RECENT TRENDS ON OUTCOME BASED ENGINEERING EDUCATION SYSTEM

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ABSTRACT:

Learning outcomes of assessment Levels in Blooms Taxonomy is knowledge, understanding, function, study, synthesis and evaluation. This can be applied for course conclusion based education. Taxonomy of learning outcomes, writing learning outcomes (LO 's), discussion and mapping, Learning Outcomes (LO's) to program Outcomes (Po 's) and can get the attainment level. Now everyone should know in the profession of teaching, what is a learning outcome? It is nothing but defining what kind of thinking and learning will happen in your classes. Suppose you are teaching a particular subject in the group of students, you should know the subject what is your teaching in the class and what extent you have to prepare. Prepare thoroughly the subject; expect what type of questions you might face. Pose questions on you on yourself. What do you do during class? What do students do during class? What students would act at the closing stages of teaching unit? Teaching strategies like over view of revision of previous class, brain storming to start the class, simultaneous reporting, un-sequencing, think–pair-share, snowballing, questioning and trouble shooting.

Blooms Taxonomy Levels- one is knowledge (Information) Level (2) comprehension and understanding, Level (3) application (independent problem solving), level (4) Analysis (logical order, components), Level (5) synthesis (create) and level (6) evaluation (appreciation) all these six levels covers on outcome based education. How to identify the way I reached this level? What do I do at this level? How will teacher know I am at this level? What are the emblematic customs that I can exhibit my knowledge? What are the typical work products? To get solutions to these questions preparing program outcomes, course outcomes, mapping of PO's to Co's and find out the attainment level of the particular subject. This is with the help of conducting class tests, class quiz's, giving assignments, midterm examinations and final examinations.

Key Words: *course outcomes (Co's), learning outcomes (Lo's), program outcomes (Po's) and mapping*

1. INTRODUCTION:

Preparation of lesson plan according to the academic calendar of university with the use of syllabus of a particular opted. Chart out the process of starting and completion of syllabus. Act according to the course plan and note down the actual and find out the deviation why plan not met with the actual. Listing of reasons and unexpected things happened to overcome these deviations to be examined frequently with the comparison of the actual. Acquire the counteractive stroke to complete the course syllabus according to the plan by taking extra classes filling the gap of plan and actual. This is a

part of dealing with the subject (teaching part).and obtain comments from the students for updating the teaching modules.

The part two is to examine the results of students with the help of the inputs given by teachers. What is the pass percentage along with the number of students attained distinction and marginally passed? What are the reasons for not gaining 100 % results? Checking whether it is the problem of yourself or deficiency in students' quality? So eminent perfection in the subject is to be tested and to what level to come down for superior understanding of the students and focus is given on outcome based education.

Outcome based education comprise the following domains:

i) Cognitive domain (thinking, knowledge) base on awareness, intellectual capacity, appliance, study, amalgamation and assessment.

ii) Psychomotor domain (doing skills) engross acuity, set, guided answer, apparatus, adaption and company.

iii) Affective domain (feelings, attitudes) includes receiving, responding, valuing, organization and internalizing for the above achievement follow the Blooms Taxonomy and taking feedback from the students, taking the results of final examination(this also having variation sometimes exam paper is easy and sometimes paper valuation liberal) and taking the SCOT analysis(strength, challenges, opportunities, threats) and mentoring the students.

2. PROGRAM OUTCOMES:

These outcomes include the broad statements like what is the immediate action to be initiated by the student after completion of his/her education program. The program outcomes might also integrate various fields of interconnected awareness and expertise improved in the program's allotted time period with a wide range of credential outline and standards of the course designed by university/college. They represent the big picture, describe board aspect of behaviour and encompass multiple learning experiences.

The objectives of programme outcomes are:

i) Cognitive:- understanding, awareness, and insights (e.g. list and explain) this includes Information recall, conceptual understanding and trouble shooting.

ii) Psychomotor: skills with hands (eg.make the connection between the components) to build associations among the components for cyclic operations of regular work by practice like riding a vehicle

iii) Affective: attitudes, appreciation, relationships: To get output of truth and false

2.1 Definition and validation of programme outcomes

It is the results based on the knowledge for the course should fit within the overall course and program Goals. Program outcomes achieved through results of wisdom.

