
ABSTRACT

In general whatever may the field outcome is measured with respect to the given input and expressed in terms of efficiency of the system ,to know whether the system is working up to the expectation or not with desired output. If the output is not up to the mark or expectation ,it indicate that there is something wrong or problem with the system and the system is required for further analysis to rectify the problem. It is giving the scope to find out the solution to the problem. Recent changes with the technology, availability of internet facility, computer animation there is a need to change the quality measures in class room teaching also. Now days it becomes important issue of giving quality education in the classroom and its attainment level in that subject for assessment of the quality education. This paper focussed on how the assessment is applied to measure the outcome quality of Teaching. What is the program? What are the programme outcomes (Po's) and course outcomes (Co's)? How course outcomes mapped with the program outcomes? Finding attainment level in the subject of concern faculty and what are the areas are lacking to take the corrective measures for further improvement with the enhanced teaching methods and techniques.

KEYWORDS: outcome based education, quality parameters, course outcomes (Co's), learning outcomes (Lo's), program outcomes (Po's) and mapping.

INTRODUCTION

In the system of education there will be a examination pattern to find out the capability of the student by conducting examination in each subject. In this pattern the output is measured for each student in each subject of input marks say 100 and output marks are given as per ability based on exam in each subject and the final result will be expressed in terms of percentage or by grading. If the level of the student scored above 70%an average it will be graded as distinction, in between 60 to 70 is first class, 50 to 59 is second class and less than 50 is third class or else graded as A, B, C, D For measuring the quality of teaching and methods to measure the quality of class room teaching is very difficult. It is only by the feedback from the students and by the examination result of the subject. Other then this there is no exact measuring stick for teaching outcomes except conducting the increased frequency of no. of examination like Mid-1, Mid-2, pre-final for quality improvement from the students side.

Now a day there is a rating for the Institutes based on the infrastructure, laboratory facilities and qualified sufficient availability no.of teaching faculty with the Institute. The reorganization of the institute is by the inspection of the concern bodies like AICTE, UGC etc., and accreditation by NBA(National board accreditation) and ,NAAC(National assessment and accreditation council) so based on rating fee structure is decided for the institutes this the one of the way of measuring the quality of Institute. The another way to measure the quality of institute is with the existing qualified faculty with Ph.D qualification, no.of years of teaching experience with eligible criteria for professors, Associate professors and Assistant professors as per student faculty ratio. If any Institute is failing to maintain the ratio, it indicates that institute not up to the quality standard. Recent Quality measure of the faculty is not only by the qualification and experience but also rating of API index. (Academic performance index)API index is based on achievement of faculty like how many papers published (National/International Journals), how many papers presented in the conferences(National/International) and how many conferences, seminars/workshops attended.

Take the syllabus of the subject given by the university and prepare the lesson plan as per the calendar of the university. Plan the lessons when to start, when to complete the syllabus. Act according to the course plan and note down the

actual and find out the deviation why plan not met with the actual. What are the reasons? What unexpected things happened, how to overcome these deviations this to be examined frequently with the comparison of the actual. Take the corrective action to complete the course syllabus as per the plan by taking extra classes filling the gap of plan and actual. This is one part of the teaching the subject and and at the same time take feedback from the students for self assessment for further modification of teaching style.

Another part is to the given input by us check the out put from the students , examine what is the output (attainment level) of the students? What is the pass percentage? How many students are getting distinction? How many students are marginally passed? Why 100 % results not achieved? What are the reasons? Is it the problem of yourself or lack of quality of the students? So quality improvement in the subject is to be examined and to what level to come down for better understanding of the students and focus is given to assess the outcomes achieved by the students to find the attainment level of the faculty in that subject.

