

Adapting Learning Outcome Framework using Blooms Taxonomy

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Abstract— Higher technical education is being revolutionized. National and international accreditation processes have posed challenges on conventional teaching learning process in higher education. As per Washington accord it has become mandatory to focus on programme outcome while framing course outcome along with mapping, assessing and attaining their outcome. Teaching faculties find difficulty in framing effective and fruitful course outcome. Various effective instructions, tools and techniques for framing course outcome of engineering courses are presented in this paper. Attributes of Bloom's taxonomy and guidelines of using it for adapting new outcome based education framework are also discussed. An innovative but simple model for framing to evaluation process is presented which can help to maximize overall attainment of programme educational objectives and programme outcome in various engineering disciplines.

Keywords— *Bloom's Taxonomy; outcome based education; course outcome; programme educational objectives; programme outcome; outcome based education*

I. INTRODUCTION

Higher education institutions call for to comply with government mandates to attain accreditation. On measures of student learning and performance, many private and public institutions are implementing learning assessments and surveys to judge the value added by higher education. Recently All India Council for Technical Education (AICTE), the governing and regulatory body of engineering education in India has also given guidelines for examination reforms [1] for achieving Outcome Based Education (OBE). It is suggested to use Blooms Taxonomy for framing and assessing learning outcomes. Learning involves far more than reasoning and thinking skills (Cognitive domain), it involves the whole personality- feelings, emotions, values, attitudes (Affective domain) and even physical skills like writing, performing experiments, taking accurate reading and making models (Psycho-motor domain). We may deduce that learning is not limited only to the classrooms but we also learn at diverse locations while we interact with our friends, colleagues and others [2]. Academic performance is concerned with the quantity and quality of learning attained in a course subject or group of courses after a long time of instruction. To improve the quality of teaching learning process it has become imperative to set objectives, outcome of a course delivery, assess and evaluate them.

Members of Washington Accord (WA) set for degree level institutes accreditation method follows outcome based model. The country that wants to be a signatory constituent of a multinational pact for the mutual recognition of engineering degrees, i.e. WA must implement OBE focuses on the objectives, outcomes of the program, requires evidence of measurement, attainment of objectives and outcomes [3]. According to this accord it has become mandatory to focus on all twelve Programme Outcomes (PO) while framing them. POs as prescribed by NBA [4] are based on four dimensions of knowledge, skills, behavior, values and attitudes. As PO has to satisfy all these four dimension, its attainment level can be enhanced if thought is given while framing course objectives itself. Generally at present COs are framed passively based on only two dimensions of knowledge and skills which covers only 3-4 POs. Other POs are considered to satisfy through co curricular and extracurricular activities as a separate element. This strategy results in weak attainment levels of POs and PEOs. Assessments of remaining POs out of twelve and dimensions like behavior, values and attitudes are well observed through performing co-curricular and extra-curricular activities are less focused while designing curriculum and conventional class room teaching. If teacher community focus all POs with their four dimensions while framing COs then not only learning outcome enhances but POs and PEOs attainment levels also escalate resulting in to enhanced overall quality of education. It has recommended in national board of accreditation (NBA) training material that [5] COs need to based on Bloom's taxonomy which is three dimensional enforcing involvements of hand, heart and head of students in learning processes. If this three dimensions of Bloom's Taxonomy or four dimensions of POs are focused in the beginning stage of framing COs itself then whole process of framing, mapping, selecting tools for assessment, evaluation and finding attainment becomes simple. This can also help in enrichment of attainment levels of overall teaching learning process, PEO and PO. A novel model for this is presented in this paper. In section II key features of original and revised Bloom's Taxonomy are presented which is the basis of defining and assessing COs. Section III focuses on key features of course outcome as suggested by accreditation process in different countries. In section IV role of Blooms taxonomy in framing CO is given whereas steps for framing CO are given in section V. Section VI highlights conclusion.

