THE PLACE OF TEACHING IN THE PROFESSIONAL RESPONSIBILITES OF ENGINEERING FACULTY MEMBERS

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1. INTRODUCTION

Engineering teachers essentially practise two professions : engineering and teaching. It is noteworthy that the majority of engineering teachers consider themselves first as teachers and only then as engineers. (This is to be contrasted with the preference of most students to work in industry, and avoid a teaching career). They often prefer to teach subjects of a theoretical nature, and avoid those dealing with current practices in technology.

2. THE MULTIPLE ROLES OF ENGINEERING FACULTY

Even though not stated explicitly, the faculty members are expected to engage in the following activities :

- instructional activities : in the class-room, laboratory : development of teaching resource materials; setting and grading examination and test papers.
- academic research : personal research; supervision of student projects at the B.Tech., M.Tech., Ph.D levels; preparation of papers for presentation / publication ; publication of text books and monographs.
- sponsored research : including preparation of proposals, reports, and administrative work connected with it.
- consultancy : interaction with industry through consultancy assignments, which serves to inject realism and relevance into the teaching and research activities of the faculty.
- curriculum development activities : in response to the rapidly expanding frontiers of knowledge and the changing needs of industry and students.
- student services.
- administration
- professional activities

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- continuing education activities

It is reasonable to assume that not all faculty members would be involved in all of the above activities. However, a reasonably productive faculty member must show evidence of involvement in most of these activities over a period of 3 to 5 years. It is also to be remembered that the faculty task profiles are a function of several factors, including the type and goals of the institution, academic rank etc.

3. THE ASSESSMENT OF THE TEACHING FUNCTION

Although this is not very common in our country, the evaluation of teachers by students is practised extensively, particularly in engineering education, in the developed countries. It is of relevance to us in the context of current trends toward recovering the full costs of education from the students, and the concept of student as a consumer.

One of the most difficult problems of higher education is concerned with the evaluation of the effectiveness of teaching. Teaching is an important component of education, and may be concisely described as a complex process involving the selection of ideas (concepts, values, skills), and the planning of experiences designed to foster mastery of these ideas in the pupils exposed to the educational process. There are several sensitive issues and questions that need to be resolved before teacher evaluation becomes as universal as student evaluation.

Historically, the first formal rating of teachers by students was conducted in the 1920s at the University of Washington. Most of the earlier ratings were of a private nature, confidential to the rated teacher only. However, the results were subsequently published as "anit-calendars"; actually, these complemented the official calendars, giving description of teachers and courses from the students' point of view. In the 50's and 60's, the number of colleges undertaking teacher evaluation grew exponentially in the U.S. Today it is almost universally used in all U.S. Universities.

Since it is not possible to evaluate any object or function without first defining the nature and function of that which is to be evaluated, it is necessary to specify the functions of instruction. One study lists the following six as the functions of instruction :

- To motivate the student
- To demonstrate to the student just what is expected of him.
- To select appropriate practice tasks which are extensive and meaningful.
- To provide the student with some satisfaction in his progress.
- To organize the material so that the cumulative significance of learning is readily apparent to the student.
- To provide the learner with high standards of performance and means for judging his performance.

If these six functions are accepted as describing the obligations of university teaching, the evaluation of instruction can proceed by an examination of the extent to which the functions are

fulfilled. One approach involves an examination of the process; the other, an examination of the results of instruction.

Much of the ineffectiveness of rating methods lies in the selection of criteria. Some traits are amenable to rating; others are not. Examples of the former are efficiency, scholarship, perseverance, and leadership, while such traits as kindness, tact, and selfishness are not amenable to rating. From a study of student ratings of faculty, Smalrized and Remmers isolated two factors of teacher effectiveness; empathy which included such traits as a liberal attitude, fairness in grading, attractive personal appearance, and a tolerant, sympathetic attitude toward students; and professional maturity, which included self-reliance, effective presentation of subject-matter and confidence.

There are many arguments for and against Teacher Evaluation. In spite of a lot of romantic ideas to the contrary, learning is not always a pleasant experience. It is often hard work, especially at the college level, and it can be disturbing. In all fairness to teachers, compulsory courses and unpopular or difficult subjects should not be reckoned in teacher evaluation. A teacher taking a freshman class, filled with students taking it because they have to, is obviously at a disadvantage when compared with a teacher teaching an advanced course to students who have chosen it as an elective.

Opponents of student rating normally list one of the following objections to the use of student opinion as a means of evaluating the effectiveness of teaching :

- Students are not competent to judge the merit of either the process or the results of teaching. They judge what the instructor does rather than what he gets the student to do. They cannot appreciate a good teacher who, like a good physician, makes himself unnecessary as early as possible.
- It is a democratic fallacy that teaching is best which pleases the majority.
- Students are immature, superficial, mistaken and prejudiced. They are not only inclined to make snap judgements, but in general their judgements are unreliable.
- The validity and reliability of student judgement may be affected and distorted by a variety of factors, among them : grades, fondness or dislike of teachers ('halo effect'), the student's interest in the subject, the amount of work-load imposed by the teacher, difficulty of the subject, pre-established reputation of the teacher, and lack of seriousness in carrying out the ratings.
- Student ratings tend to disrupt the morale of the faculty. Teachers may attempt to cater to adverse student opinion through out-of-class activities at the expense of the quality of teaching within the class-room and the laboratory.
- Student ratings tend to have a disruptive effect on the morale of students. There is the danger that students may acquire the feeling that they are the judges of the worth of teachers, curriculum and

course-content.

