

Adoption of Outcome Based Education in Engineering Education during Transition Stage

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ABSTRACT

In 2020, India is expected to possess 64% of its population as youth and will be the world's youngest country. Presently, India has positively entered into a golden age of higher education to reform its youth potential into human resources. The five year plans of 12th, 13th and 14th have been completed and the education system is improved to a larger extent. The country has emerged as one of the suitable places of choice for aspiring learners for getting high-quality affordable educational systems. One among the educational systems is Outcome Based Education (OBE). This paper discusses the salient aspects in the adoption of OBE in Indian Engineering Education, especially in the transition stage. The present paper analyzes the implementation strategies of OBE in different categories of engineering institutions. Further, the paper elaborates the macro and micro level implementation of OBE with respect to various levels of students. Fruitful suggestions have been presented in view of content delivery and assessment methods.

Keywords: OBE, Implementation Strategy, Macro and Micro Level, Types of Institutions.

INTRODUCTION

In India, the Outcome Based Education (OBE) is implemented recently in engineering education. India has become a signatory member of the Washington Accord from June 2014 onwards. The National Board of Accreditation (NBA) accredits the engineering programmes in the country based on OBE. OBE is the system based on student-based learning wherein the ultimate objective is to impart the skill required by students in their education process. The outcomes are specified in terms of programme educational objectives (PEOs), programme outcomes (POs) and course outcomes (COs). Further, it is ensured that the graduate attributes required by the students are implanted in the OBE structure. The OBE system highlights the clear standards for observable and measurable outcomes from the performance of the students during and after completion of the programme. In OBE, the curriculum is structured based on the key qualities such as understand, analyze, apply, evaluate and create in their professional walk of life. It is also keen on attitude and skill level that is inculcated to the students.

As the OBE system had been implemented in various countries for more than a decade, there are vast literatures deliberating its significance which were analyzed and presented by various authors. In view of better understanding, the available literatures were collected and few of them are presented in this

part of the paper. William Spady (1993) who was a leading exponent of OBE in USA described OBE as means of focusing and organizing a school's entire programme and instructional efforts around the clearly defined outcomes. Educational literature evolving OBE had emerged in different forms over the last few decades (Brady, 1995), but the definitions of outcome based education provided by Towers (1994, 1992), Glatthorn (1993), Hansen (1989) and Abrams (1985) suggested that the OBE has been characterized by the development of clearly defined outcomes, the design of learning activities to assure the demonstrated performance, the monitoring of individual performance through the use of criterion referenced assessment and the provision of remediation and enrichment.

Research works regarding OBE were tremendous as pointed out by Brady (1995) - some of the reports revealed the benefits of OBE (McGhan 1994, Haack 1994, Mitchell, Hoyle and Martin 1994, Jasa and Enger 1994, Fitzpatrick 1991, Abrams 1985). Benefits claimed include the elimination of permanent failure and compromised standards (McGhan 1994), the focus on learning achieved rather than time served (Haas 1992), But, there are also strong criticisms of OBE (Evans and King 1994, Pliska and McQuaide 1994, Schwartz and Cavener 1994, Towers 1994, Glatthorn 1993, McKernan 1993). In the middle-east, evidence of OBE in the curriculum development was reported by Bouslama *et al.* (2003).

In Indian Engineering Scenario, it is a transition stage for the technical institution as they are in the process of implementing OBE. In India, the engineering education has transformed through various stages and presently, the institutions offering engineering programmes are various levels. The qualities of the students admitted in the above institutions are also differing with respect to knowledge, skill, attitude and motivation. As an example, the students admitted in IITs and NITs are having better qualities mentioned above than the students admitted in state owned affiliated colleges and private Institutions. The strategies required for effective implementation of OBE with respect to various levels of students is to be studied carefully and adopted. At this context, the present work emphasis on the various implementing strategies of OBE in various levels of Institutions present in India with respect to their available infrastructure, faculty and level of students. The various types of Institutions are also discussed elaborately and implementation strategies of OBE are suggested so as to accommodate themselves in view of attaining quality engineering education.

