American Journal of Educational Research, 2015, Vol. 3, No. 2, 137-141
Available online at http://pubs.sciepub.com/education/3/2/5

DOI:10.12691/education-3-2-5

Engineering Education in India: Ethics and Stakeholders Perspective

Mohan. V. Buke[1], Santosh. M. Tondare[2,*], Sachin. D. Panchal[2]

[1]Principal, Sandipani Technical Campus Faculty of Engineering, Latur, India
[2]Assistant Professor, Electronics & Telecommunication Dept., Sandipani Technical Campus Faculty of Engineering, Latur, India
*Corresponding author: santoshtondare12@gmail.com

Received January 14, 2015; Revised January 26, 2015; Accepted February 02, 2015

Abstract Rapid and drastic changes in economic growth are creating higher demands for technical educations especially in engineering educations. Engineering education faces significant challenges as it seeks to meet the demands on engineering profession in the 21st century as unemployment, research work and social aspects. To meet these changes & continuous demands i.e. from industry or society, engineering institutes have to upgrade themselves on a continuous basis with quality of education that can prepare students to face and overcome these challenges. The paper presents a review on engineering education and discussion on different stakeholders such as regulators, Management, students, faculty with their expectations, key roles in the development of institute and the students. How all these stakeholders could involve making engineering education more interesting and entrepreneur oriented has also presented. However to comb up with the current technologies, industrial and social needs, engineering students has to ethical where the importance of engineering education with ethical values increases.

Keywords: *engineering education, stakeholders, ethics, institute*

Cite This Article: Mohan. V. Buke, Santosh. M. Tondare, and Sachin. D. Panchal, "Engineering Education in India: Ethics and Stakeholders Perspective." *American Journal of Educational Research*, vol. 3, no. 2 (2015): 137-141. doi: 10.12691/education-3-2-5.

1. Introduction

Engineering is an art of specifying application of scientific, economic, social, practical knowledge in order to invent, design, build, maintain, research and improve structures, devices, machines, material and processes. The discipline of engineering is extremely broad and encompasses a range of more specialized fields of engineering each with a more specific emphasis on particular areas including applied science, engineering and technologies, etc. An array of powerful forces, including demographics, globalization and rapidly evolving technologies, increasing demand of power resources is driving profound changes in the role of engineering in society. The changing technologies needs of a global knowledge economy which challenges the nature of the engineering practices, demanding for broadcast skills than simply the mastery of scientific and disciplines [1]. The modern engineering profession deals constantly with uncertainty of technology, its applications and demands from clients, governments, environmental groups and the general public [2]. However it requires skills in human relations with technical competence while trying to cope with these requirements, today's engineer must cope with continual changes in technology and workplace. This increasing demand in technology and its applications, the need of skillful engineers has been increasing and the basic step involved in this process begins with the students aspiring for these professional courses. However in most of the cases especially in India, it is observed that the selection of engineering courses, institute decisions has been either taken by parents, relatives etc rather considering the interest of students. Even in most of the cases the counter strategy is observed i.e. these all decisions have been taken by students itself viewing to current market trends, future requirements and area of interest. The unprecedented expansion of the higher education system in India has arisen partly because of the substantial growth of engineering education. The number of engineering institutions in India has risen merely 2,388 in 2008-09 to 3,495 in 2012-13 [AICTE 2012-13]. Technical education has always been and continues to be one of the more preferred areas of study with expectations for better career opportunities. During the last two decades, the growing demand for expansion of technical education and the inability of the Government (which traditionally has been establishing and running technical institutions), to meet the social aspirations, has resulted in private initiative to provide the alternatives. In recent years, private registered societies and trusts have established a phenomenally large number of technical institutions. The self financing technical institutions now account for more than two-third of the admissions to engineering colleges. With the increase in number of technical institutes, in absolute numbers technical personnel have increased in the country but still employability is an issue. Finally, excellence mirrors the issue of quality, which stems from various aspects of the engineering education system. Only

