1. OUTCOME BASED ENGINEERING EDUCATION - NEED OF THE HOUR

*Prof. O R S Rao**

Abstract

Low employability of fresh Engineering Graduates, coupled with absence of Premier Engineering Institutions in global rankings confirm the malaise of poor quality of Engineering education in India. There has been a growing realization that unless 'quality' is defined in terms of "Learning Outcomes" , rather than grades and is assessed accordingly , it is difficult to improve the quality of engineering education in India.

Though the initiative on Outcomes Based Education emanated in the US, now it is embraced by over 47 countries across the globe. Most of the global accreditation agencies in Engineering Education, like ABET and ENAEE have anchored their assessments on Learning Outcomes . Washington Accord (WA), set up to improve global mobility in Engineering Education, is focused on Learning Outcomes. India has been a provisional signatory of WA since 2007. Though UGC Regulation on mandatory accreditation of Higher Education Institutions (HEIs), 2012 emphasizes the importance of achievement of Learning Outcomes, it leaves the job of setting them to the HEIs. Adopting Outcomes Based Education will help all stake holders – students, parents, engineering institutions, employers and government not only to improve employability of the graduating engineers but also to tap the huge global opportunities for engineering talent.

This paper studies the genesis and evolution of Learning Outcomes in Engineering Education across the world and suggests a blue print of adoption of it in India.

Keywords: *Learning Outcomes, Engineering Education, Accreditation, Globalization, Employability, Mobility, Qualifications Framework*

1.0 Engineering Education - Expectations

Engineering, as a discipline, has a direct and vital impact on all aspects of people's life, economic development and the provision of services to the society. With engineers facing challenging expectations, including the ability to address complex societal problems, engineering education must ensure that the graduating student obtains the necessary skills and competencies to be a successful professional engineer. This education must include a strong foundation in mathematics and science, as well as training in the specific engineering disciplines. As design is a critically important skill of an engineer, students must deal with increasingly complex problems as they proceed through the educational process. The complexity of modern challenges, facing

**Vice-Chancellor, The ICFAI University, Jharkhand.*

engineers also requires that the education include sound foundation in topics such as economics, communications, team skills, and the current global geo-political environment. Engineering Professionals are expected to be honest, impartial and fair in their day-to-day working.

Graduating engineering students should be employable and at the same time, should be qualified to enter a Masters program in Engineering, if they wish. In most cases, the fresh graduates that get into core engineering jobs may involve in roles like, design, production, sale, service, maintenance of the product need requisite skills to perform the assigned roles.

Globalisation started demanding mobility of Engineering qualifications so as to facilitate deployment of technical skills wherever needed from available locations. Mobility of qualifications also enables students to pursue higher qualifications, wherever they wish to study.

2. Concept of Outcomes Based Education

In the above context, fresh engineering graduates are assessed by potential employers on the basis of the skills and competence needed on the job ,rather than mere knowledge acquired during their education. Learning Outcomes provide verifiable statements of what learners are expected to know, understand and/ or be able to do. The learning outcomes approach focuses on what the learner has achieved and is able to demonstrate at the end of the learning activity rather than the intentions of the teacher. This student-centred approach is what makes the difference between the objective and the learning outcome of a teaching activity . Program Objectives in traditional education are expressed from the teacher's point of view and deal with the intended results of teaching and learning. Learning outcomes, however, consider learning from the students' point of view and deal with the achieved / demonstrated results.

2.1 Key Constituents

Key constituents of Outcomes Based Education are Program Educational Objectives (PEO), Program Outcomes (PO) and Course Outcomes (CO). Program Educational Objectives are broad statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. Program Outcomes are statements that describe what students are expected to know and be able to do by the time of graduation. Course outcomes are what students are expected to know and be able to do when a course is completed. PEOs, POs and COs are to be aligned in such a way to meet the respective objectives.

2.2 Learning Outcomes

Learning outcomes are expressed in terms of " level of competence" to be obtained by the learner. Competencies represent a dynamic combination of cognitive and meta-cognitive skills, knowledge and understanding, interpersonal, intellectual and practical skills, and ethical values. A learning objective takes one of the two following forms:

1. At the end of this course, the student should be able to do…

2. To do well on the next test, you should be able to demonstrate…

What follows either of these is a list of tasks that demonstrate mastery of the desired knowledge and skills. Each task statement includes one or more key action words (such as list, explain, calculate, estimate, derive, model, design, choose, and critique) along with a definition of the task and possibly, specification of the conditions under which the task is to be performed.