TYPES OF ENGINEERING INSTITUTIONS

Getting admission in undergraduate engineering programme in India is a dream for many intermediate students. They generally work hard all round the year to get admitted into any one of the engineering programme of their own choice in desired institutions. The available institutions in India are generally classified as Premier Institutions, Technical Universities, Government Institutions and Private institutions. The priority among the students is also in the same order. However, many number of Institutions comes under above specified categories, few of them in each category based on the author's point of view are listed in Figure 1.

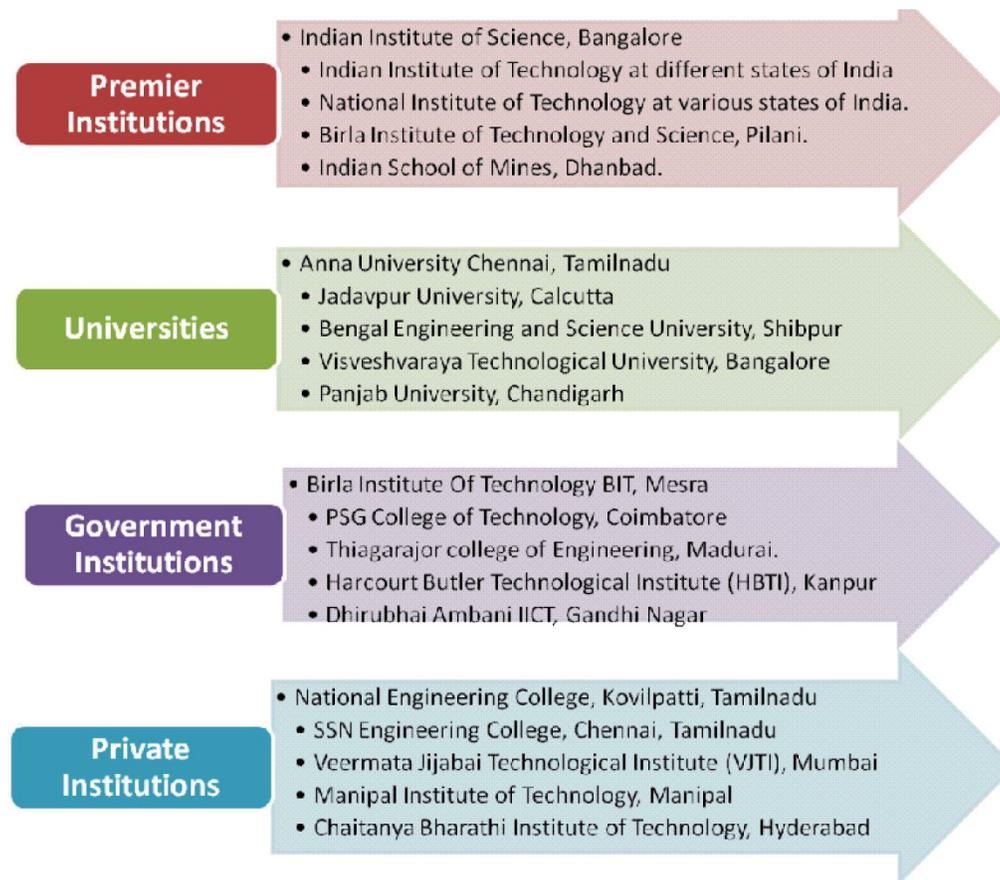


Fig. 1: Types of Engineering Institutions in India

It is useful to know by the student about the types of engineering institutions in India before applying to any of them, as with passing of each year, the cost of technical education is mounting enormously. There is a stark difference in the fee structure of government engineering institutions and other private engineering institutions. However, premier institutions are also known for their better administration and a professional environment.

