

Defining Learning Outcomes of Co-curricular Activities

Integrating Desired Commonalities

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Abstract— Higher education scenario is undergoing a massive transformation, triggered by host of events. The efforts are on to recalibrate Higher Education all over the world. Paradigm shift is from teaching to learning. Realization of learning as a conscious process and importance of formal and informal learning spaces is gathering pace. It has been felt that need is to make learning tangible and measurable. Defining outcome of the courses and programmes are the part of Outcome Based Education, but formal and core courses target cognitive and psychomotor domain in Engineering curriculum but affective domain still remains untouched. The affective domains can be taught and learned through informal learnings. This paper will throw light upon the efforts of defining the co-curricular activities which, inculcates affective domain in a more robust manner. The precise and tangible outcome in the activities mostly related with affective domain are termed as Activity Learning Outcome (ALOs). The activities which can be the part of teaching – learning methodology like blogging and virtual labs or cooperative teaching and industrial visits, have well-articulated outcomes in sync with Bloom’s Taxonomy. The paper will discuss the desired commonalities and its manifestation in the Activity learning outcomes (ALOs) for education giving impetus to systemic or holistic thinking, the assimilation of different perspectives, skills such as critical thinking, interpersonal relations and communication, and finally different attitudes and values.

Keywords—Activity Learning Outcomes, affective domain, holistic education,

I. INTRODUCTION

With the aim to discuss the desirability of commonalities that initiated the chalking down of Activity Learning outcomes (ALOs) in one of the premier institute of Gujarat, India trying to give impetus to systemic or holistic thinking; the assimilation of different perspectives; skills such as critical thinking, interpersonal relations and communication; and finally, positive attitude and solid values among other attributes, this paper will dwell on the concepts of OBE as adopted by the university..

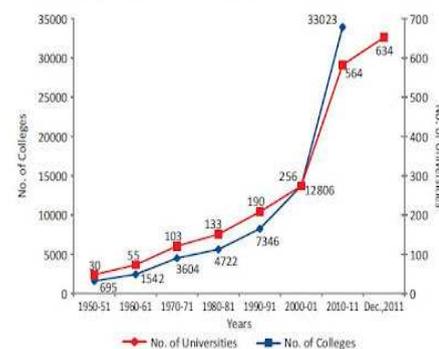
A.Premise

Issues And Concerns

India has seen a revolution in terms of setting up of HEIs. The do-it-yourself policies and mechanisms to set up higher education institutions have created Edu-topia, whereas the massification and industrialization have somehow lowered the education standards and quality of the teaching-learning process. Research has taken a back seat. Scholarship is wanting and the spirit of enquiry is less perceptible.

We are producing graduates in thousands but the other side of picture is not bright. The job market is flooded by incompetent students having degrees but not essential skills.

Growth of Higher Education Institutions



Source : MHRD / UGC

Fig:1. Source <http://www.dreducation.com/2013/08/data-statistics-india-student-college.html> (UGC/MHRD)[1]

A recent report published in a leading newspaper put the figure somewhere between a fifth to a third of the million students which after graduating out of India’s engineering colleges run the risk of being unemployed [2]. Various reports /surveys of higher professional educations were undertaken to study the root cause of rising unemployability rate among qualified students. The results were astounding. The much required skills are soft skills including critical thinking, empathy, and integrity than hard skills. One survey(1999)

mapped employers' satisfaction for graduates job skills which are desired by the them for hiring. Skills are categorized into four main factors, that is specific skills, core skills, personal characteristics, and communication skills under which skills like ethics, Critical thinking, ability to adopt to changing technology and so on [3] –

Specific Skills	Core Skills	Personal Characteristics	Communication Skills
<ul style="list-style-type: none"> • Database knowledge • Spreadsheet knowledge • Word processing knowledge • Ability to adapt to changing technology • Technical skills • Mathematical skills 	<ul style="list-style-type: none"> • Self confidence • Critical thinking • Creative thinking • Interpersonal skills • Leadership skills • Experience with real world problems 	<ul style="list-style-type: none"> • Business ethics • Professionalism 	<ul style="list-style-type: none"> • Listening skills • Speaking skills • Written communication

Fig. 2: Skills under four factors

One of the detailed surveys conducted by Aasheim, Li, & Williams, on 348 IT managers talks about parameters like Communication skills, honesty /integrity, teamwork in percentage weightage. The survey emphasised upon the importance of these parameters which gives jobseeker holistic persona for professional success.