OUTCOME BASED EDUCATION

In a traditional education system, students are given grades and rankings compared to each other. Content and performance expectations are based primarily on what was taught in the past to students of a given age. The goal of traditional education was to present the knowledge and skills of an older generation to the new generation of students, and to provide students with an environment in which to learn. The process paid little attention (beyond the classroom teacher) to whether or not students learn any of the material

The outcome of education should be assessed in the context of its agreed objectives. Out comes that encompass knowledge, skill and attitude linked to national goals for education and positive participation in society. Outcome based statements that translate those goals in to measurable objectives. They are more easily expressed in terms of academic achievement like class tests, grades but popularly in terms of examination (mid exams, end exam) performance though way of assessing creative and emotional development as well as changes in values, attitudes and behavior have been considered. When outcomes have been established, educators should design curriculum to give students the knowledge and skills they need to demonstrate the outcomes. In many cases the outcomes will be such that they can be assessed only with performance assessment, not conventional tests, so Finally, educators need to examine every other aspect of the operation to determine what changes are needed in grading policies, for example—to insure that larger numbers of students will in fact be prepared to demonstrate the outcomes

Outcome based education paradigm (1994) is based on the three premises and four principles. The premises are:

1. All students can learn and succeed but not on the same day and not in the same way;
2. Successful learning promotes even more successful learning; and
3. Schools control the conditions that affect directly affect successful learning.

The four “power principles” are:

1. Clarity of focus on culminating outcomes of significance;
2. Expanded opportunity and support for learning success;
3. High expectations for all to succeed; and
4. Design down from your ultimate, culminating outcomes.

According to the Turning methodology, learning outcomes are statements of what a learner is expected to know, understand and able to demonstrate after completion of a learned course. Harvey and Green (1993) argued that there could be five discrete interrelated way of thinking about quality. Harvey (1995) provides the following brief overview of five categories

- a) Exceptional view of quality
- b) Quality as perfection
- c) Quality as fitness for purpose
- d) Quality as value of money
- e) Quality as transformation

The perception and suggestion of different direct /internal concerned with an institute of higher education is by

- a) Faculty feedback form
- b) Supporting staff feedback form
- c) Students feedback form
- d) Alumni's feedback form
- e) Parent feedback form
- f) Superannuated Teachers feedback form

Bloom's taxonomy is a way of distinguishing the fundamental questions with the education system. Outcome based education comprises the following domains

- i) Cognitive domain (thinking, knowledge) which is based on knowledge, comprehension, application, analysis, synthesis and evaluation.
- ii) Psychomotor domain (doing skills) which involves perception, set, guided response, mechanism, adaption and organization.
- iii) Affective domain (feelings, attitudes) which involves 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

over view of out come based education

Outcome based education (OBE) is an educational theory that bases each part of an educational system to reach the course outcomes. At the end of the educational course each student should have achieved the goals. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes. Outcome-based methods have been adopted in education systems around the world, at multiple levels. Australia and South Africa adopted OBE policies in the early 1990s but have since been phased out. The United States has had an OBE program in place since 1994 that has been adapted over the years. In 2005 Hong Kong adopted an outcome-based approach for its universities. Malaysia implemented OBE in all of their public schools systems in 2008. The European Union has proposed an education shift to focus on outcomes, across the EU. In an international effort to accept OBE the Washington Accord was created in 1989; it is an agreement to accept undergraduate engineering degrees that were obtained using OBE methods. As of 2014 the signatories Australia, Canada, Taiwan, Hong Kong, India, Ireland, Japan, Korea, Malaysia, New Zealand, Russia, Singapore, South Africa, Sri Lanka, Turkey, the United Kingdom and the United States.

QUALITY PARAMETERS

NAAC, 2008 has provided a detailed list of criteria that may be used for setting quality parameters – statistics indicators and bench marks; the criteria are grouped in to seven groups namely

1. Curricular aspects
2. Teaching learning and evaluation
3. Research, consultancy and extension
4. Infrastructure and learning resources
5. Student support and progression
6. Governance and leadership
7. Innovative practices

Recently UGC has circulated the regulation on minimum qualification for the teachers and other academic staff governing selection, appointment and promotion of teachers etc., and maintenance of standards in the institutions for higher learning put together those documentation can be very helpful in setting the quality parameters for outcome of higher education