The following arguments are commonly advanced in favour of the use of ratings and student opinion :

- The educational process is in essence democratic, and the use of student opinion makes possible a wholesome kind of co-operative effort to improve the learning situation.
- Any acceptable theory of learning stresses the importance of the learner's attitudes. It is, therefore, important to learn what these attitudes are and to adjust the educational process to the attitudes or to change the attitudes in conformity with more valid criteria.
- Students alone observe the teaching process day after day. For that reason, the information acquired through systematic collection of their opinion is unique.
- Since student opinion in the form of gossip influences students, teachers, and administrators, regardless of any form of teacher rating, it would be wise to admit the fact and to capitalize fully on its value. The views of the students may be prejudiced, mistaken, superficial, immature, but whatever their validity, they exit and exert a powerful influence on the effectiveness of the course.
- Analysis of student opinion often calls attention to undesirable attitudes, methods of instruction, course of study, teacher personality, etc. of which the teachers themselves are unaware.
- Student opinion systematically collected might open the eyes of the administrator to a situation in his department or institution not readily discovered in any other way. As a result it may lead to remedial measures.
- Student opinion provides a quick, economical and easy means of evaluating teaching.
- A rating programme in which students participate tends to increase the interest of the teaching staff in teaching problems.

A frequently expressed fear is that students will only rate a teacher highly if he rates them highly, and that many students will give a teacher a bad mark out of spite and resentment at the low marks he has given them. The standard reply to this criticism is the citation of data which supposedly demonstrate that grades do not influence student ratings of instructors. However, Rodin and Rodin feel that although extensively cited, these data do not in fact support this conclusion. They also obtained in their study a negative correlation between the amount learned from an instructor and the students' evaluation of his teaching performance. This is tantamount to saying that 'students rate most highly instructors from whom they learn least'! One possible explanation might be that perhaps students resent instructors who force them to work too hard and to learn more than they wish. It may be that as students learn more they become better able to detect the weaknesses of their instructors. Rodin and Rodin also found evidence that student evaluations tend

to reflect the personal and social qualities of an instructor, 'who he is' rather than 'what he does'. They conclude that students are less than perfect judges of teaching effectiveness if the latter is measured by how much they have learned. Another study has shown that as the students matured, their judgement became less affected by their teacher's judgement of them.

In summary, whether or not the rating scales can be legitimately used as a just and objective measure of the worth of a man as a teacher, its value as a mirror of student reactions is unquestioned. Rating scales, if properly used and sensibly interpreted, give information that cannot be obtained in any other way. Although a single student may be prejudiced in one way or another, the testimony of an entire group is both reliable and valid.

4. DEVELOPMENT PROGRAMMES FOR ENGINEERING FACULTY

One of the most important factors determining the quality of engineering education is the quality and attitudes of the faculty. The development of a competent engineering teacher is a complex process, and requires detailed planning and unwavering commitment. Engineering is a profession and can only be taught effectively by faculty who have experience of the functions and responsibilities of professional engineers.

Selection and retention of qualified teaching staff are central to this. Effective development of an engineering teacher is a long process that comprises several stages Unfortunately, the process is often limited to the acquisition of a research-oriented doctorate. Such important elements as practical experience and pedagogical training are frequently omitted. Both the individual and the institution should formulate plans, establish clearly the role the individual has to play in the institution's plan and then review developments periodically for progress and possible modification.

It is currently estimated that about 30 % of teaching positions are vacant in engineering institutions, whereas there is widespread unemployment of certain qualified/trained personnel. If the best of the crop shies away from teaching, how can we hope to deliver high-quality education? If we want to make teaching in engineering institutions an attractive profession, it is imperative that the overall image of the faculty is enhanced in the eyes in the society. The significance of their role in national development must be abundantly recognized, and they must be actively involved in the determination of policies and decisions concerning technical education at the highest level.

In order to be effective, the faculty need to have continuous co-operative linkages with industries and government agencies and research laboratories through consultancy and sponsored research.

5. THE ROLE OF EDUCATIONAL TECHNOLOGY

Educational Technology or Instructional Technology is based on the belief that technology, properly supported and widely employed, could help meet some of the nation's most pressing educational needs. The stress must not, however, be on technology, but on learning. The heart of education is the

student learning, and the value of any technology used in education must therefore be measured by its capacity to improve learning.

Technological media enable the adaptability of the educational process to the individual student's differences in pace, temperament, background, and style of learning. These media can perform many of the following functions involved in the educational process.

- They can store information until it is needed or wanted ;
- They can distribute it over distances to reach the student where he happens to be, instead of bringing him to the teacher;
- They can present the information to the student through various senses and in many modes;
- They can give the student the opportunity to react to the material and respond in many ways.

In short, the student's opportunities for learning can be increased and enhanced by using a wide range of instructional technology. All the available resources for instruction, including the teacher, can work together to create conditions for maximum effective learning.

The outlook for future must recognize the tremendous potential possessed by modern instructional technology for enhancing the effectiveness of student learning. However, instead of continuing to let the machine do only what the teacher cannot do, we should ask ourselves what it is the teacher should do that the machine can not do.

In spite of all the merits claimed by proponents of educational technology, it has not become as prevalent, because of several mistakes committed in its implementation, and also because of the human belief that almost everyone favours change as long as the change is for someone else. It must be admitted, however, that regardless of the excitement generated by new developments in educational technology, many of the most important questions about education remain unanswered. As has been said, we have "new chips, but old problems". It appears that development of technology is easily outpacing the development of educational know-how. In higher education, at least, it is believed that faculty will continue to teach advanced undergraduate and graduate courses in the traditional lecture mode, and they will spend more time on research and personal interaction with students.

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