

An Innovative Approach Continual Improvement of CO-PO Attainments

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Abstract: With the growing quantity and quality of information on the internet, the trends in teaching have accelerated rapidly in recent years. The teacher's role has changed from that of knowledge-transmitter to consultant, guide, coach, and facilitator. The Outcome Based Education (OBE) Curriculum outlines specific measurable outcomes for each Course. The entire Curriculum focuses on what students can actually do after they complete the Course. In this Curriculum the teacher should focus on helping the students in providing & developing the knowledge and skills that enable them to achieve the clearly defined outcomes. After the completion of the course, attainment of that particular Course is evaluated. In this paper we talk about an innovative methodology for continuous improvement (IMCI) which is implemented at Vidya Jyothi Institute of Technology, Hyderabad that comprises of some activities which benefit the students to improve their academic performance there by increasing the attainment of that particular course. This increases the CO-PO Attainment values.

Keywords: Outcome Based Education (OBE), Course Outcomes, Program Outcomes, Attainment.

1. Introduction

Outcome Based Education focuses on Teaching-Learning enhancement in the field of engineering education system all over the globe. The OBE implementation has been supported by most academic institutions, which offers engineering courses in India and abroad.

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The process of execution of OBE is not an easy task. It requires a lot of effort to design Program Educational Objectives (PEOs) after defining the Vision and Mission of the Department, which are derived from the Institution's Vision, and Mission. Program Outcomes (Pos) are narrower statements that describe what students are expected to know and be able to do after completion of the course or program. The Course Outcomes (COs) are stated in such a way that they can be actually measured. The performance of the students indicates the CO attainment. This measurement provides the basis for continuous improvement in the quality of learning. In this paper an innovative Methodology for continuous improvement (IMCI) which is designed for all B.Tech I Year courses and implemented successfully that resulted in the improvement of CO-PO Attainments. This paper also describes and analyses the improvement in the CO-PO Attainment values.

2. Literature Review and Related Work

Bhimasen Sorian & K S Mahesh proposes a methodology for Measuring Attainment of Course Outcomes and Program Outcomes [1]. Dr.Rita Jain & Dr. A. A. Ansari proposed a simplified approach to measure course outcomes and program outcomes [2]. M.Rajendra Prasad implemented project based teaching methodology for embedded engineering education for effective attainment [3]. VA Kulkarni , B. B. Ahuja &MR Dhanvijay proposed a method for CO-PO Mapping and Attainment calculation[4]. Chandra R. Sekhar, Omer Farook and Essaid Bouktache gave a Continuous Improvement Process Based on Outcome Based Education [5].In this paper a methodology (IMCI) is employed to enhance the academic performance of the students over 5 academic years.

3. Methodology

The process of calculation of attainments for COs and POs starts from writing appropriate COs for each course of the program from first year to fourth year in a four-year

engineering degree program. The course outcomes are written by the respective faculty members using action verbs of Blooms Taxonomy.. Then, a correlation is established between COs and POs in the scale of 1 to 3, 1 being the slight (low), 2 being moderate (medium) and 3 being substantial (high). A mapping matrix is prepared in this regard for every course in the program .The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized. The example of such a mapping for the course Mathematics I is given in table 1. Based on the mapping the CO-PO attainments can be calculated with the help of the procedure described in figure 1. An example of such calculation is given in the table 2.

The Course Outcomes of Mathematics I

1. Understand the term rank and Elementary Transformations of a Matrix, System of Equations.
2. Compute Eigen values and corresponding Eigen vectors of a square matrix, finding Inverse and method of Diagonalization.
3. Verification of the Mean value theorems and to study maxima and minima of functions of two variables.
4. Evaluation of improper integrals by using beta gamma functions and evaluation of double and triple integrals by tracing the region of integration.
5. Finding Laplace transform of various functions and solving the initial value problems by using Laplace transforms.

According to these Cos the mapping is given in the following table

Table 1: CO-PO mapping of Mathematics I

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	-	3	3	3	2	-	-	1	-	1	-	-
CO2	3	3	-	3	3	3	1	-	2	-	1	3
CO3	3	-	3	3	-	-	1	1	2	1	-	3
CO4	-	3	-	-	1	3	-	1	-	1	1	3
CO5	3	-	3	-	-	3	1	-	2	-	1	-
AVG	3	3	3	3	2	3	1	1	2	1	1	3

