

# Enhancement of Student Learning Through Active Learning: A Case Study

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## ABSTRACT

This paper presents a 'Continuous Improvement Process' that is following in the Department of Civil Engineering, BMS College of Engineering. The improvement program is based on Outcomes based Education. In the present study, the various techniques that are developed and used to enhance the learning capabilities of students are presented and the techniques presented in the case study are developed over a period of 5 years. The improvement progress is also presented.

**Keywords:** Continuous Improvement, Active Learning, Think Pair Share, One Minute Question.

## INTRODUCTION

BMS College of Engineering has been practicing OBE since five years. Change from the traditional method of teaching, 'Sage of Stage' to 'Student Learning' is gradual. Faculty members were more comfortable in traditional method of teaching and hence there was a stiff resistance to change. A couple of teachers started working on OBE by adopting different active learning techniques. The present paper describes author's experience in teaching a subject called Hydrology and water Resources Engineering for 3 year students of Civil Engineering. The continuous improvement observed over a period of time is also discussed.

## OUTCOME BASED APPROACH TO TEACHING AND LEARNING OF HYDROLOGY AND WATER RESOURCES ENGINEERING

15CV5DCHWR – Hydrology and Water Resources Engineering is being offered by the Department of Civil Engineering to all Civil Engineering students. The syllabus for the said program was set in tune with OBE in consultation with the stake holders. Hydrology is an important subject which deals with the various components of a hydrological cycle. It is also a prerequisite to Irrigation Engineering, Water Resources Engineering and other allied subjects like Bridge Engineering. The following are the COs defined:

1. CO1: An ability to understand the components of hydrologic cycle.
2. CO2: An ability to understand the occurrence of rainfall and thus estimating the average rainfall over a watershed.
3. CO3: An ability to estimate the runoff from a watershed accounting for the losses like evaporation, evapotranspiration, infiltration.

Most of the times, the job of design engineers working on real time projects like urban hydrology, flood protection works or designing a dam structure, is to estimate the amount of runoff at the outlet of the catchment area, knowing the rainfall characteristics and the catchment characteristics. Hence this subject is important for a Civil Engineer.

The author is handling this subject for quite long and in traditional method of teaching, usually the black and chalk method was followed. Since the syllabus was set by the University, the author has least role in the curriculum design. When the Institution started following the OBE, in the first year, the author followed the traditional method and at the end of the course, it was observed from the continuous internal assessment that the attainment of couple of POs were not met and were far less than the target value. When the author started looking at the factors that pulled down the attainment, it was found that the students were not very clear about the subject topics corresponding to the Cos and also they were unable to imagine the various phases of hydrological cycle like rainfall process, catchment area, delineating the catchment etc., This was elaborated at the Department Academic Committee and also the Department Advisory Committee. There were two options before this committees, one is to change the curriculum and the other option is change the teaching learning process. The author has opted for the second option, change the teaching learning process.

To begin with the author changed method of teaching from chalk and talk to power point presentation. In doing so, the author was in a position to show lot of pictures, which were available on the internet. The author has developed his own presentation along with presentation from NPTEL. At the end of the course, the attainment of the POs were very close to the target value. This boosts the confidence of the author and started looking for active learning techniques.

Next time, the author introduced the group study wherein he divided the entire class of 60 into a number of batches. Each consists of 4 members and each batch was asked to get a toposheet from Survey of India for Western Ghats in Karnataka. The author will mark a dam site on any of the streams on the toposheet and asked the batch to delineate a catchment area, transfer the delineated catchment area on a tracing sheet along with prominent places in and around the catchment. Also the students were asked to identify the rainguage stations in and around the catchment area. Then, they were asked to find the mean precipitation on the catchment area, for which the students need to visit the Indian Meteorological Department. In doing so, the students were asked to select the best method, giving justification for the same. Then they were asked to find the runoff at the outlet, selecting the best method among the method available. In the entire exercise, the students study the theory in the class. Whatever they studied in the class, they implemented the same in their project. This job correlates CO<sub>2</sub>, CO<sub>3</sub> to PO<sub>2</sub>. The following were the reflections:

1. Students started showing lot of interest in the subject.
2. Their performance in answering the questions pertaining to the analytical problems was too good.

