# CHANGING STRATEGIES OF PROFESSIONAL EDUCATION

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## 1. INTRODUCTION

The ultimate purpose of education is learning by students and not teaching by the teachers. However, most often we teachers take full responsibilities of teaching by way of "Covering the Syllabus" within the stipulated time. The teaching-learning environment is mostly teacher centric with students having less important role. They always remain less active in the learning process. The placement of the teacher is at the centre for all the educational activities and he is the decision maker with respect to the speed at which students are required to learn and progress. This may cause the class-room activities to be out of phase with the learning activities that are performed by individual students.

Further, strictly syllabus oriented lecture based teaching where the teachers repeat the matter already available in text books does not motivate students much. They prefer to study few days before the examination and maximize their learning on the day of the examination. When teaching is merely a package of information devoid of much inspiration, the students find their minds being "loaded".

For using motivating methods of teaching and learning there is need to innovate and experiment on teaching-learning methods.

In this article a few suggestions have been made as to how innovative teaching-learning can be introduced through curriculum design and delivery so as to bring in variety, improve students motivation in learning, and make curriculum implementation more efficient and effective.

## 2. INNOVATIONS IN CURRICULUM DESIGN

For design of a new curriculum, a set procedure has been established and are being practiced through out the world. In such a curriculum, Physics, Mathematics, Chemistry, English etc. are taught followed by study of Core Subjects and then the Applied Engineering Subjects.

Further, the teachers and students get a copy of the syllabus (only a part of the curriculum) which they use for teaching and learning. The basic objectives of study of a subject, its relationship with other subjects, etc. are not clearly understood by the teachers as also by the students.

In the implementation of curriculum, theory teaching assumes more importance than the practical work. This makes learning less interesting for the students. All these and a few more observations, forces us to think of making innovations in Curriculum Design, some of which are briefly described as follows

### *2.1 Innovations in curriculum Design in reducing Long Wait for Engineering*

Although the traditional way of Curriculum Design seems logical in terms of developing in

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students the basic knowledge of science and foundation subjects and the mathematical and logical capabilities, the major drawback is that the students do not see or feel the real joy of engineering which they have come to experience in the engineering colleges. In classes, to start with they get mostly the science and mathematics teachers who teach and judge students quite differently from the realities of engineering. Further, for the basic engineering subjects also, most often, the junior teachers are sent to the classes who due to their lack of experience are not able to inspire the students. First two years of study in engineering colleges, therefore, remains a somewhat frustrating phase of students professional academic life. Thus, there is need of designing a curriculum which combines both logical and psychological approaches to students motivation in learning.

### 2.2 Converting the syllabus into set of competency based learning objectives

In addition to the syllabus, both teachers and students may be provided with the set of competencies that are expected to be acquired by the students. The competency statements will clearly indicate the "Learning Outcome" which will involve integration of knowledge, skill, and attitude. The responsibility of acquiring these competencies will lie on the students if they are made to realize their need. The student evaluation through continuous assessment procedure and the pattern of university examination will also be changed. If this is done, progressive institutions can take initiatives in this direction and experiment on a pilot basis.

### 2.3 Theory followed by Practice or Practice followed by Theory?

It is often said that practice is more motivating than learning of theory. Guided practice followed by study of relevant theory is assumed to be more motivating than the traditional method of course design and delivery. Why then, we are not changing?

Experimentation can be designed and tried out to make comparative study in terms of student motivation, time for learning, retentivity in learning, students initiative in learning vis-a-vis teachers role, etc,

### 2.4 Project method of Curriculum Design

The whole of the curriculum can be translated in terms of tasks to be performed by students and mini projects completed in groups. The relevant subjects of study could be taken up as self study exercises with enrichment lectures. Factors influencing students learning and their acquisition of job related skills can be studied.

### 2.5 Project based Curriculum Design

Students may be awarded degree after 4 years of study on completion of a project sponsored by the employers. Subjects are studied as requirements of working in the project. One example is Degree in Mechatronics. Here the students would design a robot as per the specifications given by the industry. They would study subjects like strength of materials, engineering mechanics, electronics, electrical drives, control systems, computer simulations, communication skills, basic mathematics, performance analysis, testing methods, etc as a requirement (need based learning). These subjects will be distributed in the curriculum of first year to fourth year.

### 2.6 Integrate in the curriculum scope for building personal set of competencies to match mployment requirements

It is often observed that students keep only minimum percentage of attendance in the classes conducted by the engineering colleges and find time for attending professional courses which will improve their "skill-set" for future employment. They even think that subjects offered by the engineering colleges need to be studied to secure a minimum percentage of marks say a 'first class' and rest of the energy

be devoted in acquiring skills and competencies required for better employment. The challenge to Engineering Colleges and Universities are therefore to create a curriculum which will respond to the students needs.

### *2.7 Education and Training To Do Things Right or Do Right Things*

A conventional curriculum does not include anything on "technology strategic planning" to equip future engineers to lead a company to be more competitive. Technical education is narrowly technical rather than broadly holistic. The leadership responsibility is mainly provided by MBAs, Lawyers, Financiers, IAS officers and others although engineers are the perfect professionals to serve as advisers.

The concept of developing a curriculum which integrates engineering and management skills or engineering with business know-how is, therefore, important.

Autonomous deemed to be universities and full fledged universities can experiment on developing integrated curriculum leading to award of dual degrees like BE+MBA, BE+B.Com, BE+LLB, etc.