LEVELS OF STUDENTS

As the admission process differ from institution to institution, the knowledge, grasping level and attitude of students admitted in premier Institutions are generally very high compared to other type of Institutions. The implementation strategy of OBE also devised carefully based on the type students get admitted in different type of Institutions. The category of students may be having attitude towards learning with varying levels. Some groups may have attitudes well below the expectations and it is necessary to motivate them initially and brought to the level of learning such students are termed as emerging level of students. On the other hand, some group of students has very high motivation with attitude towards learning and they may be grouped as accomplished or exceed expectations. The middle level groups are categorized as Developing, Acquired levels where

developing students meets the expectation to minimum level and the other category meets fully the expectations. Hence, the group of students is classified as shown in Figure 2 based on their attitude.

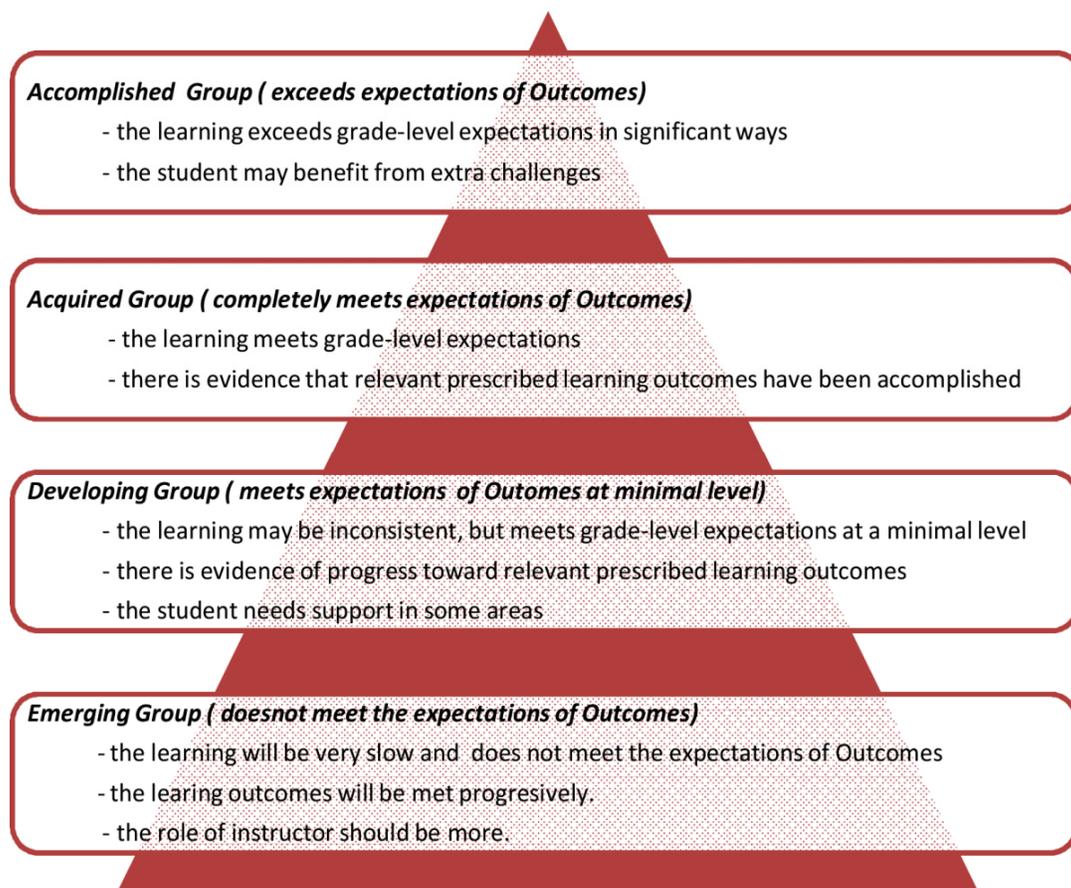


Fig. 2: Levels of Students

IMPLEMENTATION STRATEGIES IN MACRO AND MICRO LEVELS

In OBE, the content delivery (CD) and the assessment method (AM) by the instructor are playing vital role in achieving expected outcome from the student. The CD and AM are analyzed in micro and macro levels for effective implementation in various group of students. The CD and AM for different group of student described in previous section are carefully devised and presented in the Table 1. The both CD and AM have to be adopted appropriately for expected outcome. The instructors are required to be trained in effective implementation of OBE based on the level of input imparted to the student groups. As an example the emerging group of students needs to be given the content delivery from the basic level and the intervention by the instructor need to be sufficiently increased. Whereas the students of Accomplished group will be already having higher level of basic knowledge, the content delivery may be of higher standard leaving very basic concepts. In the same manner, the content delivery and the assessment methods for the other categories have to be decided based on their group levels.