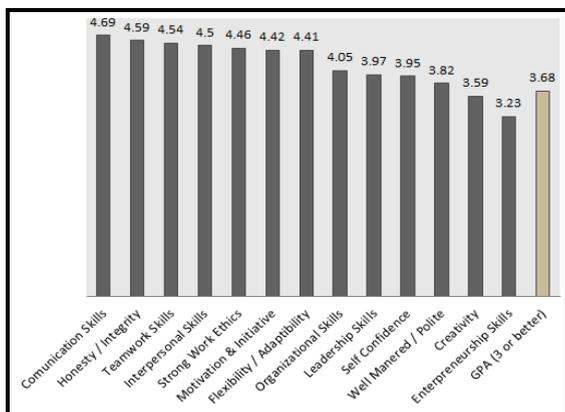


Fig. 3: Ranking of top soft-skills (Source: Aasheim, Li, & Williams, pp. 353, 2009)[4]

The need of soft skills in higher education is not new, but 21st century working places have dynamic work-culture, diversity and demands multi-tasking ability. Individuals should have attributes to adopt and adapt. The employers demand entrants to have well developed Higher Order Thinking (HOTs) but the traditional curriculum of Engineering colleges especially in India focus only on the hard skills where student passively absorb information and then write it down during the examinations. The real world requires them to be

problemsolver, adapter, team player, innovator and so on. According to Forbes magazine, top 10 jobs of 2013 required Critical thinking and higher order thinking. Various reports and working papers like that of World Bank, CII, UNESCO surveys also show need of radical changes in the curriculum to make it broader and holistic.

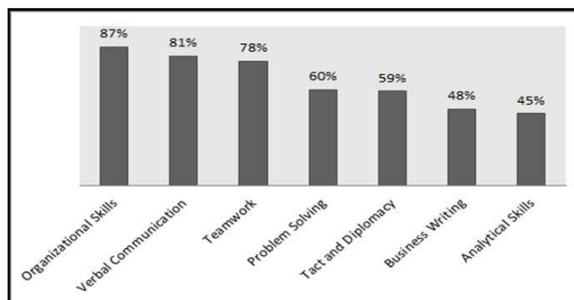


Fig. 4: Soft-skills valued by the employers (Source: R. Abbas, F. A. A. Kadir and I. A. G. Azmie, pp. 34, 2013)[5]

In a recent study by World bank - Employability and Skill Set of Newly Graduated Engineers in India done by Andreas Blom and Hiroshi Saeki put spotlight upon the need to improve the skill set of graduates namely - Soft Skills; reflection upon assessments, teaching-learning process, and curricula away from lower-order thinking skills, such as remembering and understanding, toward higher-order skills along with problem solving, as well as creativity; and understanding the local needs and demand for skills in that region [6]

Alongwith inclusion of these skills in the core curriculum, there measurability is also desirable. Some of the courses have the intent but whether the intents were achieved or not remains questionable. Thus the tangibility of the education system is desirable. The precise learning outcomes should be achieved and growing need is to restructure the pedagogy and co curricular activity. With the changing workspace the new graduates are desired to be job-ready with their affective domain well cultivated. Understanding that traditional model of education is getting digressed in its path by giving more importance to Teaching than Learning; by focusing on Lower Order Thinking skills than Higher Order Thinking Skills ; by putting stress on cognitive domain than affective domain the need is to reform the system and amalgamate the tested models of education with focus on the affective domain too.