about 25 percent of technical graduates are suitable for employment in the offshore IT industry, and 64 percent of employers hiring fresh engineering graduates are only somewhat satisfied or worse with the quality of the new hires. Because of the large number of affiliated colleges, the quality in planning, regulation, and supervision is usually not maintained by the affiliating universities. As a result, curricula are often obsolete; the skills taught are usually not matched with the demand or local needs [3]. This can be changed drastically, only if all the stakeholders should realize their responsibilities and roles like, if the regulators i.e. governing bodies emphasis on the curriculum with additional program conductions to realize students and faculties about the current trends and requirement, timely up gradation in curriculum and monitoring of the individual activity with necessary actions especially in rural areas. Private institution management should commit them to provide necessary resources with adequate quantity that may result in increasing interest of students and faculties in research work. As engineering education is not all about taking degree of four years, it's all about preparing students in every aspects of life as team player, leader, entrepreneur, capability to handle critical issues, problem solving etc. This may possible through ethical teaching at the degree level. However these problems are arising especially in rural areas where technical persons don't have a direct interface - interaction with industry. This paper mainly emphasis on importance of stakeholders in the development of curriculum as well as engineering aspirants, especially in case of private institutions. However we have also presented the expectations of stakeholders from an engineering institute.

The paper is organized as follows, in section 2 we will discuss about engineering ethics and opportunities. Section 3 deals with discussion about stakeholders of an engineering institute that might be governing bodies, students, faculties, society and industries with their perspectives and expectations required in development of education. However conclusions are presented in section 4.

2. Engineering Ethics & Opportunities

Engineering ethics plays a vital role in overall development of an engineering professional that examines & sets the obligations by engineers to society, client and to their professions. As India moves progressively towards becoming a knowledge economy, it becomes increasingly important that the research area of engineering should be improved with a focus on advancement of skills and these skills have to be relevant to the engineering economic environment. Ethics ought not to be neglected in engineering education, but more fundamentals and prerequisite it for students to learn about the social, organizational, political complexities of practices. To accomplish this, a major revolution of engineering education is required one that goes beyond, adding ethics course to the curriculum. That will lead to formation of ethical engineers taking responsibilities, analyzing and implanting them. Even it needs to open up the doors of engineering classrooms to perspectives other than these which see every task & challenges an engineer faces as a problem to be solved as individual [4,5]. Generally engineers works on real time systems, however today's classroom bounded education doesn't provide them the interface with which engineers has to perform in real time. Most of the times engineering professionals have to work in-groups, teams might be small or large size. To complete a specific a specific task, different participant begins with different expertise, ideas, each with their own disciplinary perspectives, their way of abstracting and modeling, as a result each participant in a project has to articulate his or her claims, analysis and proposals so that other those who inhabit others world can establish meaning both with respect to their own perspectives & the project as a whole. During the tenure of engineering education, students are quiet afraid of introducing themselves, their ambitions, area of interest, future plans etc, having a sound technical knowledge with lot of potential especially in suburban areas / rural areas. These realizations will be possible through ethical teaching which may include introducing the needs and expectation of industry, society from engineering students, work culture of industry, creating awareness and importance of all issues and opportunities present globally from day one of engineering education. A code of ethics enables us to set out the ideals and responsibilities of the profession, Improve the profile of the profession, Provide guidance on acceptable conduct [6], Raise awareness and consciousness of issues. As Engineers we are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Hence Engineers must perform their duties that requires adherence to the highest principles of ethical conduct. Figure 1. shows schematics of scope of engineering ethics which may address awareness of rights of engineers, responsibilities being an employee with their roles in development of industry. It may include R&D work beneficiary from industry or social point of view. Ethics lets you know about the current global issues, their impacts on society and responsibilities.

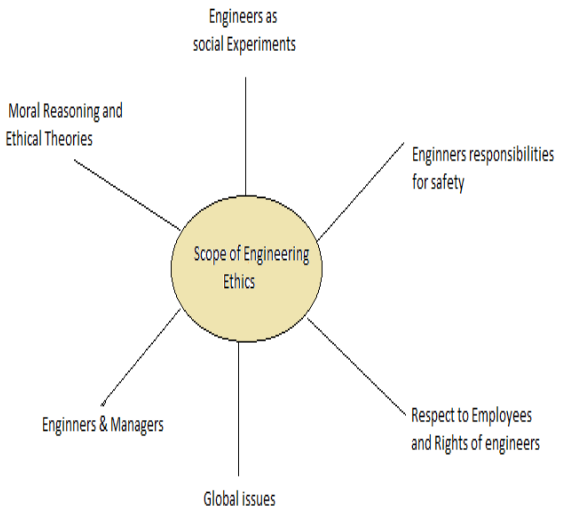

Figure 1. Scope of Engineering Ethics

3. Stakeholders - Engineering Institute

Engineering educational institutes are wellsprings of knowledge playing a central role in the development of