Program aim and goals

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Course goals

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Learning outcomes

There will be three areas of chance that includes program initiation till to its completion:

i. Cognitive domain (thinking, knowledge)

a) knowledge
b) comprehension
c) application
d) analysis
e) synthesis
f) elevation

ii. Psychomotor domain (doing, skills):

a) perception
b) Set
c) Guided response
d) Mechanism
e) Complete overt response
f) Adaption
g) Origination

iii. Affective domain (feeling, attitudes)

a) receiving
b) Responding
c) Valuing
d) organization
e) Internalizing is based on Blooms Taxonomy.

2.2 Prepared program out comes for mechanical department:

1. Graduates shall acquire and exhibit their vital awareness in mathematics, science and engineering.
2. Graduates shall have gained the experience of designing and conducting experiments and Interpretation and analysis of data thus generated.
3. Graduates have to express the essentials for improving the mechanical system or required features and needs in a specified process.
4. Graduate shall have gained the experience to recognize, prepare and crack mechanical trade issues.
5. Graduates show off their efficiency as team participant in multiple activities of course they also have to exhibit their capacity of their functioning process individually.
6. Graduates display the way of considering their professional principled errands.
7. The program outcomes show the abilities of graduates' efficiency in both verbal and written communications.
8. The graduates will build their buoyancy to pertain engineering solutions in universal and communal contexts.
9. Graduates will be capable enough to educate themselves and consider the importance of gaining knowledge in cyclical improvement in their profession.
10. The course results might also make the graduates to be familiar by way of using new tools and apparatus to analyze mechanical engineering problems.
11. Graduate shall have acquired the knowledge of project administrative and financial management.
12. The graduates shall have acquired the knowledge on physical, chemical and mechanical properties of materials, material processing and the guiding principles in their selection for a finicky claim.

2.3 Processes meant for weigh up the achievement of each PO's:

Illustrate the review process that intermittently permits and explains the extent to which the program results are obtained, also include the information on:

a) Listing and briefing the evaluation processes applied to collect information related to each program based results. Examples for collecting data might contain, with no limitations, definite assessment questions, student group within developed assessment tests, project presentations, nationally – nor mid exams, oral exams, focus groups, industrial advisory committee;
b) The frequency with which these assessment processes are carried out

2.4 Indicate result of evaluation of each Po's:

a) The likely echelon of achievement for each of the program conclusion;
b) Summarizing the illustrations for showing the extent of which the program products are obtained from process of evaluation and analysis.
c) How the results are documented and maintained

3. COURSE OUTCOMES:

3.1 Course syllabus and course plan (Include, in appendix, a syllabus for each course used):

The syllabi format may include:

- ✓ Department, course title and code
- ✓ Position as a required or elective course
- ✓ Basic Fundamentals list
- ✓ Course dealing hours and type of course (lecture, tutorial, seminar, project etc.)
- ✓ Program assessment methods (both continuous and semester-end assessment)
- ✓ Course outcomes
- ✓ Topics covered
- ✓ Textbooks, and /or reference material

3.2 The objective of Course outcomes: To identifying the knowledge skills and grown mind-set of the students during the course. It is by:

1. Naming the topic and seeking the ideas of graduates.
2. Expecting the examples for the topic from the graduates.
3. Allow the students to discuss with bench mates to get answer or idea by them 4.

Asking students to note down the data given in the problem in case of problems.

During the class time provide some time in the class room to apply the above listings.

3.3 Definition and validation of course outcomes:

Course outcomes defined as employer or professor in the field should be capable to recognize knowledge, skills and thoughts which are learned by the student and proficient to offer them after taking the course. I.e. it states knowledge, skills and attitudes the student will achieve through the course. It begins with by using

a) Change theory
b) Improved bias circuits by design

c) By demonstration of safe use of equipment its essence is to define the type and depth of learning to provide an objective bench mark for formatives, summative and prior learning assessment it is achieved by i) brain storming ii) demo/experiment/discussion and inductive teaching

3.4 prepared course outcomes for the subject Applied Thermodynamics: Here, the student:

