

Innovations in engineering and technology and the need for innovative curriculum and syllabi revision

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Opening Address

ABSTRACT: Engineering and technology education has always been a challenge for policy makers and institution builders. There are gaps between what is needed and what is taught. Complaints about student quality pour in constantly from industry and the gap is expanding continuously due to new inventions and innovations. In fact, there is a group working to bridge the gap. Science and technology advancement is galloping at a faster speed than the curriculum and syllabus revision. Obsolescence is increasing in every field at every level. This has an impact on stakeholders such as the policy makers, institution builders and the teachers who facilitate higher education, particularly technical education. This paper elaborates on aspects of this problem and on the expected role of these stakeholders about their present role and expected role in technical education in order to bridge this gap.

INTRODUCTION

Policy makers in higher education, and in particular technical education, are normally highly qualified persons, but with out-dated knowledge on current affairs in higher education and on the specifics of technical education. Policy makers are usually people who are outside the academic environment. The academic environment can be defined as the place that teachers, students and researchers conglomerate. These three groups mingle with each other and their interactions will be mainly on academic matters such as course contents, innovations and inventions [1][2].

These interactions will be effective only if there is research and development on the campus. The more research and development there is, the more will be the interactions and knowledge transfer amongst the members of the group. To sum up, one can say that the quality of students, researchers and academic teachers will improve. In such an atmosphere, the policy makers have no role and, hence, the policies framed by such groups are mostly far from reality [3-5].

Policy makers can guide institutions in order to achieve greater funding and improved infrastructure. They can also guide the institution so it has good land and buildings. However, they cannot identify the right kind of leaders to lead the institution in academic matters. To define the right kind of leaders, one can list several attributes a good leader should have. He or she:

- should be a good manager;
- should be a good administrator;
- should be highly educated;
- should be highly interactive with all stakeholders of the institution;
- should have the leadership quality to lead the academics cohesively and have interactions with international universities and R&D institutions for forging ties in order to promote research within the campus;
- should be a person to build an image of the institution across the city, state, the country and the globe;
- should be a representative of the institution;
- should promote interactions between the academic teachers, students and researchers apart from the stakeholders who have a say in the development of the institution.

Research means original research to find the unknown and discover the hidden, and devise new techniques and technologies apart from publishing research papers in reputed refereed international journals. He or she should:

- shoulder responsibility for initiating conferences within the institution;

- look into the welfare of the staff and students of the institution;
- integrate students from variety of backgrounds through cultural arrangements;
- promote discipline and character;
- move the university faster on a progressive path;
- ensure that the students receive the most up-to-date education on the campus.

Apart from all the above, he or she should be IT savvy.

The policy makers must be able to identify such a person as the head of the institution to achieve state of the art education for the students. The policy makers must have trust in the academic head, while academic and administrative matters are being reformed. The administrative head of a higher technical institution needs to understand the dynamics of a floating educational system. He or she must accept responsibility to provide the necessary infrastructure for the courses being offered by the institution and ensure that there is good academic backup for academic staff, students and researchers.

Such heads of institutions have particular problems in maintaining adequate infrastructure to cope with international standards and to be in tune with the market and industry standards. Technology is changing fast with inventions and innovations in both science and engineering and, hence, the expectations of the market, industry and other stakeholders also vary correspondingly.

The introduction of the Internet into the system provides information on the developments in science, engineering and technology on a minute-by-minute basis. Hence, academic heads are perplexed because they have to deal with new technologies, and administer the whole educational system with ageing academics who may not have been adequately exposed to computers and the Internet. These older academics might not be sufficiently exposed to current developments in the field. It might look as if this is a transition.

Unfortunately, all of us have entered an era where the technology and developments will continue to change and perhaps the rate of change will increase every year. Perhaps this rate of change will also change every month in the coming times since innumerable inventions are on the way and, hence, the teaching-learning process keeps redefining them. Accepting that change is a constant, it is essential that heads of institutions devise mechanisms to update the syllabi and restructure the curriculum in tune with international best practice and in tune with best academic institutions in the world.

There is a rule of thumb that academic institutions offer only 20% of what an ideal engineer needs to become 100% engineer. The remaining 80% is being absorbed by the individual while in training, and from society. In the present scenario, both the 20% and the 80% are changing rapidly and, hence, it is difficult to define and keep the same curriculum for many years. In the present scenario, if a student is admitted to a professional course, he or she has to undertake the course with the same curriculum and syllabus for four years.

By the time he or she passes through the institution, the syllabus is four years old. As all will be aware, in a period of four years, many developments can occur and, hence, invariably, the student comes out of the institution with an out-dated syllabus. This is a common phenomenon in higher education institutions around the world. This is where the gap exists between what is offered by the institution and what is expected by industry. In addition to the above, information technology is creating a further gap between the two, which one can call the digital divide.

Since the role of the invasion of the Internet is not limited to the syllabus, the gap widens even further. In the case of academic teachers who are teaching, the courses might not have been updated with the latest advancements in the field. The techniques of offering the developments have also been taken to a new dimension. Therefore, academic teachers cannot continue to use the same chalk and talk method if they have to deliver all the developments in the field.

Furthermore, time availability in the classroom has been reduced to a minimum and, so the teacher cannot use the conventional techniques to transfer the entire updated knowledge to the student. The teacher has to familiarise himself or herself with the techniques and technology to be employed in order to deliver the updated knowledge.

This is called *Class-Room Engineering*. Through this medium, the academic teacher will have enhanced his/her teaching skill and delivered a lot more information to the student in a shorter period. One has to realise that the student is no longer the same as the ones we became accustomed to in the 1990s and 2000s. Their reception quotient has increased considerably because of multiple channel television and multi-functional cell phones. Therefore, it is essential that *Class-Room Engineering* is implemented in all classrooms and the teaching has to be converted into a facilitation process. Moreover, the teachers need to be highly futuristic in order to carry out the task.

CONCLUSION

Starting from the policy makers, heads of institutions to academic teachers, the educational process has to be highly dynamic in order to incorporate new developments into the educational process effectively and continuously, and

ensure a one-hundred percent delivery of latest knowledge in the respective field to the student, as well as to ensure success to the satisfaction of all.

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