II OUTCOME BASED EDUCATION (OBE) AS SOLUTION

Outcome based education model is amalgamation of various education model and encompass the basic spirit of education and its philosophy. More than a model, it is this philosophy that makes educationist and academician going

back to it to understand the roots of ailment of higher education system and then try to reform it through this model.

Beauty of OBE lies with its tangibility and measurable learning outcome. It is for the Programme (PO), Programme educational (PEO), Courses (CLO) respectively. A well-defined and perceptible LOs should have clear and precise objectives of a programme or course, written with clarity and accuracy describing students' knowledge, ability and skills, they will acquire after the completion of the programme or module [7]

Per Se, the Council for Higher Education Accreditation, USA reinforces the same and states that learning outcomes should be properly defined in terms of the knowledge, skills, and abilities that a student attains after their higher education experiences [8]

Within OBE there are a certain set of beliefs and assumptions about learning, teaching and the systemic structures within which activities take place. The 'competence' is defined by OBE as what students/learner learns accurately and precisely. Defining key competence of an outcomes-based education (OBE) model draws attention to the level of granularity of the outcome OBE wishes to achieve.

"Outcome-based Education" has over 369 peer-reviewed hits in ERIC Database. The philosophy is amalgamation and repository of ideas, methodology, information which are in the same pedestal but the implementation may differ. The only acid test it faces is to have measurable and specific outcome which in itself is what its propounders are working upon

III REVIEW OF RESEARCH IN TERMS OF

A. National Scenario:

The concern of dismal state of higher education in spite of having liberal policies to set up Higher Education Institutions and proactive role of national bodies like UGC and the AICTE demands to have assertive mechanism, processes and policies in place so as to deliver quality and holistic education. These bodies are aggressively pushing for the ways and means to bring about reforms in the education systems as to improve the quality of education in Indian colleges and universities. In sync with the same philosophy, the National Board of Accreditation (NBA), after a study of the best practices in education in other countries, is also looking to introduce the Outcome Based Education (OBE) system in Indian educational institutions on par with the Washington Accord, an international accreditation agreement for professional education.

The Washington Accord, set up in 1989, recognizes the equivalency of programs, to become its signatories India has to implement the OBE system in technical institutions.

B. International Scenario:

OBE was a response of American education system when in 1957 Soviet Union launched Sputnik. It made them realize the lacuna in their technical education system. OBE was an educational innovation. There was social as well as political pressure to reinvigorate the Educational system. The key focus

areas of OBE were; behaviorism, conducive environ to succeed given right time, opportunity, and mastery learning.

In spite of USA coming up with this approach, it could not incorporate the OBE model in its pure and most evolved form. Many districts adopted them in bits and pieces. The implementation faces challenge in forms of norm-referenced and standardized Tests.

OBE in Australia was welcomed and modeled after American triumph. Australia implemented it successfully in various levels and states but possibilities for reformation are still there.

With much hope OBE was introduced to South Africa in the late 1990s by the post-apartheid government as part of its Curriculum 2005 programme, but it faced resistance from several quarters. It was perceived as failure, and was eventually. Too much dependency on documentation and data crunching so as to collect and reflect upon evidences disillusion teachers. It took their energy from the teaching as well. The process of OBE is very much data driven and sometimes it sidelines the whole teaching-learning process. [9].

In December 2012, the European Commission in a very humble and candid study accepted that youth unemployment rate is around 23% across the European Union and still almost 2 million vacancies are lying vacant in wait for competent graduate. It made very clear that a radical rethinking movement and measure is to be called upon to ensure education and training systems are delivering the skills needed by the stakeholders. It calls for fundamental shift in education, with more focus on 'learning outcomes' - the knowledge, skills and competences that students acquire is required. They emphasized and stressed upon the fact that calendar- centric education is not enough to achieve the learning outcomes [10].

