1. NEED FOR RESEARCH CULTURE IN ENGINEERING FACULTY

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Preamble

Much is being talked about and debated on whether research should be a mandatory component of teaching profession in Professional Institutions. Engineering Institutions, which are mushrooming all over our country, today, are bound by AICTE regulations for keeping up quality standards. AICTE, therefore, has specified appropriate qualifications for various positions in the teaching category. A Ph.D is a must for the post of Professor and desirable for Asst. Professors too, and a Master's degree is the minimum requirement for lecturers. There is a feeling among most of the young teachers that to be a good teacher the major quality required is communication skill and an ability to prepare the student for scoring high in the University examinations by spoon feeding in the class room. To support this argument, we have umpteen number of examples of bad and unpopular Ph.D qualified teachers on the one hand and a number of good and student–centred popular spoon feeding teachers with only under graduate degree on the other. A feed back from students shows high rating for the latter. However, feed back from the same students who enter into profession after completion of the course is found to be entirely different. They find it difficult to search and retrieve information on newer technologies and lack in the required analytical abilities for tackling live problems of the industries, as they are not trained for the same by these spoon feeding teachers. Many students, therefore, have expressed their unhappiness about the teaching and training that they received from such teachers.

It should be clear that in a Professional Institution, the teacher's role is more as a facilitator rather than a spoon feeder. He must teach the students how to approach various sources of information and knowledge and motivate them to learn the subject fundamentals with interest and focus. This requires that the teacher should be able to inspire the students by his tremendous knowledge of the subject, outstanding confidence and undisputed credibility. Instead of he giving to the students, he must make the students extract it from him through the process of interaction. Of course, there can be no compromise on the communication ability or interpersonal skills to be possessed by the teacher, may he be a Ph.D degree holder or a mere BE degree holder.

The entire discussion, therefore, boils down to the simple fact that good teaching requires high level of competence, confidence and credibility on one hand and excellent communication, presentation and interpersonal skills on the other. Teacher training, therefore, is mandatory for all members of teaching fraternity, both seniors as well as juniors, to imbibe all the essential qualities, irrespective of their technical degrees and qualifications.

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Why promote research culture in Engineering Institutions ?

Carrying out research will train the teacher in the technique of information assimilation through books, e-media, experiments, seminars, conferences and interaction with experts. Research seeks truth and clarifies uncertainties by teacher's own experiments and analytical work by which he can gain immense confidence to discuss on the subject. Further, his presentation and communication skills will be improved through participation, in paper meetings, discussions and conferences. Such a participation provokes and promotes creative thinking by interaction with experts and resource persons. Further, it induces immense self motivation due to exposure to research work in different areas presented at conferences. In general, a research minded teacher will have better confidence and motivation to teach a subject and therefore, will be at ease to establish himself as an effective and lovable teacher.

There is a saying: "I hear, I forget; I see, I remember; I do, I understand". Student will clearly understand the concept of a subject only when he works and involves himself in hands-on designs, analysis and experimentation. An ideal teacher is no longer a teacher outside the class room, but he is a life long student aspiring for continuing education. That is how, he maintains his credibility and becomes a role model for all his students.

There is a general dissatisfaction among industries that our outgoing engineering graduates are not industry-ready. This obviously requires radical changes in our new curriculum which should include cutting edge technologies currently used in world class industries, at least in the form of elective subjects at the final year level and a substantial component of useful research in the form of student group projects. The concept of flexible curriculum has been discussed earlier in Ref 1. An Industry-Institute tie up through MOUs would be very valuable to achieve this objective. The research culture and expertise developed in the technical Institutions will also attract industrial and commercial consultancy and testing. It is not out of place, to mention that in developed countries like US and Europe, Universities and Technical Institutes are primarily research Institutes which enjoy substantial amount of revenue generation from industrial consultancy and R&D. This is taken up through faculty expertise involving students in the research activities. This empowers and enables the students to build up confidence and competence to accept the technological challenges in the outside world when they step out of the Institute.

What type of research projects may be chosen at the Ph.D level?

Projects are treated as valuable if they lead to:-

- Contribution to national economy through cost effectiveness or energy saving;
- Industrial process improvement or Innovation;
- Simulation and modeling studies to eliminate expensive experimentation;
- Contribution to advanced technical knowledge and value addition;
- Improvement in the living standards of people by technology transfer to the society;
- Original / innovative / creative idea which may result in new findings and form a basis for further work in any theoretical or practical area.

