

# Engineering Education in India: The Malady and the Remedy



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## 1. PREAMBLE

Where is Engineering Education going in India? Does it move in the right direction? Why is it that a study by Aspiring Minds [July 2016] reveals that only 7% of all Engineering Graduates are employable? What happened to the erstwhile pride, prestige, prerogative and popularity of pursuing Engineering Degree Programmes? Are we taking steps to reverse the degradation that occurred in the past 2 decades? This article attempts to analyze the causes leading to despair in Engineering Education and suggests some remedial measures to be urgently implemented to save Engineering Education in India and redeem the lives of the young Engineering Graduates, numbering 1.5 million per annum.

## 2. THE GENESIS OF THE MALADY

The rot begins in primary education. The all-pass rule up to VIII Std. has become a convenient excuse for teachers and the taught to stop learning. This rule has caused havoc and irreparable damage to the young pupils; it has enabled them to move up to IX Std. without knowing even alphabets of English and the local language. Proficiency in languages and skill in mathematics have taken a severe beating. We have many graduates who cannot even write their names or degrees correctly. They have neither a grasp of mathematical concepts nor a grip in grammar, as they enter IX Standard! To add to the malady, many schools do not teach IX and XI Std. syllabus, as there are no Board exams, but teach X and XII Std. syllabus twice instead. This malpractice deprives the pupils of fundamental knowledge and leads to the memorizing of the subjects, including mathematics! In the matriculation exams, the question papers are diluted to pass all candidates with only memory and no real knowledge, critical thinking or practical application of knowledge.

Less than 10% of the schools train their pupils in soft skills, which are so important for employability. As the entrance exam for entering Engineering Education has also been conveniently dropped in many states including Tamilnadu, the students admitted into Engineering Colleges are not prepared for the pursuit of Engineering Education. They neither know languages well nor the rudiments of mathematics!

How could Engineering Education, that is characteristically mathematics based, be imparted to them in English? Such despicable conditions prevailing across the country reduce the quality of the input to Engineering Education and therefore adversely affect the quality of the output [Engineering Graduates].

## 3. THE TEACHING & LEARNING PROCESS IN ENGINEERING COLLEGES

As a student enters I BE/BTech in an Engineering College, he is at a loss to understand what goes on. Many students ask the teachers to teach in the local language, as English is not understood. It is a pity that many students coming from the so called English medium schools also do not understand English! The teachers generally yield to such requests, as many of them are also poor in English! The result is disastrous; till final year [BE/BTech], the skill in English language is not honed and they become unemployable!

The lab experiments in Physics and Chemistry form part of the curriculum in X and XII Stds. The lab classes are seldom conducted properly, but in the final exam every candidate is passed with a high score [49 or 50 out of 50!]. With this poor training and false marks, as they enter Engineering Colleges, the miserable trend continues! Most students are not interested in understanding the experiments, as here also they are passed with high percentage, in spite of absence of practical skills. The practical training that is very important for a successful engineer, is ignored.

Final year projects are introduced in the curriculum to encourage hands-on training, practical skills, trouble shooting skills and innovation. Most companies question the candidates in the job interviews about the final

year projects. Project exams have also been diluted and all the above purposes defeated, by passing every student with high percentage of marks, in spite of their ignorance about their own projects.

Tagore said, “Where the mind is led forward by Thee into ever widening thought and action (theory and practice), Into that heaven of freedom, my Father, let my country awake!” A philosopher seems to know the principles of Engineering Education, more than our politicians and the ever subservient academicians! This is in consonance with the idea of Plato, who said 2500 years ago, that only philosophers are fit to rule a country; if the rulers are not philosophers, they should be trained as philosophers, for the welfare of the country, he said.

Many Engineering Colleges (nearly 40% of the 656 ECs in Tamilnadu) do not conduct the lab classes at all! So we get ECE I Class graduates who cannot handle an oscilloscope; CSE I Class graduates who cannot write a programme in C++ ; EEE I Class graduates who are unaware of solid state drives and Civil I Class graduates who cannot distinguish between different types of foundation! Many universities in India have the practice of adding grace marks in written exams to fictitiously boost the pass percentage. The students pass in exams and fail in life! For example, Anna University in Tamilnadu adds 30 to 40% marks in most analytical subjects to boost pass percentage! It is difficult to find such malpractices elsewhere in the world! No wonder that the Engineering Graduates in India become unemployable. Is there any other country in the world where 93% of the Engineering Graduates are wasted every year? However, the Indian students are very intelligent and trainable. The educational system is at fault.

When the AICTE insisted on ME/MTech qualification for teaching in Engineering Colleges, these were obtained without even attending any ME/MTech class, due to a nexus between the ECs and the Universities! Such candidates with no knowledge or skill developed at the BE/BTech or at the ME/MTech level, are now masquerading as great teachers in ECs! Most managements of ECs have only a mercenary approach and are least bothered about releasing unemployable Engineering Graduates every year into the job market, causing several serious social problems. The erstwhile CM of Tamilnadu, Honourable C N Annadurai, once said: “Unemployed graduates are on every roadside, with their minds full of sinister designs, indicating for the future, ominous signs!” This is already happening now; many unemployable graduates, including engineering graduates, are indulging in every type of criminal activity.