2.3 Bloom's Taxonomy of Educational Objectives

When we start writing learning objectives, we will discover that different tasks call for different knowledge and skill levels, with a few tasks requiring only memorization to complete ,whereas a majority of them calling for analytical skills and creativity.

A system of classifying learning objectives according to their required skill levels was formulated by Benjamin Bloom, called Bloom's Taxonomy of Educational Objectives. Categories were formulated for cognitive (thinking and problem-solving skills), affective (attitudes, value systems), and psychomotor domains. The categories or levels for the cognitive domain (which is critical for Engineering graduates) and illustrative action words for each level are as follows:

1. **Knowledge** (repeating verbatim): list, state.
2. **Comprehension** (demonstrating understanding of terms and concepts): explain, interpret.
3. **Application** (applying learned information to solve a problem): calculate, solve.
4. **Analysis** (breaking things down into their elements, formulating theoretical explanations or mathematical or logical models for observed phenomena): derive; explain.
5. **Synthesis** (creating something, combining elements in novel ways)**:** formulate, make up , design.
6. **Evaluation** (making and justifying value judgments or selections from among alternatives): determine, select, critique.

Levels 4 to 6 are known as the Higher Order Thinking Skills (HOTS), which are expected by industry from Engineering Graduates

2.4 Assessment and Evaluation

It is necessary to judge whether and how well the students learnt a body of knowledge or mastered a skill, or how well a teacher taught a course, or how well a product or process has met its design specifications, or how well an instructional program has met its educational objectives. A two-step process is used to make the judgment rationally:

- **Assessment**. Decide on the data/ observations (that is to be used as a basis for making the judgment) and the procedures (observations, measurements, experiments, surveys) , that will be used to collect the data and perform the analysis needed to present the data into a form , suitable for the next step.
- **Evaluation**. Using the assessment outcomes and pre-established criteria, draw conclusions and make evaluative judgments.

Fig 1 presents the Concept Map on Constructive Alignment of intended outcomes, delivery and assessment

3. Benefits of Outcomes Based Education

When a student demonstrates acquisition of knowledge, skills and competencies , as described in the Learning Outcomes, it is an indication of "quality education" . Learning outcomes can help faculty members take a more holistic view of the students educational experiences. Setting Learning Objectives in advance helps the teacher to select course content and decide on how much time to allocate to each topic, create relevant assignments to make the students practice their learnings in the class ; and design relevant tests to assess their learnings. Setting such objectives is more helpful than merely prescribing the syllabus to teachers. Learning objectives can be useful if they are shared with the students in the form of study guides for tests and then used as the basis of the test preparation. When students have a clear understanding of what is expected of them, it may help them to prepare themselves better and meet the expectations .They can also help assess learning and teaching methods and establish feedback mechanisms for students, employers and other stakeholders.

