

Enhancing Engineering Student's Academic Performance Index through Outcome Based Education: A Case Study

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Abstract: Today's scenario of education goes far ahead than traditional norms for capable graduates to fulfill industry needs. Outcome-based education (OBE) has gained important recognition internationally to promote education reform and policy. Therefore, teaching-learning process need not only class based but also it emerges new technologies like e-learning, active learning. Outcome-based education means clearly focusing on what is essential for all students to be able to do successfully at the end of their learning experiences. The objective of this study compares outcome based education and traditional education (Non-OBE) with respect to Academic performance Index, which is commonly used test scores of students (Cumulative Performance index at OBE, Percentages at Non-OBE). A case study of RIT engineering education has been discussed for enhancing Academic performance Index through OBE.

Keywords: Outcome based Education, Non-OBE, Academic Performance Index, Cumulative Performance Index, Teaching-learning Process.

1. Introduction

The demand for quality and proficient graduates to accomplish the need of industry, leads many countries to reform their education system and structure (Alderson and Martin, 2007). Students learn most of the basic technical courses and professional skill development courses in their curriculum. The courses in the curriculum will teach the conceptual knowledge, but they are lack in to apply them for application. Engineering students are academic oriented and not a skill full engineer what software industry expects. We need to emphasize on "high-end engineering careers" as the vast majority of software careers in India need moderate expertise in computer sciences. *Less than 20 per cent engineers are employable for software jobs, " says Aspiring mind Report"*. The low employability among engineering graduates is a cumulative outcome of poor education standards and higher demand of skilled employees, thereby creating a drastic skill gap in the country," Aspiring Minds CEO &

Cofounder Himanshu Aggarwal said. Therefore the shape and content of education need to change.

Hence, new teaching-learning strategy, OBE has been introduced in different countries. OBE can be integrated outcome-oriented thinking which is directly opposite of traditional input-oriented education where more focus on the educational process (Lokare and Jadhav, 2017; Viveki, 2017, Jakhale and Attar, 2015, Oriah and Tang, 2012). In this way, desired outcomes are determined first and the program curriculum, teaching and learning methodology and supporting facilities are then designed to achieve the intended outcomes.

In the view of importance, this paper compares the impact of OBE with traditional education with respect to an Academic performance index (API) of students. The API is considered on the basis of, the cumulative performance index at OBE and percentage at Non-OBE (traditional education). Remaining sections introduce a literature review of OBE, Methodology used for OBE and findings, which compare OBE with Non-OBE education system.

2. Outcome Based Education:

The Outcome Based Education (OBE) is an education system that highlighting on endings measurement rather than input-oriented curriculum (Michele, 2017; Shingan and Dharawadkar, 2017).

As defined in Spady -OBE is mainly considering all in educational systems near about what is needed for all students to be able to do successfully at the end of their learning experience. This focus on predefine a learning outcomes for a student's then prepare a curriculum, teaching & learning methods and assessment to make sure outcomes are achieved. The basis of OBE is outcome oriented than how and when students will achieve (Spady, 1994). OBE is maintained by following methodology i) Education Outcome ii) Curriculum Design iii) Learning and Teaching Methods iv) Assessment

So, OBE focuses on learning by:

- a. Outline Program Educational Objectives (PEO).
The PEO are the abilities, knowledge, skills

which the students should have after the completion of total programme.

- b. Outline Program Outcomes (PO). PO are desirable graduate attributes at the time of graduation.
- c. Outline Course Learning Objectives (CLO) (Vijayalakshmi and Padmashree, 2012; Hashim and Azizi, 2009), i.e. These objectives should be achieved by students at the end of the course and they are mapped with the program outcomes (PO).
- d. Different Assessment tools are used for the accomplishment of PEO.

2.1 OBE Framework:

Fig.1 Shows a steps involved in process of OBE process.

