

Simple Method of Measuring Attainment of Course Outcomes and Program Outcomes for Diploma Engineering Program.

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Abstract: Maharashtra State Board of Technical Education (MSBTE) has revised the Curriculum for Diploma Engineering program. I-Scheme curriculum is based on the Outcome Based Education (OBE). OBE assessed according to the self-assessment report (SAR) for Diploma engineering institutions advocated by the National Board of Accreditation (NBA). Nine different criteria covering different aspects of providing diploma engineering education have been included in the report. These criteria rigorously assess the quality of diploma engineering education offered by different programs of a Diploma engineering institution affiliated to a MSBTE. Criterion 3 assesses the attainment of program outcomes (POs) through attainment of course outcomes (COs). Hence, it is required to measure the attainment of COs and POs as per the guidelines of SAR format.

This paper presents a simple method for the measurement of attainment of COs and POs. Sample course is considered for showing the measurement of attainment of COs and POs.

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I. Introduction

Demand for quality education and need of capable work force is ever increasing globally. MSBTE's new curriculum (I-scheme) for diploma engineering certainly creates employability for diploma holders. This I scheme curriculum emphasises on the philosophy of outcome based Education advocated by NBA. The present CIAAN norms and Academic monitoring proforma are revised to compatible with NBA norms. The guidelines are given in SAR in the form of ten criterions. Criterion 3 measures the attainment of POs, PSOs. Here POs, PSOs of a program are given by MSBTE.

II. Correlation between COs, POs, PSOs

MSBTE has given the POs, PSOs for each program and COs for each course of the program. So first correlation is established between COs – POs and COs - PSOs in the scale of 1 to 3, 1 being the slight (low), 2 being the moderates (medium), 3 being the substantial (high). Faculty has prepared the mapping matrix for each course and verified by respective HOD of the department or Academic coordinator. The table II.1 shows the course outcome for Basic electronics course. At the end of the course student demonstrates the following industry oriented COs.

TABLE II.1: Course Outcomes

CO	COURSE OUTCOME
C22225-1	Identify electronic components in electronic circuit
C22225-2	Use diodes in different applications
C22225-3	Interpret the working of junction transistor in the electronic circuit.
C22225-4	Interpret the working of unipolar devices in the electronic circuit.
C22225-5	Use sensors and Transistor.

The table II.2 shows the Mapping of Course outcome with Program outcome and mapping of Course outcome with Program specific outcome

TABLE II.2 mapping of Course outcome with Program outcome and Program specific outcome

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
C22225-1	3	2	3	-	-	-	-	3	3	2	-	2
C22225-2	3	2	3			-	-	3	3	2	-	2
C22225-3	3	2	3			-	-	3	3	2	-	2
C22225-4	3	2	3			-	-	3	3	2	-	-
C22225-5	3	2	3			-	-	3	3	2	1	2
C22225	3	2	3			-	-	3	3	2	0.2	1.6

Once mapping of each course is done then HOD of each program is prepared 'Program level mapping of Course-PO POS matrix' of all the courses. TABLE II.3 below shows 'Program level Course-PO, PSO' mapping Matrix.

TABLE II.3 'Program level Course-PO, PSO' mapping Matrix.

COURSE	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2
C22101	3	2	-	-		-	-	3	3	2	-	-
C22102	2	2	2	-	-	-	-	2	2	2		
.
C22201	2	3	2	-	-	3	2	3	2	2	-	-
C22202	3	2	3	3	2	2	2	3	3	2	2	2
.
.
C22302	3	2.5	2	3	2	2	3	2	2	2	2	2
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III. Attainment of COs

Course outcomes are specific, measurable and can be demonstrated by students on completion of the course. As per CIAAN norms of MSBTE direct measurement of CO attainment levels based on the Progressive assessment of theory PA (TH), practical PA (PR) and on the result of the end semester examination ESE (TH, PR) conducted by MSBTE. Progressive assessment of theory contains two unit test (UT) and micro project. For the calculation of attainment of COs first calculate attainment level of COs in UT-1, UT-2, Micro project, ESE (TH), ESE (PR), then decide the direct attainment level of CO.

