepreneurial leadership. 5. The capacity for moral leadership. The students should also be taught how to cope with failure in addition to celebrating success (APJ Abdul Kalam, 2003).

3. Student who is industry ready

The lecture method has prevailed in the class room for a long time in most educational institutions with a few exceptions like the Indian Institutes of Technology, where, for example, Project Based Learning and Problem Based Learning (PBL) were implemented long ago, though without using the associated jargon. As a welcome development, in recent times, the teaching has tended to be more student centered than ever before. The classroom is gradually transforming from an autocratic to democratic set up, thanks to the persistent efforts of enlightened teachers. The internet revolution has made accessible the fruits of research work by several educationists from all over world. The awareness of best practices has further increased due to innovative efforts such as those of the National Programme of Technology Enhanced Learning (NPTEL), Indo Universal Collaboration for Engineering Education (IUCEE) and open courseware of Massachusetts Institute of Technology and several other universities and institutions. Teaching is not limited to colleges and universities. Industry specific teaching is part of the Human Resource Development department of any reputed industrial organization.

4. Needs of engineering education

Jianmin Qu, 2016 has summarized the needs of engineering education:

- a) Flexible: fewer number of required courses, so our students will have time to learn knowledge beyond engineering, such as finance, economics, management and even arts and history.
- b) Relevant: real world problem solving
- c) Appealing: personalized learning.
- d) Experiential: learning by doing through team based and project based courses.
- e) Innovative: design and design thinking in every class.

- f) Multicultural: exposure to a global, diverse and inclusive learning environment.

Swami Vivekananda said: Education is that which helps the common mass of people to equip themselves for the struggle for life, which bring out strength of character, a spirit of philanthropy and the courage of a lion. The essence of education is concentration of mind, not the collecting of facts. Facts are available on demand, at the click of a mouse.

5. Special Teachers

When we look back in life and recollect experiences from school, college and work place, some teachers stand much above the others in one's esteem and we remember them forever. What was special in each one of those teachers? They were all committed. They were excellent time managers. They were willing to give much more than expected. They enjoyed doing their job and did not link their performance with rewards. They loved their students and their profession. The ideas presented here are those I picked up from them.

6. Resource utilization

For the person keen on learning, be he a student or a teacher, several resources are available: his own and others' experiences, experiments and published literature. The author lists the articles [1-25] all of which played an important role in his own education as a teacher. Frequently, motivating techniques used for school children also come in handy for teaching engineering students.

The reservation system, unique to India has extended opportunities to some while leaving out several deserving cases in a scenario of limited resources. The private educational institutions have stepped in, in a big way, to fill the gap. They are in a position to bring about the much needed transformation in engineering education.

The old mindset of learning scarcity — limiting the audience for their best professors and classrooms — must give way to a more open approach of taking the best teachers to students across the globe, using technology as a tool (Prasanna and Choudhury 2013).

7. Setting an example

Teachers are very particular about late coming students. But they themselves come late or cancel

classes. Frequently students depend on public transport and arrive at far off colleges after changing buses. A lot of time is lost in transit. The buses are overcrowded and do not maintain punctuality. When the students are required to submit homework before the deadline, how long did the teacher take to correct them? Has the teacher submitted error-free question paper without having to be reminded by the Examination Branch? The disciplined and empathetic teacher will be remembered.

8. Class room experience

This author used the following methods in the class room for several years. These were found by students to be interesting, engaging and effective, as recorded in their feedback forms:

