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Assessing the Impact on Course Outcomes Using Different Types of Assessment Components with Varying Teaching Approaches

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***Abstract*---**The concept of measuring the course outcome (CO) is emphasized by the introduction of outcome-based education (OBE). The CO attainment measured depends on various factors such as student's background, diversity, influence of family members, teaching approaches and evaluation approaches etc. The attainment of CO directly influences he Programme Outcomes (PO) attainment. In three different approaches is taken, i.e., conventional and flipped classroom approach and blended learning approach with components by conventional written assessment activity-based assessment and case study assessment. The impact of the assessment components was measured in final written exam. The results indicates that the activity-based assessment given in conventional and flipped classroom approach has better CO attainment % in terms of conventional written assessment in teaching approaches.

***Keywords*---**Course Outcome, Programme Outcome, Flipped Classroom.

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Introduction

Education in general implies in imparting knowledge, skills to learners with comfort and equality. However, for assessing the educational impact, the traditional system lacks the defined outcomes and the learning community awareness related to the outcome were been minimal. To overcome the issues with traditional education setup, Outcome Based Education (OBE) was introduced. The OBE system has well defined outcomes planned for each course preferable by term course outcome (CO). The learning community with a set of target outcome for course are highly motivated and involved than conventional system. [1]

For classroom teaching the most common method been employed is direct instruction method. Direct instruction. The Direct instruction approach involves lectures, demonstration of topics in the curriculum etc. With time, the teaching approach also evolved its course as various tools and methods were been practiced for teaching and evaluation. The concept of flipped classroom involves digital approach towards the course to students, as technology is been introduced to them. With flipped classroom model, the concept of conventional classroom model is been swapped. The concept of listening to class lectures in classroom in done in home and solving the home work assignments are been carried out in the classroom. [2] With current students been techno orientated, and students can exhibit better understanding on self-pace learning and provide flexibility to their life styles with achieving the target course outcomes. [3] The recent study presents positive influence of flipped classroom approach to the learning process of students. However, with students diverse related problems related to readiness for classes were been observed [4.] Model of flipped classroom approach implying the before, during and after class were been implemented and studied showed favourable results in terms of student's engagement and learning process comparing to conventional process. [5]

Classroom based assessment during the course progression plays important role in assessing the student's performance related to course outcomes. The conventional classroom-based assessment doesn't require modifications to the course plan prepared. [6] Like the method of instruction, the method of assessments given to the students during the course influences the final outcomes. Standard Based assessment (SBA) were proven to effective in terms of providing the perception of the requirement to the learners. With proper understanding of the course outcomes and assessment requirements, the learning community can perform better. [7] Study previously carried out on the influence of activity-based assessments during the course progress has also shown better results in terms of course outcome and student engagement. [8] Setting standards and criteria for evaluating and grading are important aspects of teaching learning process. The quality often expected from the students are been non transparent in some cases leading to under performance. Studies indicated that criteria-based assessments may capable of providing positive development. [9.] Practising of blended approach has influenced the overall course outcome in positive manner, however adaptation and availability of the technology were some of the factors to be considered along with student's background. [10]

The objective of this study is to analyse the influence of teaching method and assessment type on Course Outcome attainment.

Population

A total of 120 students studying engineering course were taken as population. Out of the 120 students 73 students were from rural background and 47 from urban areas. The marks obtained by them are been analysed considering the different classroom teaching approach and the type assessment components. Normative survey method is used for data collection.

Category	No of Students
Urban (U)	47
Rural (R)	73
Total	120

Table no.1 Population Diversification

Course Description

The course having five course outcomes. Topic related to the outcomes are composed and five modules were been outlined. The course evaluation is planned by having equal weightage to both Formative assessment (During the course progression) and Summative assessment (After completion of course). The formative assessment having 50 % of weightage consist of 3 Continuous Assessment events, CA1, CA2 and CA3. The CA1 and CA2 are written based examination covering CO1, CO2 and CO3, CO4 respectively. The CA3 assessment are been rubrics or parameters based where students are provided with task related to CO. The course progression and events planned are shown in figure 1.