III.1 Attainment of COs through Internal assessment

NBA has given guideline for attainment level for internal assessment in its SAR format.

Attainment Level - 1: 60% students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "1"

Attainment Level - 2: 70% students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "2"

Attainment Level - 3: 80% students scoring more than 60% marks out of the relevant maximum marks is considered to be attainment of "3"

Table III.1 shows sample process of computing CO attainment for the internal assessment of Unit Test.

Table III.1 attainment of COs for the internal assessment of Unit Test.

Course Name: Basic Electronics

Course Code: 22225

Enrollment No	Seat No	Student Name	CO mapped	CO-1	CO-2	CO-3	CO-4	CO-5	Total Marks
			Target set	3	3	-	-	-	
			Maximum weight	12	8	-	-	---	
12325	S123	xyz		12	8	-	-	-	20
12326	S124	abc		12	8	-	-	-	20
12327	S125	sce		11	8	-	-	-	19
12328	S126	wer		11	8	-	-	-	19
12329	S127	abv		12	6	-	-	-	18
12330	S128	sde		AB	AB	-	-	-	AB
12331	S129	erf		12	8	-	-	-	20
12332	S130	dfg		6	2	-	-	-	08
Attainment Calculation									
No. of student attempted test				7	7				
No. of student got >= 60%				6	6				
% of student got >= 60%				85.7%	85.7%				
Attainment level				L-3	L-3				

From this table set target for CO-1 & CO-2 is level-3. % of students score more than 60% marks for CO-1, CO-2 is 80%. Hence attainment level of CO-1, CO-2 are level -3. Attainment calculation and set target can be represented in graphically also. Fig 3.1 shows graphical representation of Attainment level.

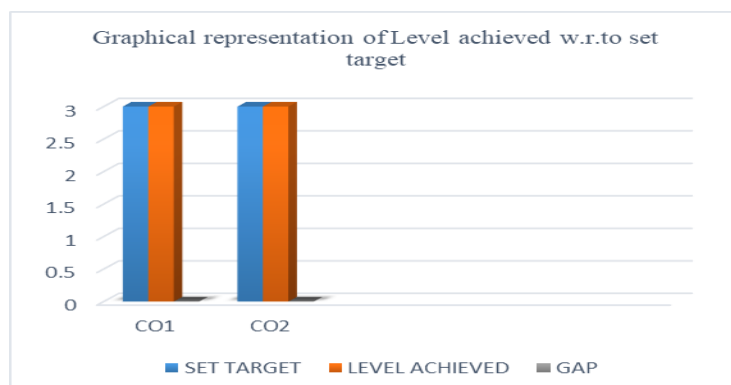


Fig. 3.1 graphical representation of Attainment level with respect to set target

For the calculation of attainment of COs through unit test, micro project & Progressive assessment of Practical same method is used. % of students who achieve a set target for COs that are covered is computed which decide attainment level of each COs.

III.2 Attainment of COs through End Semester Examination

After declaration of MSBTE result compute the attainment level for ESE (PR) & (TH). NBA has given guideline for attainment level for End semester examination (ESE) assessment in its SAR format.

Attainment Level-1: 60% students scoring more than board average percentage marks in the final examination is considered to be attainment of “1”

Attainment Level-2: 70% students scoring more than board average percentage marks in the final examination is considered to be attainment of “2”

Attainment Level- 3: 80% students scoring more than board average percentage marks in the final examination is considered to be attainment of “3”

It is difficult to know the coverage of CO’s question wise, so consider the obtained marks of each students for each COs. Table III.2 shows sample process of computing CO attainment for the End semester examination (ESE).

Table III.2 attainment of COs for the End semester examination (ESE).