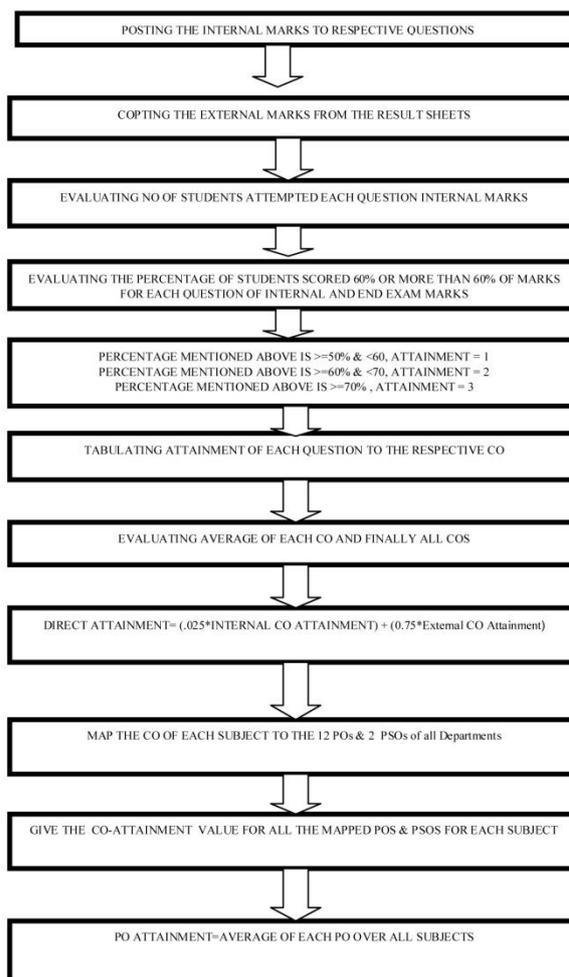


Figure 1: PO Attainment calculation process

Table 2: CO-PO Attainment calculation for B.Tech First Year Courses in one academic year

COURSE	P O1	P O2	P O3	P O4	P O5	P O6	P O7	P O8	P O9	PO 10	PO 11	PO 12
ENGLISH	2.3 3	-	-	2.3 3	-	2.3 3	2.3 3	2.3 3	2.3 3	2.3 3	-	2.3 3
MATHEMATICS I	1.6 2											
ENGG.PHYSICS	1.6 3											
ENGG.CHEMISTRY	1.7 3	-	-	-	1.7 3	1.7 3						
CPDS	1.7 4											
EDRAWING	1.7 4	1.7 4	1.7 4	1.7 4	1.7 4	1.7 4	-	-	1.7 4	1.7 4	-	1.7 4
MATHEMATICAL METHODS	1.4 8	-	1.4 8	1.4 8								
CPDS LAB	3	3	3	3	3	3	3	3	3	3	3	3
EP/EC LAB	3	3	3	3	3	3	3	3	3	3	3	3
ELCS LAB	3	-	-	3	-	3	3	3	3	3	-	3
ITWS/EWS LAB	3	3	3	3	3	3	3	3	3	3	-	3
AVERAGE	2.2 1	2.1 0	2.1 0	2.2 1	2.1 0	2.2 1	2.2 5	2.3 1	2.2 5	2.3 4	2.0 3	2.2 1

4. The Remedial Actions taken to improve the performance of the students:

After analyzing the value of CO-PO attainment for the continuous improvement of the first year B.Tech courses the following actions were implemented.

1. Remedial Classes
2. Make-Up Classes
3. Guest Lectures
4. Slip tests
5. Communication and Interpersonal Skills

4.1. Remedial Classes

Remedial classes are often used to improve the basics in a subject such as maths, science or languages. These classes can help the students who are having problems with advanced concepts by giving a strong foundation in basics. Students can also use them to catch up on the concepts after a long break from education. The following process is implemented to select the remedial students.

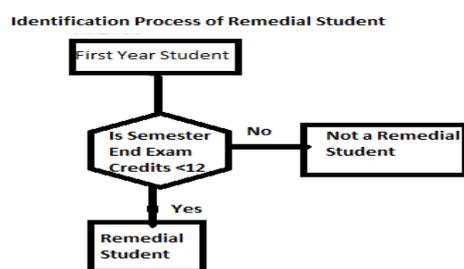


Figure 2: Remedial Classes student selection process

4.2. Make up Classes

Make up Classes are conducted for slow learners after 8 weeks of class work by taking the feedback from the subject teachers. It is proved to be very effective method to improve the slow learners performance.