- a) Summarize the previous lecture. This was done either by the teacher or the students.
- b) Ask leading questions related to the present lecture.
- c) Give very brief overview of present lecture.
- d) Deliver the present lecture.
- e) Make every participant to give one point from the lecture beginning with the first students in the first row. The sequence can be changed every time. (Repetition of the same point is not permitted. "We learned Fick's Law of diffusion" is not acceptable. The Laws must be specifically stated.)
- f) Encourage question session after the lecture.
- g) Give a brief overview of the next lecture.
- h) Give a different home assignment to each student, so that there is no copying.
- i) Encourage student to come to the dias and speak. This is worthwhile even if two or three students are made to speak in a period of one hour.
- j) Divide the class into teams of three or four depending on the size of the class. Each team to elect its team leader. Rearrange the chairs in the classroom so that the team members face each other, discuss and elected leader will write down the answers for the questions after discussion with the others.
- k) Individual assignments for literature review and oral presentation.
- l) Individual assignment of project and presentation of project report.
- m) Follow the same method for seminar presentation as for the test above.
- n) With the above methods, the students feel involved and enjoy the classroom experience. Then they are ready to take the individual final test, inevitable for grading.
- o) Instead of sticking to only the subject, show or encourage students to show short duration inspirational videos. This will break monotony and minimize boredom.
- p) If you are a substitute lecturer and have no idea of the subject of the class, use the occasion to make the students speak without interrupting them. Give an opportunity to every one for a minute. Give the student a choice on the topic he or she would like to speak.
- q) The Jig Saw method of distributing different aspect of a project to different students, giving an opportunity to every student to discuss the subtopic in his own group and then integrating into one report in the other group.
- r) Form teams on the basis of lottery to avoid religious, linguistic, community and culture polarization.
- s) Provide for out of class room extracurricular activity including sports, cultural items and delegate authority to manage these events.
- t) Be available to students at all the times including the teachers' lunch time.

9. Student as an Autonomous Learner

One cannot learn car driving by sitting by the side of an expert driver and watching him. The student has got to be in the driver's seat, though under the watchful eye of the teacher. The aim is to teach one to fish rather than give him a fish.

An old Chinese proverb nicely summarises the difference between traditional subject-oriented

education and the project-oriented educational model of PBL [Enemark, 2002]:

Tell me and I will forget

Show me and I will remember

Involve me and I will understand

Step back and I will act

10. Respect the student

- a) Be available to the student offline and online.
- b) Greet and respond to greetings.
- c) Encourage questions and discussions.
- d) Appreciate in public and criticize in private.
- e) Understand the circumstances of the student.
- f) Show concern not just for the student knowledge, but his welfare too.
- g) Offer genuine advice.
- h) Be fair in assessment.

11. Presentation style

NPTEL video lectures are excellent in that they are free for every one and rich in content and diversity of subjects. It is remarkable that a developing country India with a welfare motive has chosen to offer a wealth of knowledge free while the commercially driven entities have increased their fees with no appreciable growth in income of the people. The NPTEL presentations are extremely useful to teachers in some of the private engineering colleges who do not have the resources in investing on teacher training and improvement in the subject.

Those engaged in making video lessons must ensure that the following features are minimised in their presentations:

- a) Poor quality pronunciation of the speaker.
- b) Sounds like 'Oh, Uh, Um, Ah', do not contribute to the presentation.
- c) Undue gaps between sentences.

- d) Typing errors in slides.
- e) Correcting mistakes during final video recording.
- f) Too small lettering and cluttering in slides.
- g) Not using colour code for clarity.
- h) Deficient in pictorial content.
- i) Clumsy hand writing or pictures in slides.
- j) Inappropriate body language.
- k) Camera remains mostly on the face of the speaker rather than on the slides. Technology is available for inserting the speaker into one corner of the slide with less than life size (see for example, Jianmin Qu, 2016).
- l) The speaker stands between the camera and the slide.
- m) Too slow a presentation or too fast.
- n) Unduly long emphasis on overview and introduction and too little on the substance.
- o) Poor audio and video quality. Check for echo, hum, screech, whistle before uploading.
- p) Questions from listeners are not audible, while the answers are.

12. Emphasise Physical Fitness

Being living organisms, physical wellbeing is important since the fittest survive. This lesson was learned from the Physical Director. Every morning, he used to make a round of the hostel where the students resided. He banged on the doors until opened and drove the just awakened students to the gymnasium. There he made the students jump, twist and run for at least half an hour. This habit continued in later life and helped tremendously whatever be one's age. The importance of this cannot be underestimated in today's world when you see students arriving by motor bikes instead of walking down and queuing up at the elevator instead of using the stair case and with food of all kinds being readily available at all places and all times. Several days are lost due to headaches, body aches, fever etc., which would not happen if a little more was done to preserve health.

13. College Managements

College managements can help a lot by granting a little autonomy to the teacher. They should not see delegation and empowerment of students as abrogation of duties by the teacher. The teachers too have several problems and the Managements can do a lot to help them. This will in turn enhance the loyalty of the teacher to the educational institution and to the students. Staff room space, Furniture, upgraded computer, fully equipped laboratories etc. are minimum requirements. The transportation and personal problems of the teachers also need to be addressed to the extent possible. The college managements can assist the teacher by flexible working hours where possible, by providing baby crèche for teacher's children, by encouraging teachers to improve their qualifications and in several other ways.