II. BLOOM'S TAXONOMY

To promote higher-order thought in students learning outcome teaching faculty should use Bloom's taxonomy in framing and assessing their course outcome. Fig. 1 represents levels of Blooms taxonomy and verbs used. It helps in constructing up from lower-level cognitive skills and learning objectives into larger-scale educational goals or guidelines. In the current examination scheme, memorization occupies a foremost place. The recall of realistic knowledge, though essential to any examination, is only one of several key abilities to be demonstrated by the graduates. The assessment process must also test higher level skills like solving complex problems, apply knowledge, design, analyze, synthesize and even additional, professional skills. The aptitude to communicate; work in teams, lifelong learning has become important elements for the employability of the graduates [6]. It is important to consider appropriate weight ages to the assessment of these higher-level skills and professional competencies if adopted to use Bloom's taxonomy. In the mid-nineties Lorin Anderson, a earlier student of Bloom, reframed the cognitive domain and made some changes, by changing the names in the six categories from noun to verb forms, and slightly rearranging them as shown in Table I .

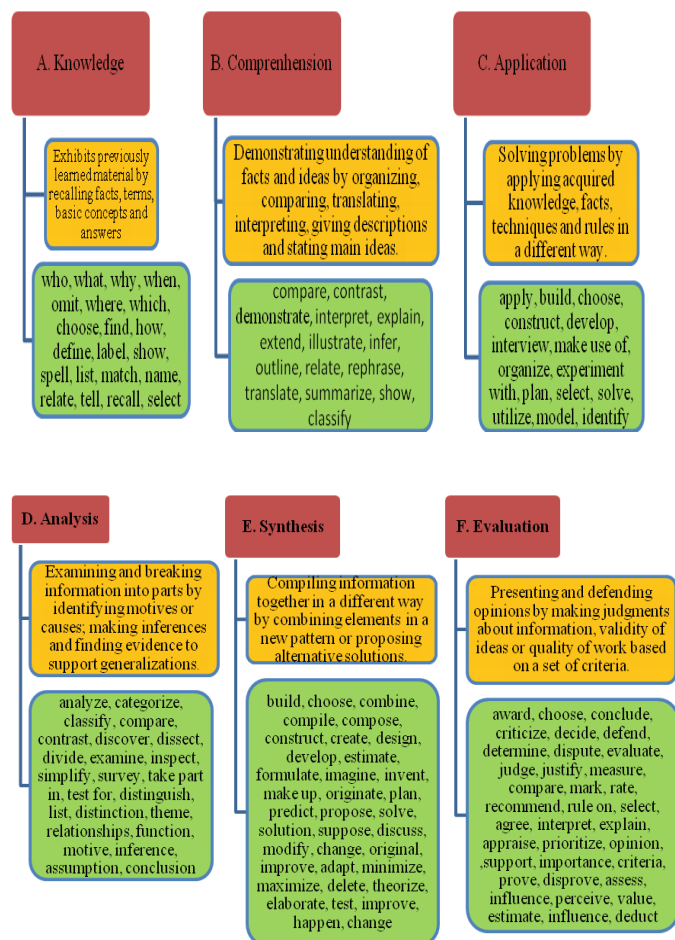


Figure 1 Six levels of original Bloom's taxonomy

Bloom's original and revised taxonomy [7] refers to a categorization of the different learning objectives in to different domains and levels. Figure 2 describes revised Bloom's. It divides the way people learn into three domains which are further divided into different levels or categories. These levels are supportive in developing learning outcomes because certain verbs are mainly appropriate at each level and not appropriate at other levels.

TABLE I

1	PO Class	knowledge	Attitude & Behavior	skills
2	Domains of Bloom's taxonomy	Cognitive	Affective	Psychomotor
3	Action	Knowing (Mental skills)	Feelings, emotions, attitude	Doing (Manual, physical skills)
4	Organ Involvement	Head	Heart	Hand
5	Categories/ levels Old Taxonomy	Knowledge, comprehension, application, analysis, synthesis, evaluation	Feelings, emotions, values, attitude	Perform, experimenting,
6	Revised Taxonomy	Remembering, understanding, applying, analyzing, evaluating and creating	Not revised	

III. FEATURES OF LEARNING/COURSE OUTCOMES

Course outcomes are narrower statements that explain what students are likely to be aware of, and be able to do after carrying out each course. [8]

1. COs framed should be Student-focused and not teacher-focused aiming at learning and not on coverage-oriented.
2. Alignment between course, program, and institutional level Course outcomes need to reflect both the objectives and

outcomes that the academic program represents as well as the broader mission of the institution as a whole.