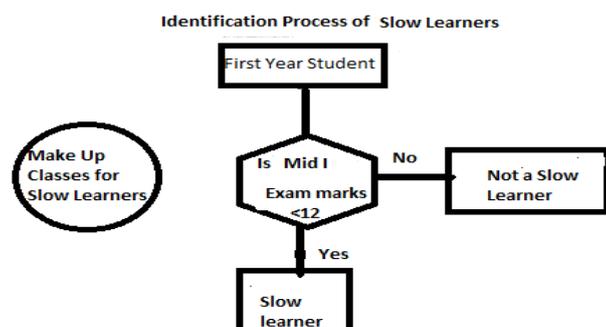


Figure 3: Make up Classes student selection process

4.3. Guest Lectures

After making a study on gap analysis and discussion with the faculty members the following Guest Lectures were conducted at Vidya Jyothi Institute of Technology, Hyderabad.

Table 3: List of Guest Lectures

After making a study on gap analysis and discussion with the faculty members the following Guest Lectures were conducted at Vidya Jyothi Institute of Technology, Hyderabad.

S.No	Subject	Date	Topic
1	Mathematics	15-7-2015	Application of Matrices in Real Life
2	English	10-8-2015	Improvement in Teaching Learning Skills
3	Physics	21-8-2015	Nano Photonics or Nano-Optics
4	Mathematics	12-01-2016	Role of Mathematics in Engineering & Sciences
5	English	15-7-2016	Empowering Education in ELT & Teaching Communication Skills
6	Physics	18-11 -2016	Lasers & Optical Fibers.
7	Physics	6-5-2017	Laser Spectroscopy for Explosives Detection
8	Mathematics	6-09-2017	Applications of Numerical Methods
9	Computer Programming	17.02.2018	Introduction to Computer Applications

The Subject knowledge of the students increased in that particular area due to the above guest lectures given by experts .This raised the interest of the students to learn the subjects there by increasing the attainment levels.

4.4. Slip tests

One of the major component of our education system is examination. The education process in any discipline of learning ends with examinations. The entire effort put in by the teachers on teaching and the student on learning is centered on getting good results in the examinations. Regular Slip tests are conducted in class that helps them to prepare for exams in an easy way. After completion of a concept a small test will be conducted to evaluate the performance of the students.

4.5. Communication and Interpersonal Skills

Interpersonal skills are people skills. They’re the skills that are used while communicating and collaborating with others, both individually and in groups. Strongly associated with emotional intelligence, interpersonal skills are the attributes that are used to understand what motivates people and how they use their knowledge to achieve the best results in all streams of life. In today’s job market, possessing technical skills is not enough. You need to go beyond the call of duty and show that you have what it takes to fit within the organization culture. From career point of view, now-a-days, recruiters use personality tests and assessments and gauge who will be a better fit between two applicants of similar qualifications and experience. They rely on identifying interpersonal skills. Interpersonal skills will give them a chance to differentiate from other job applicants as well as workmates and move up the ladder. These complement their technical skills, enhance the job performance and social interactions.

Implementing the above methodology the student whose result was down the mark have shown a positive remarkable change in their knowledge and retaining capacity. As a result the attainment levels has increased considerably.

5. Result Analysis

The CO-PO attainment values of I B.Tech courses for 5 consecutive years are analyzed for 5 Programs and are described below.

Table 4 : PO 1(Engineering Knowledge)

It is observed that MECH,EEE Programs have improved much with respected to this PO 1.

	2013-14	2014-15	2015-16	2016-17	2017-18
EEE	2.18	2.2	2.32	2.45	2.58
MECH	1.5	1.65	1.7	1.85	2
ECE	2.22	2.35	2.42	1.25	2.65
CSE	2.11	2.22	2.34	2.45	2.57
IT	2.16	2.25	2.32	2.41	2.57

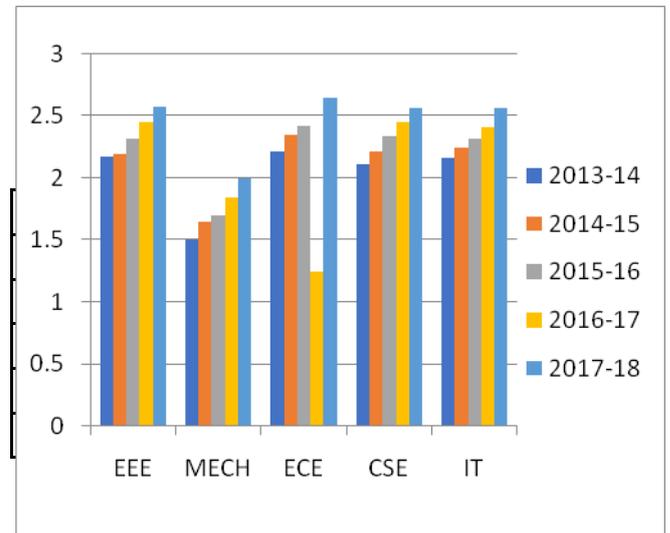


Table 5 : PO 2(Problem Analysis)

It is observed that All Programs have improved much with respected to this PO 2.