human resources and therefore have to continuously upgrade their institutional policies, facilities and overall structures to meet the demands of changing times [7]. However this overall development will be possible with the help of different stakeholders as presented below. These stakeholders should commit the resources, programs and leadership necessary to enable participation in engineering to achieve a racial, ethical and gender diversity consistent with the Indian population

3.1. Regulators

Engineering education in India is regulated by different governing bodies as university grant commission (UGC) and by all India council of technical education (AICTE). The AICTE has been established as an apex statutory body in 1986 for proper planning & co-ordinate development of technical education system throughout the country. The AICTE is responsible for formulation of norms, standards and their compliance, developing regulatory mechanisms for collaboration with foreign universities and providing support for the growth of industry academia alliance, modernization of academic infrastructure, faculty development [AICTE-13] etc. These governing bodies are the central role player in the development of engineering education in India. Continuously monitoring the aforementioned issues, knowing current status of individual institutes with the students passing and employability ratio, may lead to corrective actions to be taken. Continuous Up gradation in the curriculum activities with current industrial technologies, their expectations is also essential, such that engineering aspirants will able to match up. However AICTE is providing funds for faculty, student development programs knowing the importance in engineering education. The only thing needed is to approach properly.

3.2. Management

By viewing the engineering profession as a service to humanity, the College helps students become responsible, effective members of society. Management the key role player in establishing private institution aims to provide a quality education to each and every individual in first tier, second tier and third tier cities. As it is quiet impossible for the government to establish institutes in each and every region of country, these requirement of educations are fulfilled by the private institute managements. The primary goal of these engineering institutions is to advance the frontiers of knowledge via engineering science, to translate, innovate, and integrate new technologies from the laboratory to society, to provide a rigorous education to prepare students to become highly qualified engineers and the society leaders of tomorrow, to prepare graduates to lead fulfilling professional lives, participate in lifelong learning, and assume roles as contributing members of society [8]**.** They can contribute in the development of students, curriculum by providing necessary resources, infrastructure for research work, platform to stand and deliver the innovations. From students point of view this may be possible with the guidance of qualified faculties, who can motivate them for research work, curriculum and extracurricular activities. However faculty recruitment issue is concerned with management strategy based on revenue policies. Institute authorities may involve in determining branch wise trends, interaction with epic bodies in relevant fields, collaborations and making them a part of institution. It may create employment opportunities and real time system working environment i.e. industry sponsored projects. Even in most of the cases it is observed that, a strong administration leads to full-fledged development of institute and ultimately students.

3.3. Students

It is the most important stakeholder in view of education, that might be in engineering or any other education. The students are naturally drawn in the learning process related to the aspect of personality development over & above technical skills [9]. The requirements of 21st century engineering are considerable & continuously revolving around engineering students. However to fulfill these requirements, an engineering student must be technically competent, globally sophisticated, culturally aware, innovative & entrepreneurial. Being an engineering student it is often observed that, engineering education is perceived as a job or business opportunity rather than the strongest interest among research, technology and its study. Despite this the first step involved in choosing this begins with selection of engineering institute. In most of the case especially in India, it is being observed that, the decision of selecting institute, branch etc has been taken either by parents or relatives rather than considering the interest of aspirants and it seems to be quiet harmful in view of overall development of students. Student should commit themselves to achieve technical excellence by creating interest in the respective fields, instead of studying only for the sake of degree, they should go for knowledge. Knowing and realizing current trends, demands of industry. This may possible by attending various career oriented workshops, technical events. Working culture can be developed by, being a part of different committees, curricular activities where students from different section with different views, responsibilities comes together. They share their ideas and try to implement it effectively. It also includes different tasks as advertisement, financial planning, people management etc. such kinds of activities always boosts the confidence of students. It helps them to plan their career, set their goals, and the way to achieve it. Stakeholders like society, parents and industry are having large expectations from engineering professionals, as they are the pioneers of the world. The Expectations may be, innovations helpful for welfare of human beings, which can create local employability opportunities, transforming education and its importance to the local sectors or peoples etc. Thus this stakeholder has to work in all perspectives along with the others to fulfill the expectations.