The assessment is through internal test and the quizzes conducted during the course.

After seeing the students' involvement, the author further introduced Index cards, wherein every batch is given an Index card. This card consists of Photo, Name, USN, CGPA, SGPA, Contact number of all the students in a batch. Every batch is given a name and allotted a desk. Every batch is asked to stick to the same desk throughout the course. Also the Internal test marks are also entered on the Index card. Lecture hour is divided into explaining what was taught in the previous class for 5

minutes, what is being taught in the present class, then lecture for about 25 minutes then a small quiz with think pair share exercise. After this another 15 minutes lecture. The lecture is ending with a one minute question. By doing so the students are showing lot of interest. Also at the end of every chapter, each batch is asked to come out with a set of questions, about 5. The condition is that they have to set these questions in such a way their other batches must find it difficult to solve. This helped the author in two ways. One, the author has an excellent collection of questions for each chapter and the other one is the students are forced to go to library, look for a number of text books for finding the problems. Present GenX students wholly depend on internet for everything, this activity forced them to use library facilities.

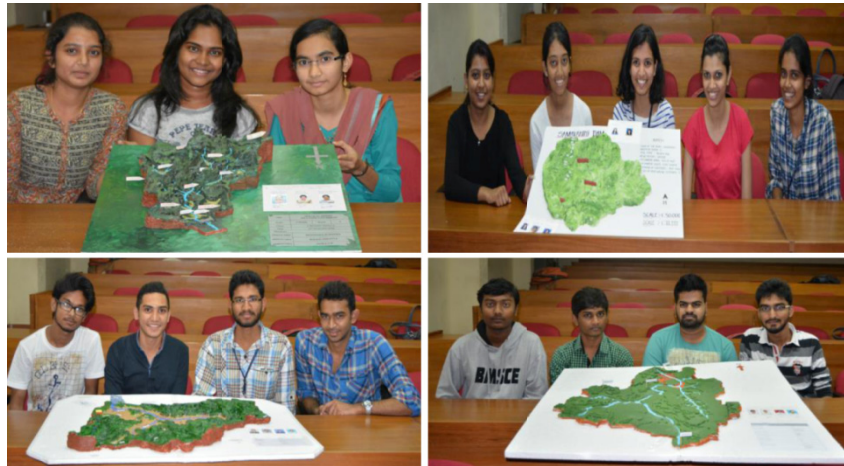
Since the students are from different backgrounds, students from rural areas shy in answering/ interacting with the teachers. To break this and boost the confidence, the author identifies such students and ask them to meet him independently. During this interaction the author gives a question with an answer to a student and ask them to read and come to the next class. In the next class, the teacher asks the same question to the student and student answer the same. This exercise boost the confidence and the student starts interacting with the teacher more often. It will also enhances his speaking skills.

In the recently concluded semester, the students were asked to develop models for their case study as a part of their project. Figure 1 shows a model developed by the students. Table 1 shows the attainment over the number of years.

**Table 1: Attainment Values**

TARGET is > =60% Marks and More than 50% of Students must Achieve 60% Marks						
PO AND CO SCALE	3	Strongly Related				
	2	Moderate				
	1	Low				
Number of students scoring > =70%						
Year	2010		2011		2012	
COs	% of students achieved CO	CO result	% of students achieved CO	CO result	% of students achieved CO	CO result
CO1	83.10%	Y	86.10%	Y	93.10%	Y
CO2	29.31%	N	67.31%	N	79.31%	Y
CO3	73.10%	Y	76.10%	Y	83.10%	Y

Year	2013		2014		2015	
COs	% of students achieved CO	CO result	% of students achieved CO	CO result	% of students achieved CO	CO result
CO1	95.10%	Y	92.10%	Y	94.10%	Y
CO2	85.31%	Y	88.31%	Y	89.31%	Y
CO3	93.10%	Y	89.10%	Y	91.10%	Y



**Fig. 1:** Students Displaying their Work

From the attainment values, it is observed that active learning enhances the learning ability of a student. It is also observed that the students who are very good in kinesthetic, always sitting in the last benches, not showing much interest in the class also started enjoying the class.

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