PROGRAM OUTCOMES

These are broad statements of what student will know and able to do immediately after they graduate from a program. They incorporate many areas of interrelated knowledge and skill developed over duration of the program through a wide range of credential frame work and program standards set by college/university. 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 (eg: list and explain) this includes Information recall, conceptual understanding and problem solving

To recall the information, understanding and problem solving

ii) Psychomotor: skills with hands (eg. make the connection between the components)

To make connections between 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

Definition and validation of programme outcomes

It is the Learning outcomes for the course should fit within the overall course and program

Goals. Program outcomes achieved through learning outcomes

Program aim and goals



Course goals



Learning outcomes

For successful completion of the program from beginning of programme to completion of the program falls in to three possible categories (domains)

i. Cognitive domain (thinking, knowledge)

ii. Psychomotor domain (doing, skills):

iii. Affective domain (feeling, attitudes)

Prepared program out comes for mechanical department

1. Graduates shall acquire and demonstrate basic knowledge 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 will demonstrate the ability to develop a mechanical system or a process with desired specifications and requirements.
4. Graduate shall have gained the experience to identify, formulate and solve mechanical engineering problems.
5. Graduates will demonstrate the ability to function effectively individually, also as a team member in multidisciplinary activities.
6. Graduates will demonstrate an understanding of their professional ethical responsibilities.
7. Graduates will be able to communicate effectively in both verbal and written forms.
8. Graduates will have the confidence to apply engineering solutions in global and societal contexts.
9. Graduates will be capable of self-education and clearly understand the values of lifelong learning in continuing professional development.
10. Graduates will be familiar with modern tools and equipment 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 particular application.

Processes used for assessing the attainment of each PO's

Describe the assessment process that periodically documents and demonstrates the degree to which the program me outcomes are attained, also include information on:

a) Listing and description of the assessment processes used to gather the data upon which the evaluation of each the program me outcomes is based.

Examples of data collection process may include, but are not limited to, specific exam questions, student portfolios, internally developed assessment exams, project presentations, nationally –nor med exams, oral exams, focus groups, industrial advisory committee;

b) The frequency with which these assessment processes are carried out

Indicate result of evaluation of each Po's

- a) The expected level of attainment for each of the program outcomes;
- b) Summaries of the results of the evaluation processes and an analysis illustrating the extent to which each of the program me outcomes are attained
- c) How the results are documented and maintained

COURSE OUTCOMES

5.1 Course syllabus and course plan

(Include, in appendix, a syllabus for each course used)

The syllabi format may include:

Department, course number, and title of course

Designation as a required or elective course

Pre-requisites

Contact hours and type of course (lecture, tutorial, seminar, project etc.)

Course assessment methods (both continuous and semester-end assessment)

Course outcomes

Topics covered

Textbooks, and /or reference material

The objective of Course outcomes

To identifying the knowledge skills and attitudes gained by the students during the course. It is by

1. Naming the topic and seeking the ideas from the students
 2. Expecting the examples for the topic from the students
 3. Allow the students to discuss with bench mates to get answer or idea by them
 4. Asking students to write the data given in the problem in case of problems.
- Allot the time for few minutes for the above in the class during the course.

Definition and validation of course outcomes

Course outcomes defined as employer or professor in the field should be able to identify what knowledge, skills and attitudes gained by the student and able to offer them after taking the course. i.e it states knowledge, skills and attitudes that the student will gain 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

prepared course outcomes for the subject Applied Thermodynamics

1. Student can explain about thermal power plant and its major components like boilers, steam turbine, condensers, cooling towers etc.
2. Students can able to collect data from steam tables for both saturated water and steam and for super heated steam of specific volume, enthalpy and entropy.
3. Student can explain mollies chart and how to read values from mollies chart.
4. Student can analyze the processes of steam power cycles and gas power cycles
5. Students can explain the difference between impulse turbine reaction turbine and gas turbine
6. Student can solve the problems on steam power plant and gas power plant
7. Student can explain various steam condensers and cooling towers

8. Student can explain the principle of operation of jet propulsion and classification of jet Propulsions and rockets
9. Student can solve the problems on jet propulsions