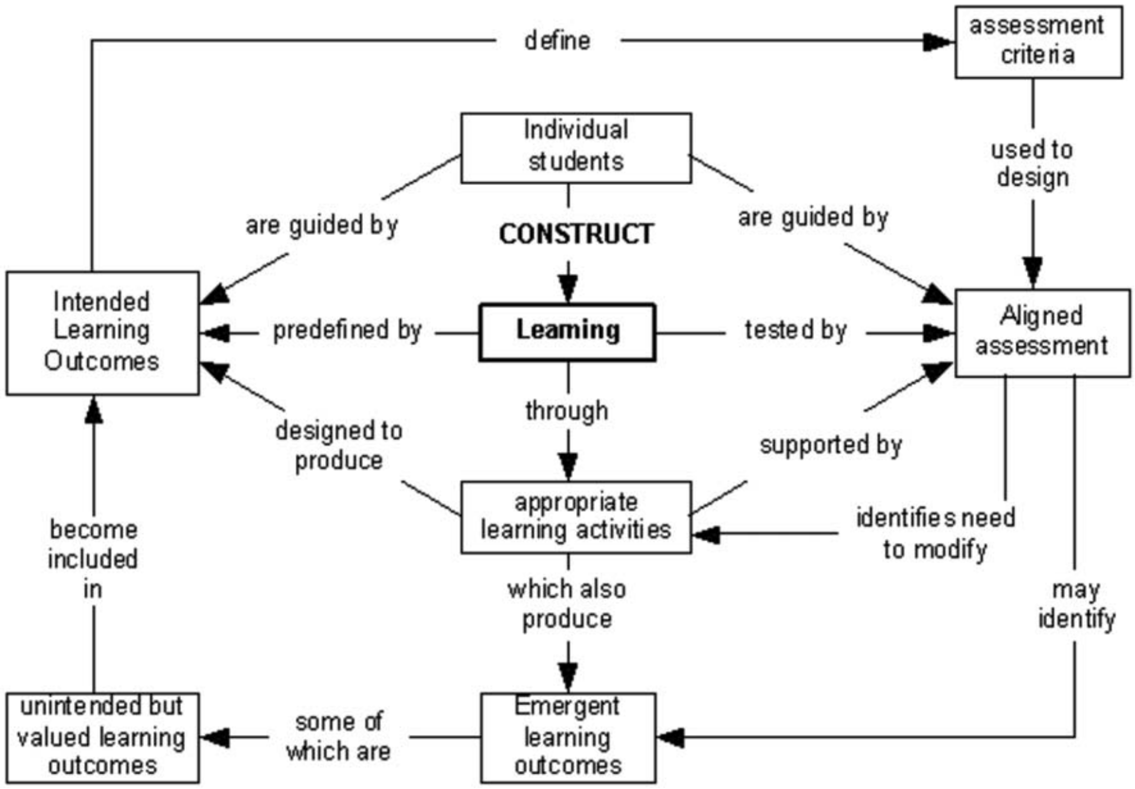

Fig 1 : Concept Map on Constructive Alignment of intended outcomes, delivery and assessment

(Source: Concept Map illustrating the main ideas put forward by Biggs on Constructive Alignment (Houghton , 2004)

Learning outcomes, especially when mapped to specific educational experiences, can also be used by the students to do self-assessment of their own progress. At the same time, learning outcomes may best be used as a tool for academic and professional mobility but not as a tool to standardise curricular content at the national/international level .

4. Evolution of OBE in various geographies of the Globe

41 Accreditation Board of Engineering and Technology , US :

One of the most important developments was the introduction , in the United States , of the Engineering Criteria 2000 (EC2000) for the accreditation of engineering programs by the Accreditation Board of Engineering and Technology (ABET). In terms of EC2000, Engineering programs are to be guided by a holistic and consistent quality system , starting with the institution's mission, learning outcomes for the individual engineering programs, operationalisation of key performance indicators, supported by a quality assurance system to ensure that the learning outcomes are actually met. Besides program-specific learning outcomes, ABET formulated eleven generic outcomes to be achieved by every engineering program at the bachelor's level. The ABET approach became one of the role models for the development of similar trends in other parts of the world

4.2 Bologna Process, Europe:

The Bologna Declaration, signed in June 1999, by European Ministers for higher education, set in motion, events, which eventually led to the launching of a common Framework for Qualifications in European Higher Education Area (EHEA) in March 2010. The objective of the Bologna process is to improve the efficiency and effectiveness of higher education throughout Europe and to promote its mobility within the European Community (EC) by ensuring increased transparency and comparability of programs among the Institutions. The three overarching principles of the Bologna process have been: the introduction of a three-cycle system (bachelor/master/doctorate), quality assurance at all levels, and consistency of recognition of qualifications and periods of study. In the context of the Bologna process, LOs are considered essential building blocks for quality of programs among the Institutions within Europe. Till date, forty-seven countries signed the Bologna Declaration. One of the projects on European Accredited Engineer (EUR-ACE) conceived five groups of Learning Outcomes as minimum requirement for entry into Engineering profession. EUR-ACE LOs are the basis for a European mutual recognition agreement under the framework of European Network for Accreditation of Engineering Education (ENAEE) , which was agreed by 30 European countries.

4.3 International Accords

Several international accords provide for recognition of graduates of accredited programs of each signatory by the remaining signatories. The Washington Accord (WA) provide for mutual recognition of programs accredited for the engineering graduates. The Sydney Accord (SA) and the Dublin Accord (DA) provides for mutual recognition of accredited qualifications for engineering technologists and engineering technicians. These accords are based on the principle of substantial equivalence rather than exact correspondence of content and outcomes.

The Washington Accord (WA) ,signed in 1989, is an independent international agreement for:

- Mutual recognition of accredited engineering programs
- Benchmarking standards for engineering education
- Benchmarking accreditation policies and processes

ABET was part of WA, which was the first to recognize the substantial equivalency of programs accredited by the members and recommends that graduates of programs accredited by any of the signatory bodies be recognized by the other bodies, as having met the academic requirements for entry to the practice of engineering. As of now , it has fifteen full signatories (Australia , Canada, Hong Kong, Ireland, Japan, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa ,Taiwan, Turkey, the UK and the US) and five provisional signatories (Bangladesh ,Germany, India, Pakistan and Sri Lanka) .