1. Can explain about thermal power plant and its major components like boilers, steam turbine, condensers, cooling towers etc.
2. Can able to collect data from steam tables for both saturated water and steam and for tremendous heated vapour of specific volume, enthalpy and entropy.
3. Can explain mollies chart and how to read values from mollies chart.
4. can analyze the processes of steam power cycles and gas power cycles
5. can differentiate the impulse turbine reaction turbine and gas turbine
6. can solve the problems on steam and gas power plant
7. can explain various steam condensers and cooling towers
8. can explain the law of action of jet propulsion and classification of jet Propulsions and rockets
9. can solve the problems on jet propulsions

Table -1: Mapping of course outcomes with program outcomes

Course Outcomes	Program outcomes											
	PO_1	PO_2	PO_3	PO_4	PO_5	PO_6	PO_7	PO_8	PO_9	PO_{10}	PO_{11}	PO_{12}
CO_1								1			3	
CO_2	3		1					1				
CO_3			1					1				
CO_4			1					1		2		
CO_5								1		1		
CO_6								1			2	
CO_7								1		1		
CO_8								1		3		
CO_9								1			3	

Faculty should map all their course outcomes with Pos by making 1 or 2 or 3 .Three levels of attainment need to be defined (1 to 3)where level 1 is lower than level 3)

1= maps slightly 2= moderately and 3= substantially

3.5 Way of Course delivery helps in the accomplishment of the PO's: (description of course delivery modules) E.g. Lectures interspersed with discussion, asynchronous mode of interaction, group discussion; project etc., used to deliver the courses and justify the efficiency of module selection of the PO's .This may be future justified using the indirect assessment modes like course – end surveys)

4.0 Outcome Measures and Assessments :

The following steps express the way of observed and weighed students capability in reaching the desired objectives and results for this mode of program:

1. Conducting class test both in objective and descriptive
2. Assignment from each unit. Selected homework problems from the text will be assigned and collected weekly. All homework must be presented in a professional format;
3. Conducting quizzes.
4. Satisfactory conclusion of a comprehensive, end assessment premeditated to demonstrate the students ability to not only solve specific individual problems amenable to closed- form solution, integrating the several topics considered in formulating the program and solution of more complex and multifaceted thermodynamic systems.

4.1 Recorded outcome of students:

Total strength of a course group : 52

a. Total class test marks : 80 (both objective and descriptive)

Grades attained by the students : 1119

Average marks of every learner : 1119/52 =21.52

Out of 52 a few students might be absent for exam but consideration is class strength=52

Average % attained for total marks (80 marks) : 21.52/80 =26.9

b. Assignme nts

Assign-1 : 247
Avg. Marks of assgn-1 :247/52 = 4.75
Average % attained for assign-1(5marks) : 4.75/5 =95

Assign-2 : 194
Avg. Marks of assgn-1 :194/52 = 3.73
Average % attained for assign-1(5marks) : 3.73/5 =74.6

Assign-3 : 219
Avg. Marks of assgn-1 :219/52 = 4.21
Average % attained for assign-1(5marks) : 4.21/5 =84.2

Assign-4 : 45
Avg. Marks of assgn-1 :45/52 = 0.87
Average % attained for assign-1(5marks) : 0.87/5 =19.3

Assign-5 : 45
Avg. Marks of assgn-1 :45/52 = 0.87
Average % attained for assign-1(5marks) : 0.87/5 =19.3

Assign-6 : 188
Avg. Marks of assgn-1 :188/52 = 3.62
Average % attained for assign-1(5marks) : 3.62/5 =72.4

Assign-7 : 98
Avg. Marks of assgn-1 :98/52 = 1.88
Average % attained for assign-1(5marks) : 1.88/5 =37.6

c. Mid exam-1

Total class mid-1marks : 20
Grades achieved by the students : 885
Average marks of every undergraduate : 885/52 =17.02
Out of 52, only a few numbers will be absent for exam but consideration is class strength : 52
Average % attained for total marks (20 marks) : 17.02/20 =85.1

d. Mid exam-2

Total class test marks : 20
Marks obtained by the students : 770
Average marks of each student : 770/52 =14.80
Out of 52 some students may be absent for exam but consideration is class strength=52
Average % attained for total marks (20 marks) : 14.80/20 =74.0

e. total marks at the end exam

Total end exam marks : 75
Marks obtained by the students : 2608
Average marks of each student : 2608/52 =50.15
Out of 52 some students may be absent for exam but consideration is class strength=52
Average % attained for total marks (25 marks) : 50.15/75 =66.87