3. Focus on abilities, central to the discipline. Course outcomes should help prepare students for what is important to the discipline of which the course is a part.
4. They focus on aspects of learning that will endure teaching.
5. COs are limited to a manageable number about 6.
6. They must specify enough and be measurable. [9]

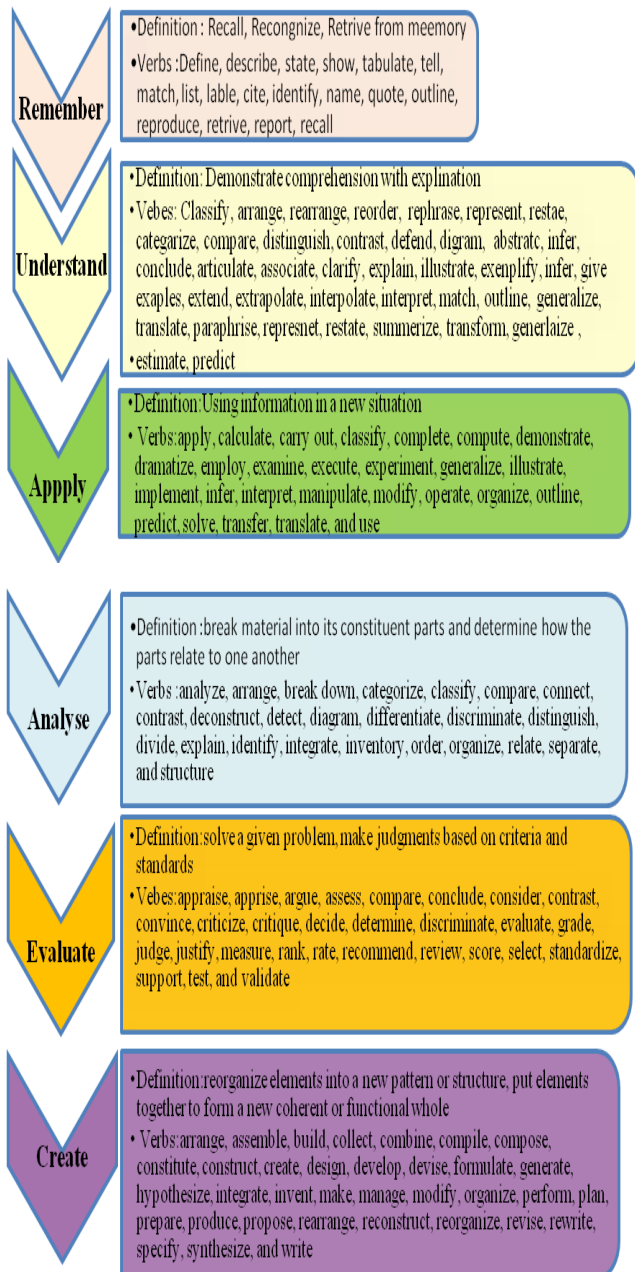


Figure 2 Six levels of revised Bloom's taxonomy

IV. ROLE OF BLOOM'S TAXONOMY IN FRAMING AND ATTAINMENT OF LEARNING/ COURSE OUTCOME

Latest technology available for a teacher plays a new role, enabling a transition from a traditional delivery of knowledge to support with the construction of knowledge. Adapting this technology the interrelationship with learners also transforms "learning *from* technology" into "learning *with* technology." In this framework, learners are using technology to support learning, rather than simply to learn the technology itself [10]. Use of Blooms taxonomy in framing and assessment of learning outcome helps to achieve those higher level skill attainments as they deal with what the student will know or be able to do. They have to be always demonstrable, observable and, where appropriate, measurable. If Blooms taxonomy is understood and referred before framing COs then faculty members get lots of benefits. Such effectively framed COs then helps to identify what is most important to teach, clarify the connections between courses and the overall coherence of the program outcome, as well as serves as the link between student success in the program and in students' later pursuits and provide demonstrable evidence of good teaching, documenting student learning success. Effective teaching plan designed on the basis of COs and Bloom's taxonomy then benefits students and enhances attainment of course and programme. It helps the students to understand what they are to know and be able to do in course or program. They help students to focus their time and energy appropriately, allowing them to more accurately understand their academic strengths and weaknesses in order to improve on areas of weakness [11]. Ausubel in [12] well thought-out that meaningful learning can radically and absolutely affect learners who are capable of achieving self-growth. The CO framing and teaching plans designed implementing different domains of Blooms Taxonomy thus helps teacher in investigating how education and technology can integrate into meaningful learning through an actual instructional process [13].

V STEPS OF FRAMING CO

All courses in a particular programme would have their own course outcomes. These COs need to be designed based on the requirement of the POs. Each CO needs to be mapped to a relevant PO and they are mapped to the PEOs. It is important to ensure that the student is able to acquire the knowledge or skill required [15]. It is necessary for institutes to set their programme objectives and outcome to cover up all these aspects. The department or programme cannot imbibe all these values on larger scale unless they are included in course objectives by majority of faculty members in the department. General practice adopted presently is to think co-curricular and extracurricular activities as a means to assess and attain programme outcomes based on skills, behavior, values and attitude aspects. However we need to frame course outcome based on Blooms Taxonomy. It will help us to cover all four dimensions of PO. Frame COs as per the steps shown in figure 3.