Course Progression		Events
Course Commencement		
Module 1	CO1	
Completion of Module 1		
		CA3.1
Module 2	CO2	
Completion of Module 2		
		CA3.2
CA1 WRITTEN EXAM (CO1 & CO2)		
Module 3	CO3	
Completion of Module 3		
		CA3.3
Module 4	CO4	
Completion of Module 4		
		CA3.4
CA2 WRITTEN EXAM (CO3 & CO4)		
Module 5	CO5	
Completion of Module 5		
		CA3.5
COMPLETION OF TEACHING AND LEARNING PROCESS		
Final Written Exam (CO1, CO2, CO3, CO4, CO5)		

Figure 1. Course Progression Plan

Table no 2 indicates the actual marks and weightage of each event throughout the course progression. The written exam during the formative assessment both CA1 and CA2 are conducted for 50 marks with equal weightage given to corresponding CO as mentioned in course progression plan.

	CO1		CO2		CO3		CO4		CO5	
Actual marks (A) / Weightage (%)	A	%	A	%	A	%	A	%	A	%
CA1	25	7.5	25	7.5						
CA2					25	7.5	25	7.5		
CA3	5	3	5	3	5	3	5	3	30	8
FA TOTAL	30	10.5	30	10.5	30	10.5	30	10.5	30	8
SA TOTAL	20	10	20	10	20	10	20	10	20	10
Total	50	20.5	50	20.5	50	20.5	50	20.5	50	18

Table no.2 Actual marks and Weightage Distribution

Method

Three different classroom teaching approaches were been used for carrying out teaching learning process i.e., conventional classroom approach, Flipped Classroom approach and blended classroom approach. Conventional classroom approach involves lecturing by teachers to the students in classroom. In flipped classroom approach the mode of lecturing is reversed as student learn with helps of videos, data provided by digital manner. Homework assignments provided to the students are been carried out in classroom with guidance of teachers as students were already familiar to the topic to some extent. In third approach blended learning the classroom teaching is carried out with aid of digitalized platforms to show animations, working models etc.