Course Name: Basic Electronics			Course Code: 22225					
Enrollment No	Seat No	Student Name	CO mapped	CO-1	CO-2	CO-3	CO-4	CO-5
			Target set	3	3	3	3	3
			Maximum weight	70	70	70	70	70
12325	S123	xyz		51	51	51	51	51
12326	S124	abc		44	44	44	44	44
12327	S125	sce		34	34	34	34	34
12328	S126	wer		38	38	38	38	38
12329	S127	abv		39	39	39	39	39
12330	S128	sde		40	40	40	40	40
12331	S129	erf		22	22	22	22	22
12332	S130	dfg		AB	AB	AB	AB	AB
Attainment Calculation								
No. of student attempted test				7	7	7	7	7
No. of student got >= 40%				5	5	5	5	5
% of student got >= 40%				71.4%	71.4%	71.4%	71.4%	71.4%
Attainment level				L-2	L-2	L-2	L-2	L-2

For the end semester examination (ESE) % of students who achieve a set target for COs that are covered is computed which decide attainment level of each COs.

From this table set target for each co is level-3. % of students score more than 40% marks for CO-1, CO-2, CO-3, CO-4, CO-5 is 71%. Hence attainment level of CO-1, CO-2, CO-3, CO-4, CO-5 are level -2. Calculated attainment level with respect to set target can be represented in graphically. Fig 3.2 shows graphical representation of Attainment level.

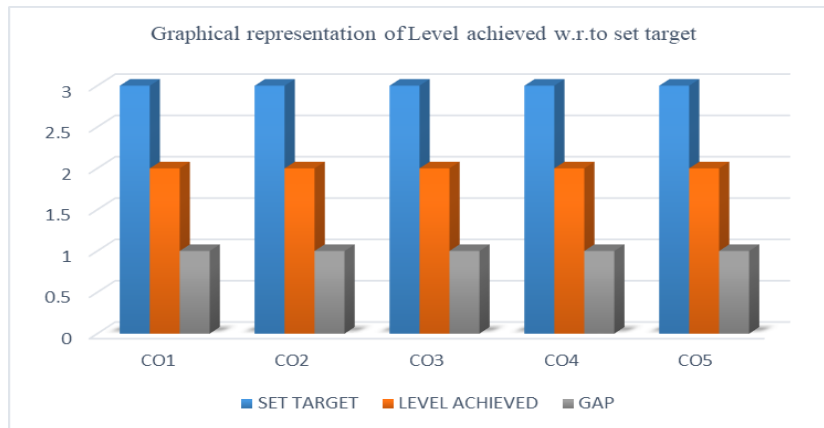


Fig. 3.2 graphical representation of Attainment level of ESE with respect to set target

III.3 Overall course outcome Attainment:

The overall CO attainment level in the course is calculated as

Overall CO attainment level = 30% of CO attainment level in Internal assessment + 70% of COs attainment level in ESE. Here MSBTE decided the weightages for ESE and internally assessment.

For the overall calculation of CO attainment level consider the attainment level of Internal assessment(UT1,UT2,Microproject, progressive assessment of Practical) and attainment level in End Semester Examination(ESE(PR),ESE(TH)).

Table: III.3 shows the sample calculations of overall CO attainment level in Basic Electronics course

TABLE: III.3 overall CO attainment level in Basic Electronics course

CO no.	Direct Attainment									Target Set	Attainment Gap
	Internal Assessment					ESE			Total Direct Attainment		
	UT 1	UT 2	Micro. Project	PR(PA)	Average	ESE (PR)	ESE (TH)	Average			
22225-1	3		3	3	2.25	3	2	2.5	2.45	3	0.55
22225-2	3		3	3	2.25	3	2	2.5	2.45	3	0.55
22225-3		3	3	3	2.25	3	2	2.5	2.45	3	0.55
22225-4		3	3	3	2.25	3	2	2.5	2.45	3	0.55
22225-5	0	3	3	3	2.25	3	2	2.5	2.45	3	0.55
22225					2.25			2.5	2.45	3	0.55