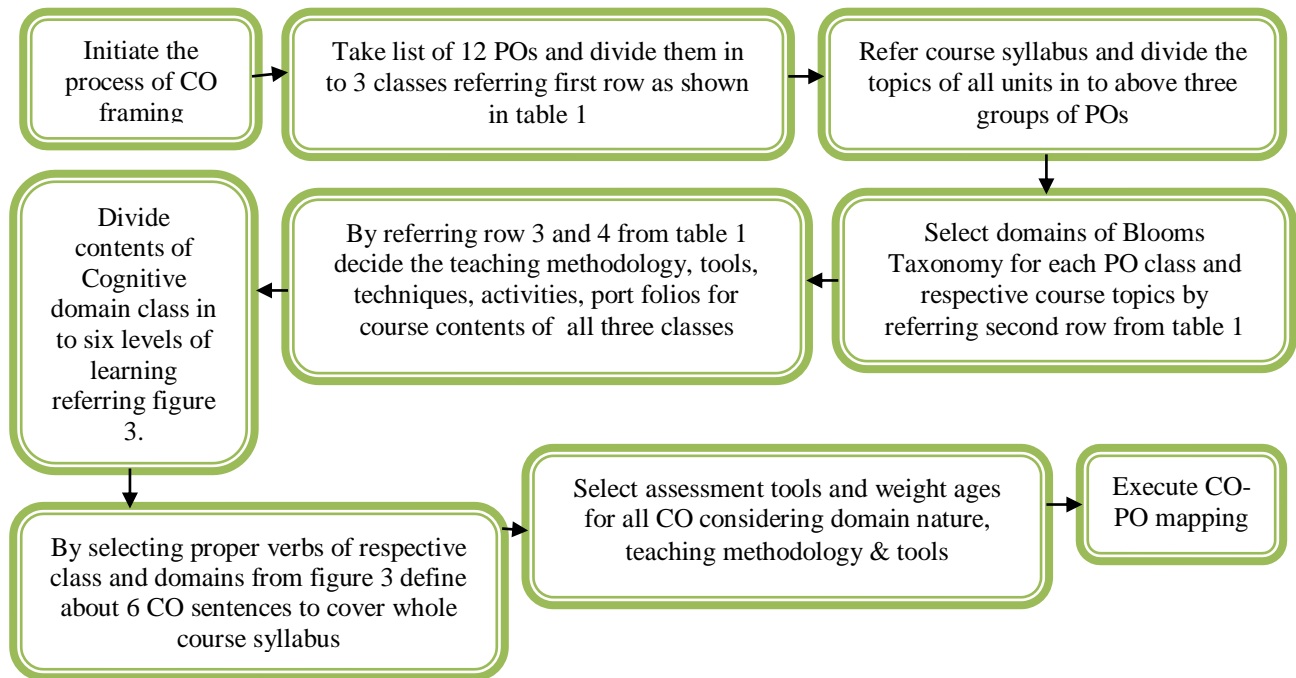


Figure 3 Steps of CO framing

CO framed using those steps brings strong mapping with programme outcomes as defined in accreditation process and result in to improving over all quality of learning outcome.

VI. CONCLUSION

For every higher educational institute accreditation processes has posed challenges on teaching faculty to set their course outcome with target goals prior to instruction delivery and attain maximum levels of these set goals with evidences by selecting appropriate assessment tools and evaluation methods. If expected programme outcome defined by accreditation processes are divided in to sub classes using Blooms taxonomy then effective and fruitful framing of course outcome can be achieved. This can achieve maximum learning outcome and hence over all objectives of quality education as prescribed by accreditation norms. This helps to teaching faculties to play important role in enhancing standards of institute in global market.

REFERENCES

- [1] AICTE Recommendations for Examination Reforms November 2018.
- [2] Dr. Kiran Saxsena, E Content of module I from Swyam MOOC course on “learning and instruction,” March 2019.

- [3] Mangal Hemant Dhend, Vijay Nanaji Gohokar, “adaptive, cognitive and innovative tools & techniques for improving learning performance: A Case Study”, IEEE international conference proceedings on innovation and technology in education of educational Technology, Thaper University, Patiala University, Punjab, ISBN_ 978-1-4799-82240, December 2014, pp. 51-57.

- [4] National Board of Accreditation, Manual For UG engineering programmes (Tier-ii), January 2013.