### *2.8 Development of a holistic engineering education*

We produce many engineering scientists rather than engineers. Like other science subjects which are analysis-oriented, engineering curriculum has also become quite analytically oriented. A real engineer is one who can integrate i.e. put things together rather than take things apart as in analysis. The design of curriculum should be such that it teaches students to take a holistic view of engineering. The components of such an integrative model will include experiential learning, lateral thinking, skill of synthesis, facing the uncertainty or the unknown, formulating problems, implementing ideas, team work, professional ethics, functional engineering, design for customers, science of improvement., flexible manufacturing, etc.

### *2.9 Development of an Inverted Curriculum*

Experiments could be made to offer an "inverted curriculum"' where engineering subjects are brought earlier to be taught in first and second year of the engineering course in order to keep students interest in engineering study high and to provide rationale for the study of mathematics and science which otherwise dominates first two years of engineering study.

### *2.10 Need based teaching of mathematics and science subjects*

An innovative curriculum may be developed to create a just-in-time (JIT) coordination of Mathematics and Science teaching with engineering courses where knowledge and understanding of mathematics and science is required.

### *2.11 Development of Higher order cognitive skills*

A curriculum may be designed so as to include engineering design and problem solving throughout the entire course. Here, from the very first year students will be confronted with problem solving and design exercises (from simple to complex) so that the students are trained for higher order cognitive abilities like ability of analysis, synthesis, and decision making.

## 3 INNOVATIONS IN CURRICULUM IMPLEMENTATION

A well designed curriculum often fails to produce desired results due to poor implementation. The curriculum and course contents properly in place, we need teachers who can do justice in producing excitement in students for learning. It is assumed that holding Ph.D degree should be good enough to do good teaching for engineering college and university teachers. In view of the changes in the student characteristics, backgrounds and the complexity of material being taught nowadays, the above perception needs to be revised since

teachers are to play key role in creating desirable changes in the curriculum implementation process. This section highlights some of the innovations that can be tried in curriculum implementation process.

### *3.1 Integrating Innovation, Research, Development and Teaching*

Teaching alone can no longer be a satisfying job for professional teachers either intellectually or in terms of professional status. To attract and retain good teachers opportunities for research, development, consultancy should be provided which not only would satisfy the teachers but also would enrich their teaching. We need to develop an "integration model" where all these could be combined without sacrificing good teaching.

### *3.2 Improving the Quality and Relevance of Laboratory Work*

An analysis of experiments performed by students in the laboratories will show that most of them are of verification type or repetitive type. These are felt boring exercises by most of the students. Although verifying type experimentation may be required to enrich understandings, of the relevant theory, a balance of verification type and open-ended, design oriented experimentation throughout the course is desirable. Emphasis on design of own experimental setups can also motivate both students and teachers by incorporating some type of reward systems. The students will develop the ability to design and conduct experiments, as well as analyze and interpret data which are considered as essential real life skills.

### *3.3 improving Assignments to be given to students*

The purpose of giving assignments to students after teaching a particular topic through lectures is to help them understand the topics better through solving a few related numerical problems or by formulating answers to questions framed by the teachers by consulting various learning resources.

The timely feedback provided to students for their completing assignments works as reinforcers and further motivation in working on assignments.

Most often teacher gives the same set of assignments to all the students due to which it has been observed that students often copy from each other. Only the good students do the work while others try to copy. Further, an average and below average student cannot gain much from this exercise. Further, timely going through the students work and providing constructive suggestions on their files becomes difficult for the teachers.

Development of graded assignments, which will generate thinking and creation of computer assisted assignments for individual students and provision for on-line feedback mechanism could be tried out for the benefit of students of all levels.

### *3.4 Innovation in Student Evaluation*

The way the teachers teach and the way the students study vastly depends upon the student evaluation system. The quality of question papers used for formative evaluation as also for end of semester examinations need to be improved. The examination system must aim at evaluating students for their achieving higher order intellectual abilities. In fact, evaluation of students must be made competency based. A gradual change in the system can be bought about by making use of 'Trend setter' question papers.

## 4. CONCLUSION

Over the years we have not made much change in the way curriculum is designed and is implemented. If we want to 'inform' as also 'inspire' students and make learning real joy, innovation is the key to success. This article has provided a few suggestive projects, which the universities, colleges, and teachers can take up and experiment with, on proto- type basis. The teachers can take up innovations in many

other areas like "how to develop communical skills in students as an integral part of curriculum implementation", "how to design experiential learning by students rather than their passive listening in the class", "how to provide ample opportunities for practicing new skills", etc.

Innovative curriculum design and changing strategies of implementation will alter the total academic climate of an institute. The teachers and students in the campus of the institute will gradually create a 'learning society' rather than remaining satisfied working in a traditional teaching institute.

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**Incubation:** This involves incubation of the project based on the selected idea, wherein it will get an opportunity to evolve and develop the value proposition and transform it into a fundable enterprise. The institute will provide sustenance to each team member and invest a seed capital to the tune of Rs.20 lacs in the project.

**Growth:** The next phase is the spin-off of the project as a start up company, with the project team holding 80% equity. The incubation centre will be continuously involved in providing it with opportunities for strategic networking, reality checks, and exploring new horizons.

The surprising results are a great cause for concern. Any economy cannot survive only on certain sectors. As per the report by CNBC TV 18, today 60% of the GDP contribution comes from the urban area and only 40% comes from the rural areas. This is in stark contrast to the data in the 1980s where rural India contributed 85% to the GDP. This was largely due to the agrarian economy. We must understand the fact that even if today's economic growth is largely due to service sector, it cannot be sustained over a long period without development in other sectors too. This prompts us that creation of jobs in other sectors too has become of prime importance. This also means that unless and until entrepreneurship is not encouraged in other sectors, creation of jobs will be a difficult task. We should always ask one question. Why do we want to be a brilliant glorified technical operator instead of being a self motivated, self supported entrepreneur?

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