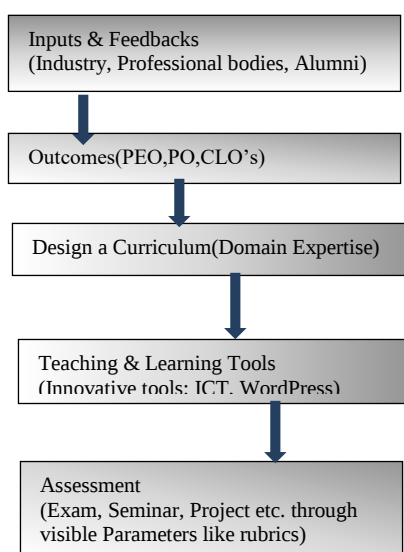


Fig 1. Steps involved in OBE Process

Outcome-based grading provides a clear and direct relationship between course Learning Outcomes (CLOs) and the student's final grade. In traditional education is mainly focuses input oriented system. The curriculum is designed and then evaluation is done on the basis of invisible parameter for deriving a percentage. Table 1. Compare a traditional education system with the OBE system with different parameter.

Table 1. Comparison between Non-OBE and OBE

	Traditional (Non-OBE)	Outcome-Based
Parameters for Grade	Attendance, assignments, exams, activities, etc.	Achievement of course CLOs
Evaluation	Marks obtained in exams. Invisible parameter for checking performance	The grade obtained for the achievement of CLOs, Visible parameters are considered (e.g., Rubric)
Grading	The percentage is derived from the total number of points on activities, assignments, exams, etc.	Grades are derived from total points on assessment activity like assignments, test etc.

Grading in Traditional education is considered in term of percentage obtained for total no. of activities, assignments etc. While in OBE, grading considered in term of the cumulative performance index.

For a student registered in autonomous RIT, Rajaramnagar CPI is calculated as per following methods.

2.3 Calculation of Academic Performance Index

The performance indices viz. Semester Performance Index (SPI), First Year Performance Index (FYPI), Cumulative Performance Index (CPI) represents the performance of a student in a semester (SPI), cumulated for two semesters of the first year (FYPI) and cumulated over all semesters from the third semester onwards till current semester (CPI) on a scale of 10.

A) Semester Performance Index (SPI):

The performance of a student in a semester shall be indicated by a number called SPI. SPI shall be the weighted average of the grade points obtained in all the courses registered by the student during a semester.

If 'gi' shall be a grade with numerical equivalent as gi obtained by a student for the course with credits 'Ci' then, SPI for that semester is calculated using formula. Where summation is for all the courses registered by a student in that semester, SPI shall be calculated and is rounded off to two decimal places.

$$SPI = \frac{\sum_i C_i g_i}{\sum_i C_i}$$

B) First Year Performance Index (FYPI):

For a student registered in autonomous RIT, Rajaramnagar right from the First semester, First-Year-Performance-Index (FYPI) shall be calculated as weighted average of the grade points obtained in all the courses registered by him/her in semesters I and II only.

$$FYPI = \frac{\sum_i C_i g_i}{\sum_i C_i}$$

Where, summation is for all the courses registered by a student in first two semesters. FYPI shall be calculated after calculating SPI for the second semester is calculated. FYPI shall be rounded off to two decimal places.

C) Cumulative Performance Index (CPI):

An up-to-date assessment of the overall performance of a student for the courses from the third semester onwards till completion of the program shall be obtained by calculating an index called Cumulative Performance Index

(CPI).

CPI has been the weighted average of the grade points obtained in all the courses registered by a student since the beginning of the third semester of the program.

$$CPI = \frac{\sum_i C_i g_i}{\sum_i C_i}$$

Where, summation is for all the courses registered by a student from third semester till that semester. CPI shall also be calculated at the end of every semester from the third semester onwards and shall be rounded off to two decimal places.

3. Findings and Summary Discussion:

In order to achieve the objectives of this study, the three batches of traditional education and three batches of OBE education at RIT, Computer science and Engineering department is considered for data analysis. Analysis is conducted on Passing percentage (percentage at Non-OBE and cumulative performance index at OBE) and alignment of classes obtained for grading.

As shown in Table.2 and Fig 2. students academic performance in terms of Academic Performance of Index, the findings discovered that OBE students score higher than non-OBE students. There is a significant difference in the passing percentage between OBE and non-OBE students with 96.34% to 98.34 %.

Table 3 and Fig 4. Shows level of a class like first class with distinction, first class, second class, Pass, Fail obtained by students at OBE and Non-OBE environment.