In 2005, the WA adopted a set of learning outcomes, (set up by ABET) , with which those of all signatories must be compatible . In 2011, WA established Graduate Attributes , which are a set of individually assessable outcomes that represent the generally agreed reference for accredited programs by the member countries . The Graduate Attributes , as listed below, supported by level statements, developed by the signatories give confidence that the educational objectives of programs are being achieved.

a. Depth of Knowledge

b. Problem analysis

c. Design & Development of Solutions

d. Investigation of Complex Problem

e. Modern tool usage

f. Engineer and society

g. Environment& sustainability

h. Ethics

i. Individual & team work

j. Communication

k. Lifelong learning

l. Project management & finance .

As per ABET guidelines, for accreditation of Bachelor degree programs in engineering for 2013-14, the student outcomes must include, but are not limited to, eleven capabilities/ abilities , as below:

a. an ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities;

b. an ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies;

c. an ability to conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes;

d. an ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives;

e. an ability to function effectively as a member or leader on a technical team;

f. an ability to identify, analyze, and solve broadly-defined engineering technology problems;

g. an ability to apply written, oral, and graphical communication in both technical and non-technical environments; and an ability to identify and use appropriate technical literature;

h. an understanding of the need for and an ability to engage in self-directed continuing professional development;

i. an understanding of and a commitment to address professional and ethical responsibilities including a respect for diversity;

j. a knowledge of the impact of engineering technology solutions in a societal and global context; and

k. a commitment to quality, timeliness, and continuous improvement.

4.4 OECD initiative:

The OECD launched a feasibility study, Assessment of Higher Education Learning Outcomes(AHELO), which is a ground-breaking initiative to assess learning outcomes on an international scale by creating measures that would be applicable across multiple cultures and languages of OECD countries. The AHELO feasibility study contains four complementary strands of work:

i) a generic skills or transferable competencies strand;

ii) an economics strand;

iii) an engineering strand; and

iv) a value-added measurement strand that will recommend possible methodologies to capture learning gained during a student's higher education experience.

The study group compared ABET EC2000 Learning Outcomes with EUR-ACE Learning Outcomes for the first cycle (graduation) and came to the conclusion that they are comparable and hence decided to synthesise them into one set of commonly agreed LOs, which are detailed in the next section.

A methodology has been developed , within the framework of the European Bologna Process, by a large group of universities and their departments under the initiative , Tuning Educational Structures in Europe3. In 2007, groups of high level peers validated the Tuning approach as a methodology as well as its implementation in multiple disciplines. It is currently applied in more than 30 subject areas, in many institutions throughout Europe and Latin America as well as some countries in Eurasia. At present, the Tuning methodology is being tested in three US states. Furthermore, Tuning has served and is serving as a platform for developing reference points within subject areas. These reference points are relevant for making study programs comparable, compatible and transparent.

5.0 OBE Approach for graduation in Engineering

The main requirements for any outcomes-based qualification are a clear understanding of the goals and objectives of the program, and teaching strategies that are able to support the development of the required competencies, coupled with assessment procedures , capable of reliably monitoring whether the established targets are being met, or not. Hence, the Institution should ensure that the programs that they deliver provide a coherent assembly of discipline specific and complementary knowledge areas, along with integration of required skills and values. Besides, adequate opportunities are to be provided for the development, demonstration and assessment of required competencies, as the student progresses through the program. to ensure effective preparation for the world of professional practice, and lifelong learning.

51 Three Stage process

Development and delivery of an outcomes-based program should ideally follow a three-stage process:

Stage 1: Description of the Qualification:- Setting the purpose of the qualification, and the expected competencies of the graduates of the program.

Stage 2: Structuring the Curriculum:- Establishing the content and learning activities required to support the achievement of the outcomes required.

Stage 3: Program Delivery:- Providing the teaching, learning and assessment strategies / plans of action that will facilitate the development and assessment of the outcomes associated with the qualification.