3.4. Faculty

The foremost important stakeholder is faculty working as a guide, instructor to create aspirants of tomorrow's world and advancing the frontiers of science and technology through research and discovery. Dissemination of knowledge, and the training of engineers to apply that knowledge for the general welfare, is central to faculty's mission. All tenure and tenure-track faculty are expected

to participate in teaching and to take teaching seriously, to do it well, and to seek to improve teaching through examination of their methodologies, student feedback, mentoring from more experienced faculty members, and accessing College and University resources for improving instruction [10]. Engineering education faces significant challenges as it seeks to meet continues demands on the engineering professions in the 21st century. Engineering faculties needs to learn new approaches to teaching and learning, which in turn will require effectively professional development for both new and experienced instructors [11]. Being an engineering academia, the responsibilities of faculties is to guide students, create interest among them through the teaching. What needs to create interest?, is to involve them in the entire academia, realize the importance of individual concepts with a little bit interesting tricks, actual applications of proposed concepts, practical oriented teaching methodologist. Effective teaching can be possible by examining expert tutorials. Ministry of HRD India has taken an initiative, by providing online tutorials as "NPTEL" of the experts from different fields.

3.5. Industry

It is another most important stakeholder of engineering community, providing opportunity to engineering aspirants to enhance their knowledge with a prosperous career. There is a tremendous demand of engineers i.e. quality engineers for a better prospect not only of their own but also of industry and ultimately nation. The rapid and drastic changes in economic growth nowadays are creating higher demands for employability skills in the workforce. Labor market becoming more competitive and depends on quality of knowledge, skills as the globalization come across in all industries. The employers have high expectations on fresh engineering graduates to perform in their organizations as soon as they hired [12]. However it will possible only with "Institute – Industry" collaboration to prepare students in such a way that, engineering aspirants can easily adjust & work at their best with the knowledge they had. The different skills that students have, from industry point of view are effective communication skills, engineering problem solving & decision making skills, competent in applications & practice, interpersonal or team working skills, should understand professional, social and ethical responsibilities, entrepreneurial skills with a positive attitude [13]. Every sector has its own work culture and environment, even the demand are different. To fulfill these requirements, industries could play a vital role. It has to transform the industrial aspects form workshops to institute. They can create a research environment with involvement of students and faculties with the expertise of industry. Industrial needs and technical skills can be made as a part of curricula, it may lead to ground level interaction amongst the different stakeholders in the educational development. Even industries can start their production through establishing small scale units at institute level, which will create employment opportunities; will get skilled employees. These small scale units will create working environment amongst the students, faculties and also will lead to innovations, research work.

3.6. Society

The aforementioned stakeholders will definitely affect the social views. However society always had a great exception of institutes. The role of an institute is to further knowledge of the community and to encourage, develop scholarships, learning processes among the needy one. Engineering graduate professional supports the local region in many sectors such as teaching and health. These aspirants also help in crating awareness and importance of education, health, other social issues requires for successful execution of systems. With the establishment of an institute, it may attract many support businesses to locate near institutions boosting local employment and contributing the regional economy. Engineering as an education opens doors to many opportunities.

These opportunities should be encouraged across the whole population and are not dependant on cultural or racial background, age, gender or disability. Rising education aspirants and educational attainment in under-represented communities i.e. a part of the widening participation agenda [13,14].

Figure 2 shows relationship amongst the different stakeholders of engineering education with their key roles, processes with value addition.