- [5] National Board of accreditation orientation workshop on “outcome based accreditation” training text material for phase-I & phase-II workshops.

- [6] Shuman, L. J., Besterfield-Sacre, M., and McGourty, J., *The ABET “Professional Skills”- Can They Be Taught? Can They Be Assessed?* Journal of Engineering Education, January 2005, pp. 41-55.

- [7] Anderson, Lorin W., and David R. Krathwohl, eds., “ A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom’s Taxonomy of Educational Objectives,” *New York: Addison Wesley Longman, Inc, 2001.*

- [8] Dr. D.K. Paliwal, Dr. A. Koteswara Rao, Dr. S. Bhaskar Dr. A. Abudahir, Dr. S. Rajakarunakaran, PPT on Outcome based accreditation: A three day workshop for evaluators/resource person.

[9] Mangal Hemant Dhend, S.K. Biradar, "Corse Outcome :A Novel model for framing, mapping, assessment and evaluation", The Indian Journal of technical education, vol. 38 no.4, Oct-Dec. 2015, pp. 17-23.

[10] D. Jonassen, J. Howland, R. Marra, and D. Crismond, *Meaningful Learning with Technology*. Upper Saddle River, NJ: Prentice-Hall, 2008.

[11] Bloom's Revised Taxonomy from document of Assessment Colorado College, <https://www.coloradocollege.edu/other/assessment/>

[12] D. P. Ausubel, *Educational Psychology, a Cognitive View*. New York: Holt, Rinehart & Winston, 1968.

[13] J. D. Novak and D. B. Gowin, *Learning How to Learn*. NewYork: Cambridge Univ. Press, 1984.

[14] Self assessment report (SAR) format for undergraduate engineering programs (tier-ii) appearing first time accreditation, June 2015.

[15] Mangal Hemant Dhend, S.K. Biradar, "Elements of quality engineering education", published in journal "The Indian Journal of Technical Education, Delhi, Sept. 2000, pp. 57 – 60.

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