5.2 Commonly agreed Learning Outcomes

Learning Outcomes , that came out of the OECD project, are classified into five categories: General Learning outcomes, Basic Engineering Sciences, Engineering Analysis, Engineering Design and engineering Practice.

a. General Learning Outcomes

Graduates are expected to have achieved the following general learning outcomes:

i. ability to function effectively as an individual and as a member of a team;

ii. ability to communicate effectively with the engineering community and with society at large;

iii. ability to recognise the need for and engage in independent life-long learning; and

iv. ability to demonstrate awareness of the wider multidisciplinary context of engineering.

b. Basic Engineering Sciences

In general, the underpinning knowledge and understanding of science, mathematics and engineering fundamentals are essential to satisfy other program outcomes. Graduates should be able to demonstrate their knowledge and understanding of their engineering specialisation, and also the wider context of engineering. More particularly, graduates are expected to have

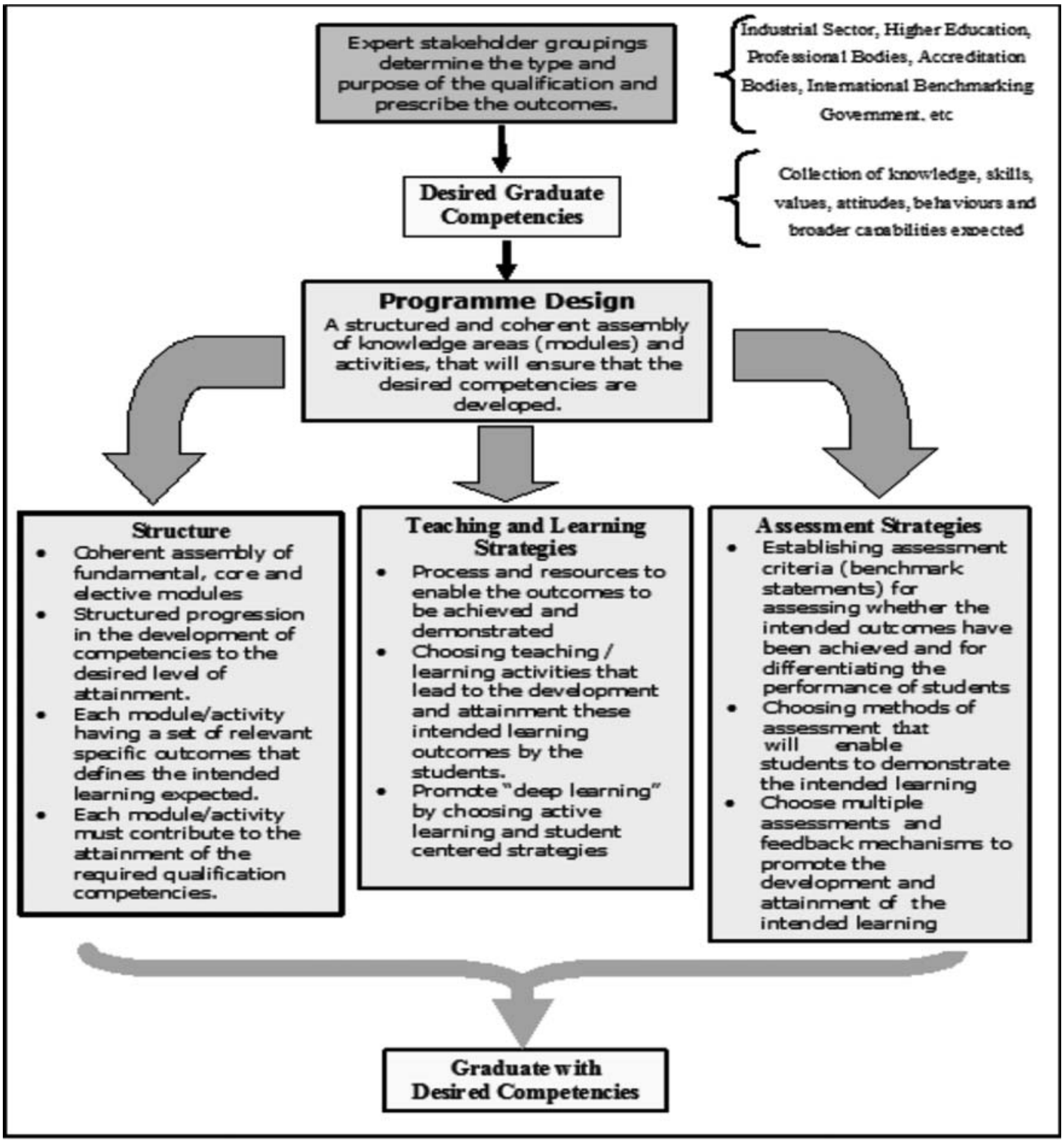

Fig 2 : Stages in delivery of outcome based education

(Source: Implementing outcomes based education in chemistry and chemical engineering , Prof Ilkka Turunen et al, Work package 15, European Chemistry and Chemical Engineering Education Network).