Table 2: Expected level of course outcomes

Types	CO_1	CO_2	CO_3	CO_4	CO_5	CO_6	CO_7	CO_8	CO_9		From data
Test-1	25	25				25			25	100	26.90%
Asign-1	50	50								100	95.0%
Asign-2	50	30	10	10						100	74.60%
Asign-3	25		50	15		10				100	84.20%
Asign-4	25	25			50					100	19.30%
Asign-5	25	25			50					100	19.30%
Asign-6	25					25	50			100	72.40%
Asign-7				25	25	50				100	37.60%
Mid-1	30	20	25	25						100	85.1%
Mid-2					20	20	30	20	10	100	74.0%
End Exam	15	15	10	10	10	10	10	10	10	100	66.87%

Total	270	190	95	85	155	140	90	30	45	

Table-3: Match percentage of course outcomes:

Types	CO_1	CO_2	CO_3	CO_4	CO_5	CO_6	CO_7	CO_8	CO_9		from data
Test -1	6.72	6.72				6.72			6.72	100	26.90%
Assign- 1	47.5	47.5								100	95.0%
Assign- 2	37.3	22.38	7.46	7.46						100	74.60%
Assign-3	21.05		42.1	12.63		8.42				100	84.20%
Assign -4	4.82	4.82			9.65					100	19.30%
Assign-5	4.82	4.82			9.65					100	19.30%
Assign-6	18.1					18.1	36.2			100	72.40%
Assign- 7				9.4	9.4	18.8				100	37.60%
Mid -1	25.5	17.02	21.3	21.3						100	85.1%
Mid -2					14.8	14.8	22.2	14.8	7.4	100	74%
End Exam	10.03	10,03	6.68	6.68	6.68	6.68	6.68	6.68	6.68	100	66.87%
Total (A)	175.84	113.29	77.54	57.47	50.18	73.52	65.08	21.48	20.8		

Divide(A)by	270	190	95	85	155	140	90	30	45	61.0%
Outcome	65.12	59.6	81.6	67.6	32.3	52.5	7 2.3	71.	46.23	

The attainment level of course outcome is=
65.12+59.6+81.6+67.6+32.37+52.53+72.3+71.6+46.23)/9 =548.91/9=61.0%.

Overall CO's attainment shows the attainment in the particular course is not up to the mark and the corresponding faculty has to set new measures to overcome their negatives and get ready for next year.

Table 4: Course outcome matched %age with program outcomes.

CO's	**PROGRAM OUTCOMES**											
	PO_1	**PO_2**	**PO_3**	**PO_4**	**PO_5**	**PO_6**	**PO_7**	**PO_8**	**PO_9**	**PO_{10}**	**PO_{11}**	**PO_{12}**
CO_1								65.1			65.1	
CO_2	59.6		59.6					59.6				
CO_3			81.6					81.6				
CO_4			67.6					67.6		67.6		
CO_5								32.3		32.3		
CO_6.								52.5			52.5	
CO_7								72.3		72.3		
CO_8								71.6		71.6		
CO_9								46.2			46.2	

5.0 Development measures to improve attainment level:

- Collection of opinions from the students at initial and end situation of a semester would help a faculty to strengthen their abilities. 360^0 feedback has been used by learning and development professional for many years to help individuals and organizations to perk up their performance and effectiveness.
- Prepare subject material of both descriptive and objective from each unit. Minimum questions five and minimum objective questions fifteen.
- Use power point presentations to explain clearly with good clarity by LCD/LED projectors.
- Show animations of the topic by using internet and
- Get expert faculty material from NPTEL-IIT professors.
- Use charts and tables for easy and fast calculations.
- Scope for future development in education system.
- IIT Mumbai already started e-learning course programs and online teaching of various subjects. Various subject lecture material available in web sites. Many animations related to the topic available through you tube.
- Scope to develop by watching Video lectures from NPTEL (National Programme on Technology Enhanced Learning) of various IITs like IIT-Madras, IIT-Bombay, IIT-Kanpur, IIT-Kharagpur, IIT-Delhi, IIT-Guwahati

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