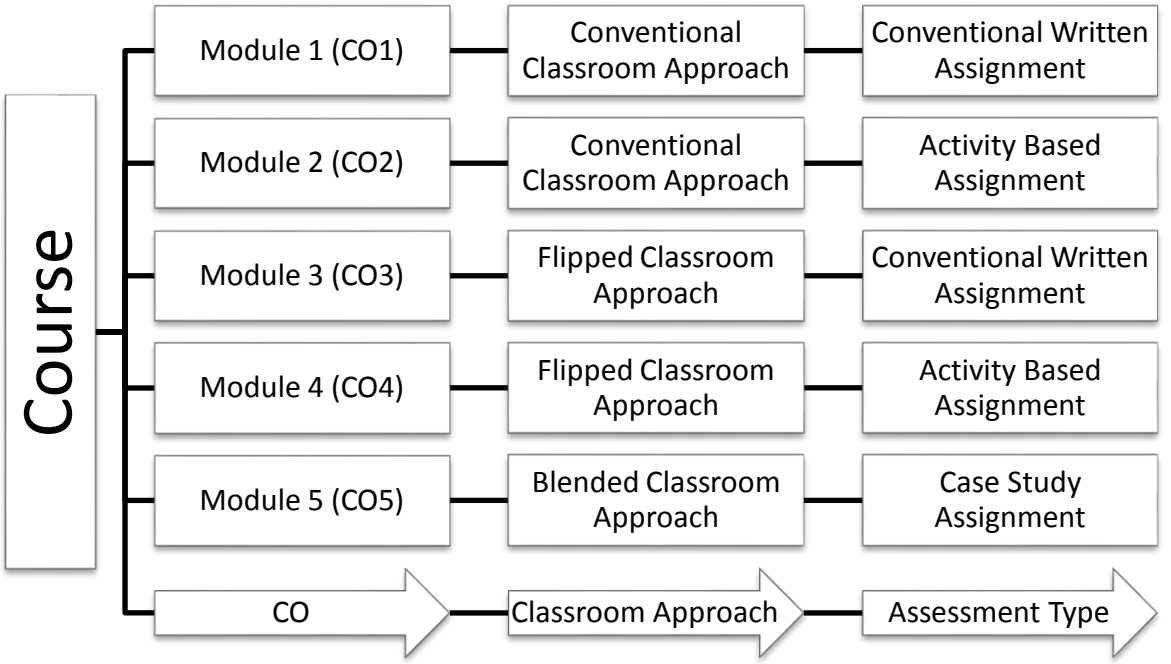

Figure no. 2 Method

During the course for continuous assessment, the students are provided with components (CA3) after the completion of each module. Three different types of assignments were provided to the students. A written based assignment in which the students were provided with a topic and have to submit a detailed content within stipulated time. During the time of the written assignment initiation, a well-defined rubric was put forward, by which the emphasis of the content required and evaluation plan are been intimated to the students. The second type of component provided is activity based one in which students were assigned to carry out activity related to the topic assigned to them. The activity includes model making, chart presentation etc. The third type assessment involves carrying out case study related to topics. Figure 2 represents the schematic of method followed during the course progression.

Formula Used

Course Outcome % is calculated for each module using the formula where average marks of the class and maximum marks were considered.

$$\text{Course Outcome \%} = \frac{\text{Average marks}}{\text{Maximum marks}} * 100$$

Results

The performance of students is evaluated and measured with respect to their respective course outcomes. Based on Descriptive statistics the average marks, minimum and maximum marks are tabulated. The course outcome % calculated for Formative assessment is tabulated in table no 3

	Category	N	Mean	Minimum Marks Secured	Maximum Marks Secured	Total (Max Marks	CO %
CO1	R	73	17.59	0.00	25.50	30	58.64
	U	47	17.78	7.42	26.10	30	59.27
	T	120	17.67	0.00	26.10	30	58.89
CO2	R	73	18.73	0.00	26.07	30	62.43
	U	47	19.20	8.75	28.71	30	63.99
	T	120	18.91	0.00	28.71	30	63.04
CO3	R	73	13.55	0.00	23.70	30	45.16
	U	47	13.67	0.00	20.79	30	45.56
	T	120	13.60	0.00	23.70	30	45.32
CO4	R	73	15.68	0.00	25.20	30	52.25
	U	47	16.18	0.00	25.50	30	53.93
	T	120	15.87	0.00	25.50	30	52.91
CO5	R	73	16.95	0.00	28.60	30	56.49
	U	47	17.81	0.00	25.50	30	59.35
	T	120	17.28	0.00	28.60	30	57.61

Table no.3 CO attainment - Formative Assessment

Likewise, the Summative assessment's descriptive statistics are tabulated in table no 4.

	Category	N	Mean	Minimum Marks Secured	Maximum Marks Secured	Total (Max Marks	CO %
CO1	R	73.00	9.47	0.00	18.06	20.00	47.37
	U	47.00	9.14	0.00	15.33	20.00	45.71
	T	120.00	9.34	0.00	18.06	20.00	46.72
CO2	R	73.00	9.58	0.00	17.20	20.00	47.88
	U	47.00	9.17	0.00	14.60	20.00	45.86
	T	120.00	9.42	0.00	17.20	20.00	47.09
CO3	R	73.00	9.55	0.00	16.34	20.00	47.76
	U	47.00	9.19	0.00	15.33	20.00	45.95
	T	120.00	9.41	0.00	16.34	20.00	47.05
CO4	R	73.00	9.50	0.00	16.34	20.00	47.51
	U	47.00	9.10	0.00	14.91	20.00	45.51
	T	120.00	9.35	0.00	16.34	20.00	46.73
CO5	R	73.00	9.57	0.00	18.06	20.00	47.86
	U	47.00	9.19	0.00	14.91	20.00	45.97
	T	120.00	9.42	0.00	18.06	20.00	47.12