Topic should be selected in the area of teacher's interest after a thorough literature survey in consultation with his chosen guide, senior faculty, published conference proceedings, journals, visit to research establishments of national importance or by close interaction with industries to pick out their live mind boggling problems. The teacher needs to have some attitudinal changes and certain qualities to achieve work satisfaction and enjoyment in his pursuit of research. For this, he needs to nurture motivation and urge, concentration and focus, perseverance and

commitment, team work and team spirit, patience and common sense and, most important, ability to face failures. Positive qualities such as optimism and pro-active thinking are the most important requirements for sustained research efforts since possibilities of failure at several steps are very common in innovative research.

Evaluation of research

As per the qualification norms specified by AICTE, it is mandatory for a teacher to possess a Ph.D.degree to get the Professor's post. This has resulted in Ph.D degree hunting to satisfy the AICTE requirement for promotion. Of late, many teachers have been seen to be involving in unfair means to obtain the Ph.D degree from some private Universities. This necessitates the need for a mechanism to evaluate the genuineness of research of the candidate. Suggested methodologies include indicators like (i) number of research papers published by the candidate on his research work in National and International Journals (ii) number of papers personally presented by the researcher and discussed at National and International Conferences (iii) number of patents obtained or applied for by the researcher on his research findings (iv) number of research students registered under him for guidance (v) his urge to initiate follow up research at his own institute with suitable funding agencies and (vi) a thorough presentation of his work to the subject experts at the interview for the applied post. It may be necessary to form norms for the above indicators to evaluate the excellence and authenticity of the research project undertaken by the candidate. In short, doing research should not be for commercial benefits, but it must come as an imbibed culture to bring glory to the Institute and pleasant job satisfaction for the researcher.

Under-graduate research at State level colleges

It is well understood that research culture should sprout from the budding engineers at the undergraduate level. However, it is not happening even at the Institutes of excellence like the IITs. With mushrooming State level engineering colleges and management Institutions today, providing satisfactory group projects to the students has become a challenging task for all Institutions. Teachers do not have patience and time to personally monitor the participation of individual students in the project and hence, students will be left to themselves to choose, execute and complete their projects. This, in reality, has resulted in duplication of project reports from college to college, from year to year, particularly in cities where cluster of colleges exist. Taking advantage of this situation, a few roadside 'institutes' have cropped up who collect the undergraduate project reports from various colleges, modify them and sell them to their student 'customers'. With the result, in general, the undergraduate projects are slowly becoming a farce and are now only a leverage to push up the grade of student at the final year. A small percentage of self motivated students may be exceptions to the above.

To overcome this uncomfortable situation, some measures need to be taken by the Institutes. The students should be given an effective briefing by a senior, preferably a research minded teacher on the importance of group projects and the benefits that they can accrue from such an exercise, such as team spirit, creative thinking, hands-on-skills, project management, report writing etc, all of which will be directly useful to them when they enter into their future job responsibility. Only when students are motivated in this fashion, good work can be extracted from them. Undergraduates cannot do great research due to their limited time frame, but they can be associated with on-going high level M.Tech or Ph.D projects at the Institute. Some of the projects most suitable for their level could be modification of existing engineering devices for better efficiency and cost effectiveness, production of models with innovative ideas, transfer of technology to rural mass, writing useful computer softwares for government and commercial organizations,

alternative energy production and distribution studies, use of alternative fuels for automotive traction, design, production and testing of innovative devices for house hold safety, modified agricultural implements, energy audit exercises to control energy wastage, time motion and process studies in industries for economical operation and many more such areas which will benefit the society, help the industries or which can capture the market on commercialization. A small financial assistance from the State science and technology centres or from the Institution Management itself, as well as incentives of attractive prizes for the best adjudged projects in the in-house exhibition will be a great source of encouragement and motivation for the participating students.

Closure

Teaching and research should go hand in hand in any professional Institution, if it has to strive for excellence. The research culture will strengthen the knowledge of the teacher, improve his competence and confidence levels and increase his professional credibility. Moreover, the imbibed research culture and the improvised infrastructure attracts revenue generation through consultancy, testing and R&D needs of industries. It may be mentioned here that the Management of the Institution has an important role to play in this regard. In order to nurture research culture within the Institute, it is necessary that the authorities provide proper encouragement to the teacher by way of some seed money for research, adequate relief in teaching load, basic facilities to work in the Institution after regular working hours and during vacations, adequate financial assistance and encouragement for presentation of his work at national and international conferences and proper incentives and rewards for his achievements. Similarly, the budding engineering undergraduate students must be motivated by all academic encouragement and possible financial support to sincerely carry out good projects. Only then, an Institution can succeed in building up a sustainable research culture and project its image and visibility at the global level.

Reference

1. B.S. Samaga, "Introducing Flexibility in Technical Education", Journal of Technical and Vocational Education, Issue 18, T.T.T.I (Chennai), pp 29-31, 2001.