The Washington Accord- an international accreditation agreement for professional engineering academic degrees covers undergraduate engineering degrees under Outcome-based education approach.

Organisation for Economic Co-operation and Development (OECD) (of which India is also a member) has well defined Competence for general education and lifelong learning again focusing on the learning outcomes, and it serves as the drivers and bench mark for specific learning outcomes. According to OECD key competencies are: using tools with deftness (includes language, symbols and texts, knowledge and information, use technology interactively); Interrelating in heterogeneous groups (interpersonal relations, diversity; acting autonomously (self-aware, can plan and conduct personal projects, defend and assert rights).[11]

The competences are in sync with the attributes and levels as described in Bloom's revised taxonomy. The three knowledge domains namely Psychomotor, Affective and Cognitive are covered in the competence as suggested.

Further more, in various conferences on Higher education including Declaration of Barcelona time and again desired outcome of education in these areas: systemic or holistic

thinking; integration of different perspectives; skills that are emphasized; and how attitudes and values appear in the sets of LOs[12].

VI FRAMING LEARNING OUTCOMES

To integrate all this and to produce effective individuals having not only hard skills but soft skills too; Cognitive as well as affective understanding- Institute of Technology, Nirma University, after taking the considerations, need and demands of the stakeholder has identified the Graduate Attributes (GAs). To fulfill the GAs following Programme Objective (POs) are designed. They are:

1. an ability to apply knowledge of mathematics, science and engineering in practice
2. an ability to identify, critically analyze, formulate and solve engineering problems
3. an ability to select appropriate engineering tools and techniques and use them with dexterity
4. an ability to design a system and process to meet desired needs within realistic constraints such as health, safety, security and manufacturability
5. an ability to devise and conduct experiments, interpret data and provide well informed conclusions
6. an ability to understand the impact of engineering solutions within purview of laws, in a contemporary, global, economical, environmental, and societal context for sustainable development
7. an ability to function professionally with ethical response ability as an individual as well as in multidisciplinary teams with positive attitude
8. an ability to communicate effectively
9. an ability to appreciate the importance of goal setting and to recognize the need for life-long learning
10. To produce well informed socially responsible global citizen with sharp critical thinking skills having sound awareness about finance management, engineering laws and human rights, ethics and values. They will have intrapreneurial spirit.(Pointers from ABET and NBA)

Various think tanks on Engineering education has reaffirmed that engineers should be able to work in multidisciplinary teams and another one states that they should be sensitive to their surrounding environmental conditions in other geographical areas [13] and recognize the importance of local, national and international cooperation and should be able to have acumen to interrelate with society and the environment, locally and globally...."[14].

We understand that attributes like team playing, economic, environmental, and socially conscious engineers having solid ethics and value understanding can't be cultivated in the class room teaching which was desired in these think tanks. They emphasized "integrated approach to knowledge, attitudes, skills and values"[14] , for this we need to adopt and adapt

other pedagogical tools for teaching-learning. Not only that, several empirical studies has proved that learning also happens beyond the classrooms. These informal learning spaces by the learners, for the learners derive the knowledge through experiences. Most of these learnings are affective in nature too.

The efforts are to achieve the tangible and measurable objective of teaching- learning process. According to L Vygotsky learning precedes development and it happens in the conducive environ. His theory dwell around Environment which is conducive for social interaction , ZPD and MOK. Where ZPD is Zonal Proximal Development which is expanse one need to cover in problem solving with the help of any adult or in collaboration with more capable peers "[15], MKO- is More Knowledgeable Other, is someone with better understanding or a higher ability level than the learner, with respect to a particular task, process, or concept, it can be a teacher , mentor, facilitator, peer or colleagues

In university, teaching is the one part of whole learning process, other consist of student engagement which is provided by information reported by the students themselves, which is measured through higher-order problem-solving and meta-cognitive learning strategies through sources such as student projects, exhibitions and learning journals or logs [16].