Table no.4 CO attainment – Summative Assessment

Conclusion

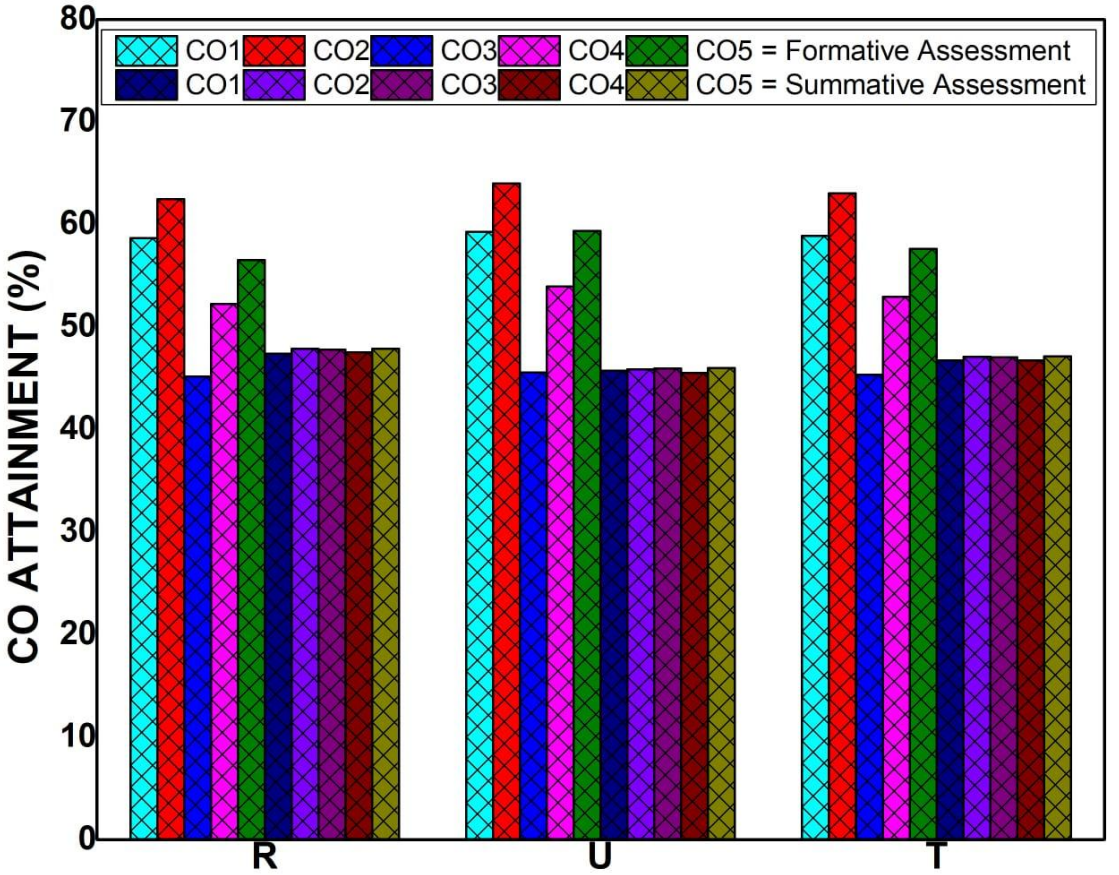

Figure no. 3 CO Attainment Analysis

From the CO % calculation, the teaching approach adopted by conventional classroom practice has better attainment comparing to flipped classroom and blended learning approaches. The CO % of CO1 and CO2 is 58.89 and 63.04 respectively higher than CO % in CO3, CO4 and CO5. Likewise, the blended learning approach practised in the module 5 also having better CO % of 57.61 than Flipped classroom approached modules of 3 and 4. In terms of teaching approaches practised, the student diversification factors taken rural and Urban variables also indicates slightly higher % of attainment in Urban population comparing to Rural population shown in figure 3.

In the conventional classroom approach, two different types of assessments were provided at the end of each module. For module 1 conventional written assessment and for module 2 an activity-based assessment was given. The Module 2 has better CO % comparing to the Module 1, as it may the activity-based assessment has positive influence over the Course Outcome. Likewise in the second approach the of flipped classroom, the assessment for Module 3 is conventional written based and for Module 4 is activity based. The CO % of

module 4 is 52.91 % higher comparing to the module 3 having 45.32 %. The third assessment type given for module in terms of case study work is of higher-level learning requiring extensive research and was not considered for comparison with Conventional written assessment and activity-based assessments. The results of summative assessments CO % is moreover same for all the course outcomes with minute deviation from Course Outcome %. From the course outcome attainment %, it is evident that the activity-based assessment during the course progress has influenced positively towards the attainment in formative assessments. The activity-based assessment regardless of the teaching approach followed has positive influence over the course outcomes. However, it has to be noted that the attainment % might vary with student diverse such as regional, gender, habits, family background, study environment etc.

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