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Graduate Attributes and Quality in Higher Education

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Abstract: **Higher education has expanded exponentially across the world. This rapid expansion has impacted quality of education in colleges and universities. Traditional teacher-oriented approach of teaching/learning and examination-oriented assessment processes have been found to be lacking severely, leading to falling of academic standards and impacting the employability of students. Issues of continuous quality improvement and teacher accountability have also not been addressed effectively in the conventional mode of education. This paper describes the graduate attributes, outcome-based educational process wherein it is possible to ensure continuous quality improvement (CQI) and faculty accountability in academic institutions of higher learning.**

Keywords: Higher Education, Academic Standards, Continuous Quality Improvement, Student-centric Learning

I. INTRODUCTION

THERE has been rapid and huge expansion in the field of higher education, both technical and non-technical, in India during the last two decades, and this trend is continuing. It is expected that another about 400 colleges and 300 universities will be created by the end of the 13th Plan Period. Further, liberalization and privatization of education has forced higher educational institutions to strive for Continuous Quality Improvement (CQI) and achieve international standards in order to be able to compete with their competitors. In addition, demands of students, and other stake-holders are getting more and more complex. The educational institutions must ensure that the students receive high quality education, gain relevant skills, develop competences and are able to face challenges emerging in the globalized society.

Many studies have brought the issues ailing our curricula, delivery, monitoring and assessment. Govt. of India, (via MHRD, UGC, NBA,…) has initiated several steps to bring improvement in quality of higher education and training, such as National Skills Qualification Framework [1], making accreditation of institutions mandatory in order to receive government grants, and so on. Moreover, student-centric teaching/learning /assessment(also referred to as Outcome-based Education – OBE) [2] has also been mandated and encouraged in the teaching/learning institutions.

Student-oriented teaching/learning process emphasizes the achievement of higher order learning among the students, rather than the traditional approach of merely passing the university examinations and collecting credits. OBE aims to develop and identify higher levels of thinking (*e.g.* innovation, creativity, ability to analyze, synthesize and interpret data, plan and organize tasks, etc.). This approach attempts to bring about the desired changes within the students, by increasing the knowledge, developing skills, influencing attitudes and creating socially-aware ethical mindset. This approach enables to measure-'what the students are capable of learning, doing and demonstrating', which the traditional education system often fails to do [2]. Moreover, OBE is a 'holistic' approach, which involves all stake-holders – learners, parents, management, employer, industry, society, environment and government for its implementation.

Student-centric teaching/learning also leads to improvement in quality of education as it lays strong emphasis on measurements. These measurements are carried out by defining the Graduate Attributes (GA), relevant Program Educational Objectives (PEO), Program Outcomes (PO), Course Outcomes (CO) and Key Performance Indicators (KPI) for a program. Measurements of program and course outcomes enable to ascertain educational quality and its improvement on an on-going basis. Teachers are involved in assessments of relevant outcomes, and hence assume the responsibility of their attainments by the students. Benchmarks for attainments of outcomes are defined collectively by the institute, faculty and other relevant stake-holders. Satisfying the relevant benchmarks leads to better quality of student learning.

II. GRADUATE ATTRIBUTES

GA's have been defined as "the qualities, skills and understandings a university community agrees its students will desirably develop during their time at the institution and, consequently, shape the contribution they are able to make to their profession and as a citizen" [3]. GA's also embody the broad concepts for employability, lifelong learning, preparation for an uncertain future, and social justice. 'Graduate Attributes seek to describe the core outcomes of higher education. In doing so, they specify an aspect of the institution's contribution to society and carry with them implicit, and sometimes explicit, assumptions as to the purpose and nature of higher education' [4]. The graduate attributes are intended to define the scope and standards for programs and provide lead to

define ProgramEducational Objectives (PEO) and Program Outcomes (Program Learning Outcomes). Quality assurance in higher education relies heavily on Graduate Attributes (GA).

GA's are relevant to the discipline. Concerns and needs of the society and stakeholders are also reflected in GA's. They are designed in such a way that they are also consistent with modern theories of learning and emphasize the development of higher levels of learning [5]. GA's may be specified for Science/Humanities/Medical/engineering stream graduates and so on. Universities/Institutions may design the GA's, keeping in view the needs and requirements of the stake-holders. Thus, involvement of stake-holders – students, parents, industry, alumni, society, government – is essential for defining the GA's. Thus, GA's can address the present needs and be futuristic as well.

Another important consideration for students to succeed in the present times is to acquire 21st century skills, as for instance, critical thinking, problem solving, reasoning, analysis, interpretation, synthesizing information, innovation, creativity, leadership, entrepreneurialism, and so on [6]. These skills are highly important for employability. GAs are designed so that they help to inculcate these skills among the students and, thus, enhance employability.