achieved the following learning outcomes:

i. ability to demonstrate knowledge and understanding of the scientific and mathematical

ii. principles underlying their branch of engineering;

iii. ability to demonstrate a systematic understanding of the key aspects and concepts of their branch of engineering; and

iv. ability to demonstrate comprehensive knowledge of their branch of engineering including emerging issues.

c. Engineering Analysis

Graduates should be able to solve engineering problems consistent with the level of knowledge and understanding expected at the end of the program. Analysis can include the identification, specification and clarification of the problem, determination of possible solutions, selection of the most appropriate solution method, and effective implementation. The graduates should be able to use various methods, including mathematical analysis, computational modeling, or practical experiments, and should be able to recognize societal, health and safety, environmental and commercial constraints. They s are expected to have achieved the following learning outcomes:

i. the ability to apply their knowledge and understanding to identify, formulate and solve engineering problems using established methods;

ii. the ability to apply knowledge and understanding to analyse engineering products, processes and methods;

iii. the ability to select and apply relevant analytic and modeling methods;

iv. the ability to conduct literature searches, use databases and other sources of information; and

v. the ability to design and conduct appropriate experiments, interpret the data and draw conclusions.

d. Engineering Design

Graduates should be able to create engineering designs and processes , working in co-operation with the team of engineers and non-engineers and are expected to have achieved the following learning outcomes:

i. the ability to apply their knowledge and understanding to develop designs to meet defined and specified requirements; and

ii. the ability to demonstrate an understanding of design methodologies, and be able to use them.

e. Engineering Practice

Graduates should be able to apply their knowledge and understanding to developing practicalskills for solving problems, conducting investigations, and designing engineering devices and processes.They should also recognise the wider, non-technical aspects, such as ethical, environmental, commercial and industrial, implications of engineering practice, ethical, environmental, commercial and industrial considerations. Graduates are expected to have achieved the following learning outcomes:

i. the ability to select and use appropriate equipment, tools and methods;

ii. the ability to combine theory and practice to solve engineering problems;

iii. the ability to demonstrate understanding of applicable techniques and methods, and their limitations;

iv. the ability to demonstrate understanding of the non-technical implications of engineering practice;

v. the ability to demonstrate workshop and laboratory skills;

vi. the ability to demonstrate understanding of the health, safety and legal issues and responsibilities of engineering practice, the impact of engineering solutions within a societal and environmental context, and commitment to professional ethics, responsibilities and norms of engineering practice; and

vii. the ability to demonstrate knowledge of project management and business practices, such as risk and change management, and awareness of their limitations.

5.3 Assessment Tools

A range of Assessment Tools are used to assess the Program Educational Objectives (PEO) and Program Outcomes (PO) and Course Outcomes(CO). Employer Surveys and Alumni Surveys are normally used to arrive at achievements of Program Educational Objectives. Program Objectives can be assessed through End-of-course surveys , Instructor evaluation reports , Department performance report , student exit surveys, Alumni survey and Student Advisory Committee surveys . Course Objectives can be assessed by way of assignments , mid course as well as end of the course surveys/feedback from the students , faculty surveys etc. In order to assess performance of students in practical assignments and projects, more particularly in group assignments, Rubrics can be used. Rubrics is a set of performance indicators to define the important components of the work being completed.

Considering that Grades have been the traditional way of assessment of students' learning, a number of studies were conducted (Per O Aamodt et al ,2008) to establish correlation between grades and achievement of Learning Outcomes. Students with the excellent grades also reported higher Learning outcomes (with the exception of cultural / societal knowledge) ,but correlation was weaker than expected. Hence grades and Learning outcomes could be considered to be complementary tools of assessment .While grades primarily measure subject specific knowledge , Learning Outcomes measure transferable skills.