14. Internships and consultancy

The government and public-sector institutions have been accommodating a large number of students for practical training and internships. The private industry has been only criticizing in different forums that the university products are not industry ready, without doing anything to help the situation. They must open their doors to students and give them an opportunity to get a feel of the real situation. The needs of the industry vary widely and it is not practical to expect industry readiness. The colleges will train the students in subjects and problem solving in general terms. Specific cases need to be tackled by the industry. While being a student, if an opportunity can be given to work, it will make the student industry ready. The readiness is not limited to subject knowledge, but to several other skills such as the ability to work as a team member.

The private industry needs to be more liberal in referring to colleges some of their technical issues for resolution. In turn, the colleges may provide more flexible opportunities to working engineers to improve their qualification. The affiliating universities and regulatory bodies need to be more bold and make way for new approaches.

15. The Jig-saw – Example

The subject is Materials Science and Engineering. The students need to specify all the materials needed to build a nuclear research reactor of a specified power

and peak neutron flux level. Suppose five teams are formed and assigned the following five topics to teams of four students:

- a) Fuel materials.
- b) Cladding materials.
- c) Control rod materials.
- d) Structural materials.
- e) Shielding materials.

Each member of each team collects information and shares with the team members of the same topic. Then new teams are formed. Each new team will have five members, one member with a different topic. Now there is only one member in the team on say, Fuel materials and only one member on say, Cladding materials. The new team meets, discusses and comes up with a recommendation of the material of their choice for all the five categories. Every student is made to exert in the Jig saw method.

16. Value of team work – Example

The students are asked to imagine that they are on a sinking ship. They have to get on to a life-saving raft. They have to quickly decide which items they need to carry with them. They have to choose or prioritize from the list of about 20 items provided. Each student will choose his most important items. Then he discusses with his team members. After the discussion, he makes his choice again. The changes that he makes prove to him the benefit of team work. For example, a student gave last priority to 'Shaving Mirror' and 'Rum bottle'. When life is at stake, who will think of shaving? Who will think of a drink? But in the discussion, he was told that the mirror could be used to reflect sun light to nearby ships as a distress signal. When one is sick at sea, a little rum may keep him alive. With this enlightenment, the priority changed.

17. Student empowerment – Example

A student was found damaging the class room furniture. A punishment needs to be awarded as a deterrent. A committee is constituted to decide on the mode and quantum of punishment. The committee of four consists of three responsible students and one responsible teacher as moderator. The committee discusses and offers a choice to the erring student. He

has to choose any one of three punishments. For example, he will pick up trash from each class room as community service. He will bring his parent to the principal for counseling. He will bring a carpenter and repair the damaged furniture. He will pay a fine to meet the cost of repair. Availability of choice of punishment sends the message to the student without hurting him.

18. Conclusion

During his tenure, this author attempted to break the monotony of the college atmosphere by providing the students with opportunities for exertion of the intellect, fun, team work and empowerment. Past students are occupying eminent positions in their profession and in the society. The conscious teacher is one who keeps acquiring new knowledge from different resources such as books, articles published on the internet, NPTEL, IUCEE, open course material, You Tube videos etc. He has concern for the student's acquisition of knowledge as well as for the student's wellbeing. He will make the learning environment most enjoyable, by innovating, respecting the student, empowering the student, providing choices and giving cooperative as well as individual assignments. He will himself keep physically fit and conduct himself as an eminent example. He will continuously ask himself, "What else can I do for improving myself and my class?" The college managements too need to give greater attention to student and teacher needs. The private industry must shift from the blame game perspective, assume greater responsibility and provide training and internships to students as part of investment in future citizens for building a strong nation.

Acknowledgement

As Principal and Director (R&D) of AAR Mahaveer Engineering College, the author was given a free hand by Sri. S. Surender Reddy, Secretary, Mahaveer Educational Society, in guiding the teachers and students towards responsible and enriching learning and the same is gratefully acknowledged.

"Live as if you were to die tomorrow. Learn as if you were to live forever"- Mahatma Gandhi (1869 - 1948)

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