GAs may be generic or specific to a particular discipline (Physics, Chemistry, Biology, etc.) Below are given illustrative examples of Generic Graduate Attributes (GGA) for Science and Engineering.

a) Generic Graduate Attributes for Science

- Acquire knowledge (conceptual, theoretical and practical) specific to chosen area of study
- An understanding of the scientific method of evidence based knowledge acquisition, deduction/induction; problem solving, critical thinking, analysis and the ability to discover new knowledge.
- Ability to acquire, develop, employ and integrate a range of technical, practical and professional skills, in appropriate and ethical ways autonomously and collaboratively
- Ability to communicate effectively with various forms of communication in different environments
- Ability to think and work creatively, including the capacity for self-starting, and the ability to apply science skills to unfamiliar applications.
- Ability and motivation for life long learning
- An awareness of the role of science within a global culture and willingness to contribute to the societal issues and welfare.

b) Generic Graduate Attributes for Engineering

GGA as defined for National Board of Accreditation [7] are reproduced below:

- *Engineering knowledge***:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- *Problem analysis:* Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- *Design/development of solutions:* Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- *Conduct investigations of complex problems:* Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- *Modern tool usage:* Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- *The engineer and society:* Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- *Environment and sustainability*: Understand the impact of the professional engineering
- solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- *Ethics:* Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- *Individual and team work:* Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- *Communication:* Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- *Project management and finance:* Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- *Life-long learning:* Recognize the need for, and have

the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

GGA may be defined similarly for other disciplines, humanities, nursing, music, and so on. Institutes always try to achieve these to demonstrate the abilities, knowledge and skills of their students. GGA form the basis of Outcome-based Education Model (OBEM).

III. LEARNING OUTCOMES AND QUALITY IMPROVEMENT

OBE model emphasizes learnings of the students and their demonstration. Learnings may be specified at the program(B. Tech., B.Sc., MBA, M.A, B.A…..) level and course level. GA attributes are realized by defining Learning Outcomes (LO) for the program and course. Learning Outcomes reflect essential knowledge, skills, attitudes and behavior, which a student should acquire and demonstrate on completion of the program/course. GAs and Learning Outcomes (LO) have strong implications for curricula design, implementation, assessment and evaluation practices. These play very significant role in the implementation of the university curricula and ensuring quality.

Program consists of several courses to achieve program outcomes. Each course has Learning outcomes, Course Learning Outcomes (CLO). CLOs are formulated for each course. These CLOs are measureable and mapped to PLOs. This mapping is used as part of the process to provide a quantitative measurement of the attainment of PLOs. As the courses are delivered and implemented by the faculty, so ensuring the attainment of CLOs is the direct responsibility of the teacher. CLOs help to attain PLOs and hence the success of the program. Faculty is involved in (with inputs from other stake-holders, of course):

- Defining Curriculum Objectives and writing PLOs, keeping in view the GA
- Design of Curriculum and course contents
- Preparing Course Learning Outcomes
- Selecting Teaching and Learning Activities
- Designing Assessment Tasks
- Using an appropriate outcome-based Assessment Tools
- Ensuring attainment of CLO
- Assuring improvement in the attainment of CLOs and PLOs

[N.B.: PO or PLO are same; similarly CO and CLO].

It is the faculty, which teaches courses and implements the various assessment tools. Commonly assessment tools used to assess course learning outcomes are: Mid Term Exam, Final Written Exam, Short Article, Team Project, Oral Discussions, Lab work, Presentations, Seminars, Reports, Tests and Quizzes, Student Portfolio, and so on. Attainment of CLOs and PLOs may be estimated using the relevant tools in an appropriate fashion by the teachers.

Effective implementation of OBEM processes and KPI lead to continuous quality improvement. For this, the program must have a documented process for the periodic review of the PEOs, PLOs and CLOs. The improvement in the PEOs and the PLOs need to be aimed at and validated with proper data and documentation. Modifications in the program curriculum, course delivery and assessment brought in from the review of the attainment of the PEOs and the PLOs enable to ensure continuous improvement.

IV. EDUCATIONAL ACCOUNTABILITY

Educational Accountability is the acceptance of responsibility for conducting academic, co-curricular and extra-curricular activities so that the system and its outcomes are evaluated and improved [8]. Most common forms of educational accountability use measures such as checklists of the process or assessments of student performance. The content of measures of student performance focus on various student learning outcomes (such as what students should know and do at various levels, or percentage of students graduating after qualifying the standard examination). However, this does not give holistic view of student learning as regards Knowledge, Skill, Attitude, and Behaviour. This need be assessed continuously by relevant assessment tools.

This may be done by defining accountability in terms of LOs and their attainment. We define Accountability Index (A_i) as:

$$A_i = C/T * 100$$

where C = Course Outcome Attainment level reached
T = Target Attainment Level set.

Course Outcome Attainment level is expressed in terms of course outcomes expected for a particular course or set of courses taught by the faculty. These outcomes can be assessed using direct and indirect assessment tools. Increasing Ai would indicate 'improvement' in student performance, an outcome of faculty efforts and implementation of OBE processes and practices, thus, leading to improvement in student learnings and quality of education. A_i may serve as an index of faculty accountability.

V. REFERENCES

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The higher education landscape is shifting under neo-liberal forces that are increasingly aligning the goals of business, government and education. This shift is engendering debate around the world about the role of higher education institutions in producing employable graduates to feed national prosperity in the emerging knowledge economy. As this evolution continues, we need to consider how we enhance generic graduate capabilities as well as the disciplinary expertise of our undergraduate students.Â @inproceedings{Hill2016GraduateAI, title={Graduate attributes: implications for higher education practice and policy}, author={Jennifer. Hill and Helen Walkington}, year={2016} }. Jennifer. Hill, Helen Walkington.