5.4 Some innovative approaches to implement Teaching-Learning-Assessment in Outcome Based Education

i. Creating and nurturing an education innovation culture is crucial to improve the educational experience as well as achieve the desired learning outcomes .

ii. Institutions should create a supportive environment for education innovation and may strengthen faculty development programs on Outcome Based Education and the tools for its effective implementation.

iii. Definition of measurable learning outcomes for engineering programs and relevant assessment tools is critical to the systematic improvement of the educational experience for engineering students.

iv. Learning outcomes may be mapped throughout students' curriculum/educational experiences to determine where and when each learning outcome should be met. It is then possible to use both formative and summative evaluations to determine how well the desired learning outcomes are being met as well as determine the positive or negative impact of any educational innovation.

v. Institutions can leverage partnerships with industry to provide inputs to improve curriculum/education experience design. These industrial partners can also be useful valuable teaching sources and also can help to assess learning outcomes

vi. Besides the standard lecture mode, the students may also be provided with various professionally relevant experiential learning opportunities including international experiences, co-op and intern (sandwich programs) opportunities, multidisciplinary design experiences, and participation in learning communities.

vii. Design-Based Learning (DBL) is an interesting collaborative approach to successfully learn, teach and assess key learning outcomes in engineering, aimed at learning to design in engineering.

viii. In addition to the standard, summative teacher-course evaluations, face-to-face interactions between students and "trusted" counselors can be used to obtain more detailed information regarding the "success" of the education experiences. Alumni and employer surveys are also a useful source of information.

ix. Just as the assessment tools are used to evaluate learning outcomes, it is equally important to develop a process by which the evaluation data is analysed to identify actions leading to improvements. Without such a process, the evaluations will lose much of their value and students and others will not take them seriously.

6.5 Support Mechanisms to implement OBE

In order to facilitate implementation of OBE across the various stages, institutions need to set up an administrative support mechanism. A Quality assurance /OBE cell may be set up to co-ordinate various activities / initiatives with the relevant stake holders,like students, teachers, alumni, industry etc. While the Program Co-ordinator takes the responsibility to set PEO's and POs, design processes for delivery and assessment so that the outcomes are achieved, respective Course

co-ordinators have to play the same role in respect of the specific courses. An advisory body, consisting of senior academicians, industry professionals and alumni can review the progress and recommend corrective actions.

7.0 Outcomes Based Engineering Education - Imperative for India

As per various surveys, on an average, hardly 25% of the Engineering graduates produced in India are employable. As per a survey of employment of Technical Graduates in IT/ITES industries (Aspiring Minds,2010), employability in Technical support and IT services is only 25.9% and 17.8% respectively. As we move to more technical skill intensive roles like KPO and product design, it drops down to as low as 9.5% and 4.2%. Likewise, the figure goes down as we move to tier-2 colleges. Industry finds that it is 3 times more difficult (in terms of efforts and cost) to identify an employable graduate from tier-2 campus, compared with a tier-1 campus, with the result, most of the companies stopped recruitment from tier-2 colleges. Even the students that are selected by the IT companies have to be trained by the companies for periods ranging from 6 to 9 months, before being deployed on the jobs. Companies from other industries also face similar challenges with regard to recruitment and training of fresh Engineering graduates.

With the second largest pool of engineering talent in the world, coupled with potential global opportunities to tap , there is dire need for India to fall in line with the rest of the world to adopt Outcomes based engineering education so that mobility of qualification is ensured. Indian companies can thus leverage the Indian talent in the global market.

Indian students constitute the second largest in the world to pursue higher studies in the US, with most of them opting for Engineering. Mobility of Indian engineering degrees will help them by way of avoidance to take extra courses and save time and efforts.

7.1 World Bank survey on employability of fresh engineering graduates

During Sep - Nov 2009, an Employer Satisfaction Survey was carried out by the World

Bank and FICCI, as part of preparation of the Second Phase of Technical Education Quality Improvement Program (TEQIP-II) initiated by the Government of India and financially supported by the World Bank. 157 employers across sectors and regions in India participated in the survey . The results confirm a widespread dissatisfaction among the employers with the current graduates wherein only 36% of the employers were satisfied with the quality of the new hires.

As per the report, the skills set of engineers required by the employers can be characterized by three overall skills factors:

i. Core Employability Skills (which cover generic attitudinal and affective skills, such as reliability and team-work);

ii. Communication Skills (such as English skills, written and verbal communication), and

iii. Professional Skills (cover cognitive skills related to the engineering professions, such as ability to apply engineering knowledge; as well as design ,conduct experiments, analyse related data and interpret the results).