#### 4. WHAT ARE SCIENCE, ENGINEERING AND TECHNOLOGY?

There is a widespread lack of understanding of the terms Science, Engineering and Technology. Science is the origin and the elixir of knowledge. It contributes to fundamental knowledge, the truth. Engineering is the analysis, design and the synthesis of the postulates in science, to benefit mankind. This needs analytical skills, design skills, mathematical modelling of physical tools, and skills of interpretation of test results. Technology is to develop tools using engineering skills and theoretical concepts, to manufacture the tools and to use them for ‘the onward march of the human race’. What makes a wholesome engineer? Only the expertise in science, engineering and technology together can bring about a wholesome engineer. We have several comparative sets of activities that work if they are together and fail if separated:

|            |             |             |
|------------|-------------|-------------|
| Science    | Engineering | Technology  |
| Lecture    | Tutorial    | Practical   |
| Goal       | Team        | Product     |
| Truth      | Thought     | Action      |
| Literature | Music       | Dance/Drama |
| Meditation | Yoga        | Medicine    |
| Man        | Woman       | Children    |

Without practising practicals and effective tutorials combined with inspiring lectures instituting fundamental concepts and truths, it is impossible to bring out wholesome employable engineers.

#### 5. SUGGESTED REMEDIAL MEASURES

1. The draconian ‘All Pass Rule’ should be scrapped from the primary and secondary schools. This has led to unwritten ‘All Pass Rule’ in Engineering Colleges for practicals and projects.
2. Languages and Mathematics should be taught by well trained teachers in schools, inspiring and creating interest in the minds of the pupils.
3. Practical exams should begin in schools and taught well; the practical exams must be conducted strictly, permitting failures.

4. There must be an Entrance Examination for entry into Engineering Colleges; it should include testing of English as well. Candidates scoring less than 40% in the Entrance Examination should be disqualified for admission into ECs. This is being implemented in Kerala State already.
5. The grace marks should be abolished in all exams of Engineering Colleges, as suggested by the T S R Subramaniam Committee framing the National Policy on Education.
6. The engineering students should not only pass their university examinations, but should also pass the GATE Exam conducted by the IITs before they are conferred the BE/BTech degrees. This will ensure quality and uniformity in the engineering degrees across the country. Steps should be taken to protect and endure the credibility of the GATE Examination system.
7. Education must continue in the concurrent list, to have a check and balance.
8. Enough funds, about 6% of GDP, should be allotted to education, with effective monitoring of its utilization.
9. 'Teachers in ECs must undergo frequent training to give effective teaching and to inspire students; this is the respect to be given to students; every student should be respected', says the new VC of B S Abdur Rahman University, Chennai, Dr. Sahol Hamid Bin Abu Bakar, hailing from Malaysia. Given the poor background of the teachers, the frequent training becomes the desideratum of the day.
10. Who are the real Teachers?  
 "Those who fondly care,  
 For the students' own welfare,  
 Who can teach with flair,  
 And inspire beyond compare,  
 Are real Teachers, but rare;  
 Others, not becoming, beware!"

## 6. CASE STUDIES

A III BTech Computer Science female student from IIT, Mumbai was taken as an intern in 2015 July to work in Facebook, California. She made innovation in data collection within 2 months to the pleasant surprise of the Facebook engineers. She was asked to join Facebook on completion of her BTech degree; the salary offered was Rs. 2.1 Crore/annum!

A III BS Computer Engineering student by name Mithun from the University of Illinois at Urbana Champaign [having a sprawling 1783 acre campus with 33,368 UG students and ranking 44] worked as an intern in July-Aug 2015 at INTUIT Corporation, California. He developed a new Mobile App in a short time and was offered a job at \$100,000/ annum. After completing his IV year BS, he joined CISCO at about \$150,000/annum. Such is the demand for practical skills and new designs.

When I visited Arasan Ganesan Polytechnic, Sivakasi in 2014, the Principal Mr Nandakumar claimed that all their students get placed in Gulf countries, although they enter the Polytechnic after X Std. almost as illiterates! The secret is in giving them practical skills for all the 3 years in their Diploma Course.

## 7. CONCLUSION

The above case studies emphasize the importance of training in practicals and developing an attitude for practical application and innovative designs of new products. Communication skills, fundamental concepts and analytical skills are equally important for employability. The Government of India is now planning to close down Colleges and Universities that are not functioning effectively. The MHRD plans to divide them into 3 categories, as per their merit. The top category will get more autonomy and funding; the second category will be counselled to improve; the third category will be counselled and given a deadline to improve; if not, they will be closed down.

It is hoped such steps would be implemented without fear or favour, soon. The Indian youth are having a very high IQ and great potential for growth. They should be honed dexterously and empowered by a proper system of education and training for the prosperity of the country.

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**British Airways starts scanning faces for faster boarding:** British Airways has started rolling out a facial recognition technology at its London Heathrow Airport to allow passengers to go through boarding gates faster. The biometric devices at the airport's main security screening area capture a traveller's features and boarding pass, after which a facial scan at the gate allows them to board the plane without showing documents.