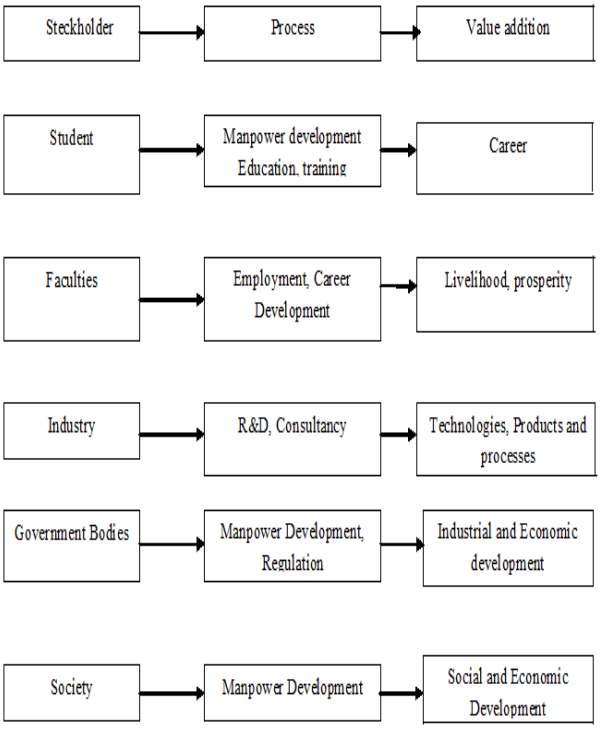

Figure 2. Stakeholders Relationship in Engineering Education

4. Conclusion

This paper provides an overview of engineering education from the perspectives of its stockholders. Stakeholder roles in development of education are also presented. Importance of ethical teaching to compete with global world especially for engineering aspirants has also being reviewed.

Acknowledgement

Authors are grateful to Dr. H. K. Abhyankar, Vice-president, VIT group pune for their visionary faculty training programs, also like to thanks Vinodji Agrawal, President, Dr.Anil Rathi Vice-president of Sandipani Technical campus latur for their Moral and financial support. Authors also like to thanks all the faculties of Sandipani Technical Campus Faculty of Engineering Latur for their kind support.

References

[1] Duderstadt, James J. "Engineering for a Changing Road, A Roadmap to the Future of Engineering Practice, Research, and Education." (2007).

[2] Mills, Julie E., and David F. Treagust. "Engineering education-Is problem-based or project-based learning the answer?." *Australasian Journal of Engineering Education* 3 (2003): 2-16.

[3] Saeki, Hiroshi; Imaizumi, Saori. 2013. International comparative study: engineering education in India. South Asia Human Development Sector report no. 57. Washington DC; World Bank.

[4] Lynch, William T., and Ronald Kline. "Engineering practice and engineering ethics," *Science, Technology & Human Values* 25.2 (2000): 195-225.

[5] Kline, Ronald R. "Using history and sociology to teach engineering ethics." *Technology and Society Magazine, IEEE 20.4* (2001): 13-20.

[6] Newberry, Byron. "The dilemma of ethics in engineering education." Science and Engineering Ethics 10.2 (2004): 343-351.

[7] Abhyankar, H. K., and S. K. Jabade. "Making Engineering Curriculum Relevant and Need based yet Stress and Burden Free…… An Experiment."*International Conference on Engineering Education ICEE*. 2008.

[8] Rosu, Luisa-Maria. "Engaging Engineering Faculty in Professional Communities Supporting Instructional Technology Initiatives," *Society for Information Technology & Teacher Education International Conference*. Vol. 2014. No. 1. 2014.

[9] Abhyankar, H. K., S. K. Jabade and Deepak Tilak, "Enhancing Quality of Technical Education – Looking Beyond". *International Conference on Engineering Education ICEE-2010*, July 18-22, 2010, Gliwice, Poland.

[10] Prince, Michael J., Richard M. Felder, and Rebecca Brent. "Does faculty research improve undergraduate teaching? An analysis of existing and potential synergies." *Journal of Engineering Education* 96.4 (2007): 283-294.

[11] Fink, L. Dee, Susan Ambrose, and Daniel Wheeler. "Becoming a professional engineering educator: A new role for a new era." *Journal of Engineering Education* 94.1 (2005): 185-194.

[12] Zaharim, Azami, et al. "Perceptions and expectation toward engineering graduates by employers: a Malaysian study case," *Wseas Transactions on Advances in Engineering Education* 9 (2009): 3014302.

[13] Wendy Purcell**,** "Balancing the Needs and Expectations of Society with the Autonomy of Higher Education Institutions". Outcomes of higher education: Quality relevance and impact, 8-10 September 2008 Paris, France.

[14] Stephens, Jennie C., et al. "Higher education as a change agent for sustainability in different cultures and contexts." International Journal of Sustainability in Higher Education 9.3 (2008): 317-338**.**