	2013-14	2014-15	2015-16	2016-17	2017-18
EEE	2.06	2.12	2.22	2.35	2.45
MECH	1.21	1.31	1.45	1.54	1.62
ECE	2.13	2.22	2.35	2.48	2.59
CSE	2.01	2.14	2.27	2.38	2.54
IT	1.99	2.11	2.22	2.38	2.49

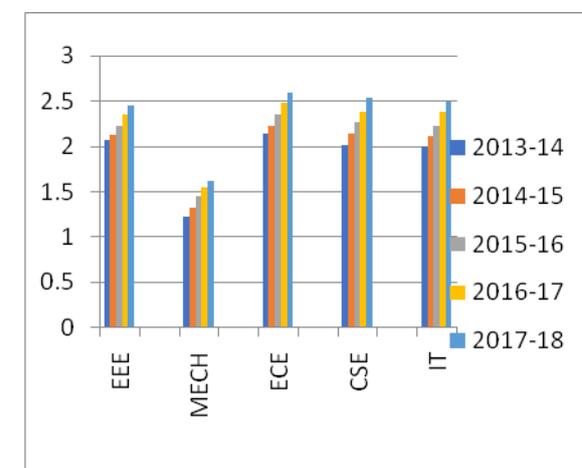
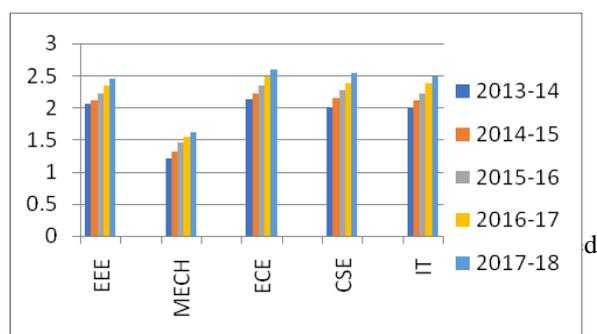


Table 6: PO3 (Design/Development of solutions)

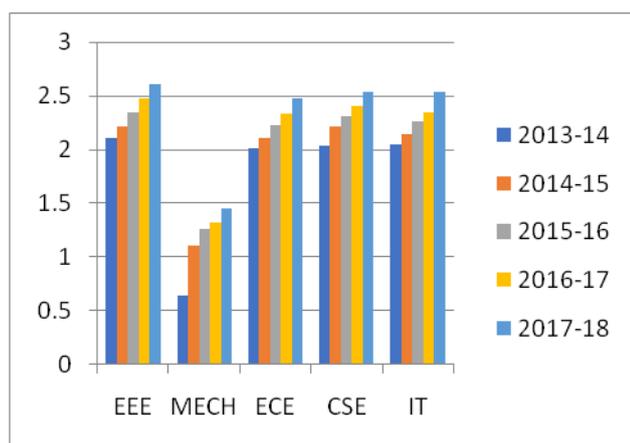
It is observed that CSE,ECE Programs have improved much with respected to this PO 3.

	2013-14	2014-15	2015-16	2016-17	2017-18
EEE	2.06	2.18	2.29	2.33	2.45
MECH	1.03	1.15	1.28	1.37	1.55
ECE	1.99	2.11	2.25	2.33	2.48
CSE	2.01	2.14	2.22	2.35	2.58
IT	1.99	2.21	2.29	2.35	2.47

**Table 7: PO10(Communication)**

It is observed that CSE,ECE Programs have improved much with respected to this PO 3.

	2013-14	2014-15	2015-16	2016-17	2017-18
EEE	2.11	2.22	2.34	2.48	2.61
MECH	0.64	1.11	1.26	1.32	1.45
ECE	2.01	2.11	2.23	2.33	2.48
CSE	2.04	2.22	2.31	2.41	2.54
IT	2.05	2.14	2.26	2.34	2.54



6. Conclusion

This paper describes an innovative methodology which is successfully implemented in all Engineering Departments at Vidya Jyothi Institute of Technology, Hyderabad, for various courses and the results of CO-PO Attainments are compared over a period of 5 years. The graphs which are drawn show the growth in the performance.

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