To fully engage and challenge the learner it is important to chalk down well-defined learning outcomes. Reinforcing that learning spaces can be formal and informal - By the learner, for the learner and understanding that it happens during industrial visits, doing projects, attending MOOC courses, Student Association Activity, Interdisciplinary research projects and so on the efforts were made to chart down learning outcomes of these activities too. The aim was to have desirable educational methodologies encompassing diversity in learning environments and pedagogies, stressing on practical activities and first-hand experience, lessening the gap between the learning and real life" and a focus on local problems{ 18]

Framing ALOs

Keeping this in mind, well-articulated learning outcomes for the activities mostly co-curricular and of pedagogical context were design. The learning outcomes are in sync with Bloom's taxonomy and focus upon the Affective domain and also centers on Vygotsky's theory of learning. Some of the activities and ALOs are :

Industrial Training

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- integrate the theoretical knowledge to industrial processes/practices
- justify the need for health and safety at the workplace

- report the details of the industrial training undergone in a well compiled form
- identify the role of organisational hierarchy in industry
- identify the area of interest for further career opportunities in industry

Industrial Visits

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- value the functioning of industry and acquire related first hand information
- identify the applicable industrial processes/practices for a product/service
- compile engineering applications in industrial perspective

Expert lectures

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- extend the basic engineering fundamentals to a focussed area
- exercise thinking and understanding regarding the topic
- follow theoretical/practical experiences of experts
- use the opportunity for networking with subject experts

Student Associations Activities

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- perform interaction with professionals and establish the network
- demonstrate enhanced communication and interpersonal skills
- display leadership qualities and professionalism
- work in multidisciplinary teams with positive attitude
- share social responsibility
- organize and manage future technical and non-technical activities
- improve horizons for career advancement

Institute Elective Courses

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- Appreciate the importance of interdisciplinary studies
- comprehend the knowledge of engineering and technology in general
- extend and explore various aspects of interdisciplinary engineering and technology

- correlate and integrate other domains in the respective engineering discipline

Virtual Lab Experiments

Activity Learning Outcome:

After successful completion of the activity, student will be able to

- recognize the importance and functionality of well-established laboratories remotely and virtually
- generate and infer the results of the experiments through the interactive computer graphics interface
- enhance learning of basic and advanced topics by conducting the experiments remotely
- enrich knowledge with the help of additional learning
- visualize difficult concepts and phenomena with the help of simulation based experiments
- mimic and demonstrate the experiments with different inputs and/or different conditions easily

Blended Learning (NPTEL/MOOC/Video lecture/Web based learning)

After successful completion of the activity, student will be able to

- understand, discover and imagine the concept more clearly by audio-visual medium
- theorize and construct after viewing demos
- synthesize the new learning with the classroom learning
- practice self-learning

V CONCLUDING REMARKS

Looking back, the glorious history of education from Vedic period in India is replete with pedagogical interventions which were in sync with the philosophy of the OBE. Constructivism and problem solving has been always a part of pedagogy and andragogy since ancient time. The learning goal was always to attain highest order of learning: heuristic problem solving, metacognitive knowledge, originality which synthesizes and modifies the existing knowledge along with creativity. It reminds of the Gurukuls of ancient India where Shishya use to learn by doing, where they use to go for 'Deshatan' so as to gather and augment knowledge hands on experience [18]. The process give impetus to cognition alongwith affective domain.

This paper is exploratory in nature and reinforces the basic tenets of OBE through exploring other learning methodology. Though OBE 'happened' long back in western HEI, in India it is still a new phenomenon. But still the need is there to textualise the LOs and ALOs. The commonalities of the desired attributes in Graduates are ubiquitous and to achieve

them is unique. More inputs, efforts and approaches in future will help in the clarity and implementation of OBE in all its glory .

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