Table 1: Implementation Strategies in Macro and Micro Levels

<i>Students Group</i>	<i>Attri Bute S</i>	<i>Macro Level</i>	<i>Micro Level</i>
Emerging	CD	<ul style="list-style-type: none"> Starts from basic level Demonstration with models Study materials to be supplied 	<ul style="list-style-type: none"> Individual attention Industrial visit
	AM	<ul style="list-style-type: none"> Through examination in remembering and understanding levels 	<ul style="list-style-type: none"> Class test, Assignments Open book test
Developing	CD	<ul style="list-style-type: none"> Starts from moderate level Demonstration with models Part of the study materials is sufficient 	<ul style="list-style-type: none"> Power point Presentation Case study- presentation In-plant training
	AM	<ul style="list-style-type: none"> Through examination in application level 	<ul style="list-style-type: none"> Seminar presentation Comprehensive study Group discussion
Acquired	CD	<ul style="list-style-type: none"> Starts from higher level Exposure of real time problems Guiding to collect study materials 	<ul style="list-style-type: none"> Power point presentation of real life problems Exposure to design of working models Internship
	AM	<ul style="list-style-type: none"> Through examination in analysis level Design of working models 	<ul style="list-style-type: none"> Seminar presentation Group discussion Online assignment with case studies
Accomplished	CD	<ul style="list-style-type: none"> Starts from advanced level Analysis of real time problems No need of study materials supply 	<ul style="list-style-type: none"> Self study through online materials Online course can be recommended Internship and consultancy
	AM	<ul style="list-style-type: none"> Solution to the Real time industrial problems Design and Creation of working models 	<ul style="list-style-type: none"> Scholarly presentation on latest developments

CONCLUSION

The attained skill levels are differed based on level of students and types of institutions. The salient aspects in implementation of OBE at various levels of institutions in macro and micro levels are critically analyzed and discussed in this paper. It is observed that every institution should concentrate on content delivery and assessment methods in view of successful implementation of OBE. Hence, it is concluded that train the trainers in the above aspects is inevitable.

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D. Ravindran, Presently occupying the position of Professor in the Department of Mechanical Engineering and having total teaching experience of 30 Years. Among 14 research scholars registered for their Ph.D. degree under my supervision, as of now six of them have completed their Ph.D. degree in various areas such as Composite materials, Diffusion bonding, optimization of wind turbine blade parameters and Joining methods of honeycomb structures. The other areas of research interest include optimization in SRFLP and FMS scheduling. So far 24 publications in Journals of International repute, five publications in international conferences and 4 national conferences has been brought out from the research work. A patent has been applied for the process of manufacturing heat resistance material using composite material. A research project funded by BRNS entitled "Prediction and control of distortion in components during hardfacing" is successfully completed with the funding of Rs. 19 lakhs. The object was to create a FEA model to predict and evaluate the distortion during hardfacing process. Presently, another project funded by BRNS entitled "Optimization of grain size for improving the creep properties of 304 HCu stainless steel" with the funding of Rs. 33.5 lakhs is under progress.

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N. Lenin, Presently working as an Assistant Professor (Senior Grade) in Department of Mechanical Engineering, National Engineering College, Tamil Nadu, India and having total teaching experience of 10 Years. The title of Ph.D. research is ‘Simultaneous Minimization of Objectives in Single Row Facility Layout Problems’. The other areas of research interest include machining and welding process optimization and machinability and tribological studies on Composite Materials. So far 06 publications in Journals of International repute, 04 publications in international conferences and 05 national conferences have been brought out from the research work. Presently holding the positions of Secretary of ‘Society for Manufacturing Engineers’ and Associate Editor of ‘Journal of Manufacturing Engineering’.