The employers felt that the graduates are relatively strong in lower-order thinking skills (knowledge and understanding), but fall short, when it comes to the more complex tasks such as application of appropriate tools to solve a problem, and analysis and interpretation. Further, these Higher-Order Thinking Skills (HOTS) are the most important Professional Skills for the graduates to be more successful. The report raised a fundamental question - whether the Indian engineering education system overly trains students to memorize science and engineering knowledge, without adequately emphasizing the applicability, analysis and out-of-the-box thinking that employers look for.

Following recommendations were made to improve higher-order thinking skills by reforming the education system:

(i) Institutions to focus on learning rather than memorization and mere understanding . They should change assessment methods, especially the examination system, to assess higher-order thinking skills and not measure memorized knowledge. In order to enable it, curricula should be designed in a way where students should learn how to abstract out practical issues;

(ii) reform curricula to increase the share of tasks where the student or a team of students lead their own problem identification, experimenting, and solving, using engineering knowledge and methodologies;

(iii) promote teaching-learning sessions, where students actively learn and develop their own analytical and evaluation skills as compared to simply listing and taking notes.

7.3 UGC mandatory accreditation Bill 2012

As per the Mandatory assessment and Accreditation of higher educational Institutions Regulation, 2012 all specified Higher Educational Institutions have to undergo mandatory accreditation by the Accreditation agency after passing out of two batches or six years ,whichever is earlier. One of the major objectives for this is to " facilitate students achieve learning outcomes appropriate to their course and relevant to their context, as shall be declared by the Higher Educational Institutions". While the objective of mandatory accreditation is laudable , the task of setting up the Learning Outcomes was left to the HEIs, thereby negating a common minimum framework for the country , as a whole..

7.4 Washington Accord and India

India , represented by the National Board of

Accreditation (NBA) , was accepted as a provisional member of the *Washington Accord* in the year 2007 and continues to be so, till date. Though India is eligible to become a full signatory since 2009 , it could not become one, due to delays in implementation of Outcomes Based Education in Engineering Institutions. NBA has included the WA criteria as part of its accreditation process in November 2012 and has been conducting awareness seminars / training sessions across the country and expects to become full member shortly.

8.0 Conclusion

There is a dire need to adopt Outcome Based Education in Indian Engineering Institutions, with a sense of urgency. Government and NBA have to create more awareness among all the stake holders and train teachers and other support staff on implementation of OBE across all stages of academics (from setting Learning Outcomes, delivery to assessment). There is also an imperative for changing the mindset of teachers, parents and students away from grades so that Learning Outcomes are accorded due weight age in the assessment systems . Successful implementation of Outcomes based engineering Education is possible only with the concerted efforts of all the stake holders - students, teachers, employers and the government - as every one of them stands to gain out of it.

Bibliography

1. ABET, Oct 27,2012, Criteria for Accrediting Engineering Technologh Programs, Effective for Reviews During the 2013-2014 Accreditation Cycle, www.abet.org, accessed on Oct 19,2013.
2. Andreas Blom and Hiroshi Saeki, April 2011, "Employability and skill set of newly graduated engineers in India", Policy Research working Paper 5640, The World Bank, South Asia Region.
3. "National employability study", 2010, Aspiring Minds
4. Denny C davis et al ,2004, "Measuring Learning outcomes for Engineering Design Education ",Proceedings of the 2004 American Society for Engineering Education Annual Conference.
5. Ilkka Tureunen and bill Byers, 2009", Implementing outcomes-based Education in Chemistry and Chemical Engineering", European chemistry and chemical Engineering Education Network
6. http://www.nbaind.org , "Outcome based education and accreditation"
7. OECD , 2011, "A Tuning-AHELO Conceptual Framework of Expected Desired/Learning Outcomes in Engineering", OECD Education Working Papers, No. 60, OECD Publishing
8. Per O Aamodt and Elisabeth Hovdhaugen,2008," assessing Higher Education Learning outcomes as a result of Institutional and individual Characteristics", IMHE Program on Institutional Management in Higher Education
9. Richard M Felder and Rebecca Brunt, 2004," the ABC's of Engineering Education, ABET, Bloom's Taxonomy, Co-operative Learning and so on", Proceedings of the 2004 American Society for Engineering Education Annual Conference
10. http://www.washingtonaccord.org/GradProfiles.cfm, accessed on Oct 21, 2013
11. http://www.washingtonaccord.org/Washington-Accord/Washington-Accord-Overview.pdf , accessed on Oct 21, 2013
12. "Mandatory assessment and Accreditation of higher educational Institutions Regulation, 2012", The Gazette of India, Jan 19-Jan 25, 2013 (PP 115 to 120).

◆◆◆