Table -1: Mapping of course outcomes with program outcomes

cos	Program outcomes											
	po1	po2	po3	po4	po5	po6	po7	po8	po9	po10	po11	po12
Co1								1			3	
Co2	3		1					1				
Co3			1					1				
Co4			1					1		2		
Co5								1		1		
Co6.								1			2	
Co7								1		1		
Co8								1		3		
Co9								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

How a mode of delivery of courses helps in the attainment of the PO's

(Describe the different course delivery methods/modes)

eg: Lectures interspersed with discussion, asynchronous mode of interaction, group discussion, project etc., used to deliver the courses and justify the effectiveness of these methods for the attainment of the PO's .This may be future justified using the indirect assessment methods such as course –end surveys)

OUTCOME MEASURES AND ASSESSMENTS:

Student progress in achieving the desired objectives and outcomes for this course module will be monitored and measured through the use of the following:

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 completion of a comprehensive, final examination designed to demonstrate the students ability to not only solve specific individual problems amenable to closed-form solution, but also to be able to integrate the many topics covered in the course in the formulation and solution of more complex and multifaceted thermodynamic systems.

Recorded outcome of students:

Total no.of students in the class

: 52

a. Total class test marks

: 80 (both objective and descriptive)

Marks obtained by the students

: 1119

Average marks of each student

: $1119/52 = 21.52$

Out of 52 some students may be absent for exam but consideration is class strength=52

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

b. Assignments

Assign-1

: 247

avg. Marks of assign-1 :247/52 = 4.75
 Average % attained for assign-1(5marks) : 4.75/5 =95
 Assign-2 : 194
 avg. Marks of assign-1 :194/52 = 3.73
 Average % attained for assign-1(5marks) : 3.73/5 =74.6
 Assign-3 : 219
 avg. Marks of assign-1 :219/52 = 4.21
 Average % attained for assign-1(5marks) : 4.21/5 =84.2
 Assign-4 : 45
 avg. Marks of assign-1 :45/52 = 0.87
 Average % attained for assign-1(5marks) : 0.87/5 =19.3
 Assign-5 : 45
 avg. Marks of assign-1 :45/52 = 0.87
 Average % attained for assign-1(5marks) : 0.87/5 =19.3

Assign-6 : 188
 avg. Marks of assign-1 :188/52 = 3.62
 Average % attained for assign-1(5marks) : 3.62/5 =72.4
 Assign-7 : 98
 avg. Marks of assign-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
 Marks obtained by the students : 885
 Average marks of each student : 885/52 =17.02
 Out of 52 some students may 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	Co1	Co 2	Co 3	Co 4	Co 5	Co6	Co 7	Co8	Co9		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	Co1	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

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

2.Overall Co's attainment shows the attainment in the particular course is not up to the mark and the concerned faculty needs to plan remedial measures and he has to improve the overall attainment in the next year.

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

cos	Program outcomes											
	po1	po2	po3	po4	po5	po6	po7	po8	po9	po10	po11	po12
Co1								65.1			65.1	
Co2	59.6		59.6					59.6				
Co3			81.6					81.6				
Co4			67.6					67.6		67.6		
Co5								32.3		32.3		
Co6.								52.5			52.5	
Co7								72.3		72.3		
Co8								71.6		71.6		
Co9								46.2			46.2	

DEVELOPMENT MEASURES TO IMPROVE ATTAINMENT LEVEL:

1. Take feedback from the students at the starting and at the end of semester and strengthen the faculty. 360⁰ feedback has been used by learning and development professional for many years to help individuals and organizations to improve their performance and effectiveness.
2. Prepare subject material of both descriptive and objective from each unit. Minimum questions five and minimum objective questions fifteen.
3. Use power point presentations to explain clearly with good clarity by LCD/LED projectors.

4. Show animations of the topic by using internet and
5. Get expert faculty material from NPTEL-IIT professors.
6. Use charts and tables for easy and fast calculations.
7. Scope for future development in education system.
8. 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.
9. 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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