Sample calculation of CO – 1 (22225-1) is as

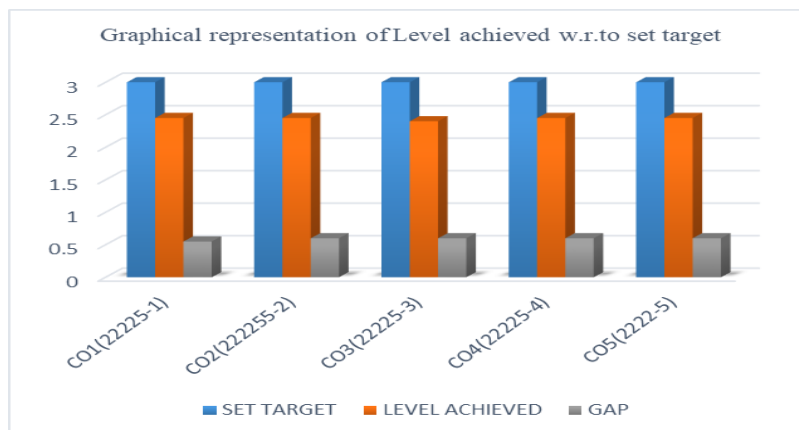
Direct attainment of CO1= (0.3*Average of Internal assessment) + (0.7*Average of ESE)

Direct attainment of CO1= (0.3*2.25) + (0.7*2.5) = 2.45

Here Set Target CO of Basic Electronics is 3, Attainment is 2.45.So gap is 0.55.

If the attainment level of CO is not achieved the target then put action plan for course.

Attainment calculation of COs and set target can be represented in graphically. Fig 3.3 shows graphical representation of Attainment level.



IV. Attainment of POs, PSOs

Program outcomes (POs) are broader statements than COs that describe what student are expected to know and be able to do upon the diploma. MSBTE suggest 10 POs and 2/3 PSOs for each program. POs and PSOs are attainment through the attainment of COs.

Using attainment level of each course and indirect attainment for program, Compute the attainment of POs and PSOs. Indirect attainment level of POs is based on the student exit surveys, employer, surveys, co-curricular activities, extracurricular activities.

In this paper 4 courses consider for sample calculation. All hypothecated values considered except 22225 course.

TABLE:IV.1 overall PO attainment level

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
22102	2.8	2.8	2.8	-	-	-	2.8	2.8	2.8	2.8
22202	2.7	2.7	2.7	-	-	-	0	2.7	2.7	2.7
22225	2.5	2.5	2.5	-	-	--	2.5	2.5	2.5	2.5
22301	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4	2.4
22401	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Direct Attainment	2.5	2.5	2.5	0.9	0.9	0.9	2	2.5	2.5	2.5
Indirect Attainment	2.25	2.25	2.25	2.25	2.25	2.3	2.3	2.3	2.3	2.25
Overall Attainment	2.45	2.45	2.45	1.17	1.17	1.2	2	2.5	2.5	2.45
Set Target	3	3	3	2	2	2	2	3	3	3

Direct attainment of PO1= (2.8+2.7+2.5+2.4+2.1)/5 = 2.5

As per SAR guideline Overall PO calculation = 80%weightage for direct attainment and 20% weightage for indirect attainment.

Over all Attainment of PO1 = (0.8*2.5) + (0.2*2.25) = 2.45.Attainment level PO1 is achieved. Compute the other POs, PSOs using same method.

If the attainment level of PO is not achieved the target then put action plan according to criteria -7 of SAR.

V. Conclusion

The paper has proposed the simple method for calculating the attainment of course outcome, program outcome, program specific outcomes. Calculated attainment value of CO, PO PSO are compared with target attainment value. If target is not achieved the program should put action plan to attain the target in subsequent years.

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