Table2. Passing Percentage at Non-OBE and OBE

Batch Year	Total Appeared Student	No of Pass Student	Passing Percentage	First Class with Dist	First Class	Second Class	Pass	Fail
2008-09 to 2011-12	79	74	93.67	31	37	6	0	5
2009-10 to 2012-13	63	61	96.83	27	29	5	0	2
2010-11 to 2013-14	68	67	98.53	13	38	15	1	1
Average			96.34	71	104	26	1	8
2011-12 to 2014-15	83	82	98.80	19	37	21	5	1
2012-13 to 2015-16	83	81	97.59	19	47	14	1	2
2014-15 to 2016-17	73	72	98.63	26	36	9	1	1
Average			98.34	64	120	44	7	4

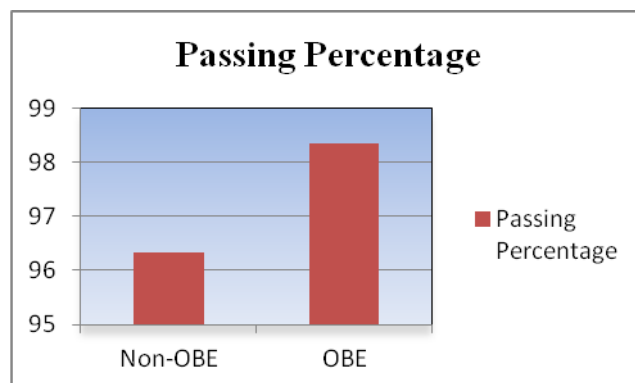


Fig2. Graph for Comparison between OBE & Non-OBE by Passing Percentage

Table 3. Comparison of Non-OBE & OBE in term of level of class Obtained by students

Pattern	First Class With Dist	First Class	Second Class	Pass	Fail
Non-OBE	71	104	26	1	8
OBE	64	120	44	7	4

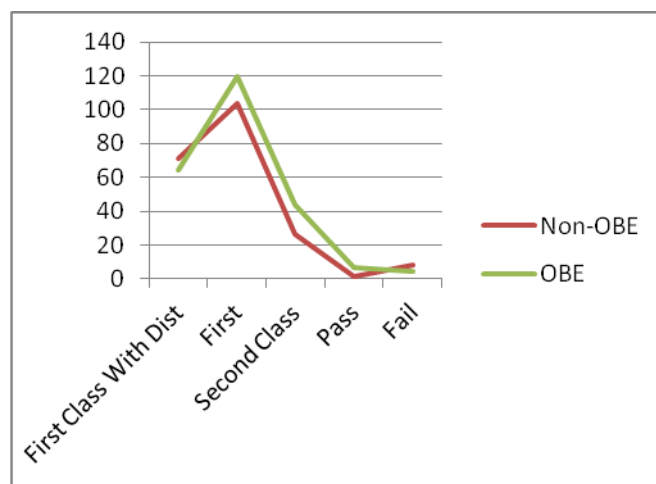


Fig 4. Non-OBE and OBE with level of Classes obtained by students

Conclusion:

As a conclusion, this paper gives a case study of RITengineering education has been discussed for enhancing Academic performance Index through OBE. The Academic Performance index is considered in term of Percentage at Non-OBE and grading at OBE. Grading in OBE with Calculation of Cumulative Performance index at RIT is discussed. Analysis for API is done and Findings revealed that, there is significant different in a performance of student at OBE, & Non-OBE. Passing percentage and level of class obtained is large in OBE

environment. OBE demand new teaching learning methods lead to better understanding of concepts. OBE approach gives a chance to students to improve employability skill which fulfil an industry need.

References:

Oriah, A., Tang, H. (2012) Teaching and learning enhancement through outcome-based education structure and technology e-learning support, Senian Maliec Procedia-Social and Behavioral Sciences 62 ,87 – 92.

Lokare, V., Jadhav, P. (2017) A Holistic Approach for Teaching Data Structure Course in the Department of Information Technology, Journal of Engineering Education Transformations, Special issue.

Michèle, J. (2017) The Perils of Outcomes-Based Education in Fostering South African Educational Transformation Journal of Political Science, 7, 368-379.

Hashim, R., Azizi, M. (2009) Implementing Outcome Based Education Using Project Based Learning at University of Malaya, European Journal of Scientific Research, 26(1), 80-86.

Shinghan, G., Dharwadkar, N. (2017) Student Quality Circle, ICTEE-2017.

Viveki,C.(2017) Outcome Based Education- A Review ,International Research Journal of Engineering and Technology (IRJET), 04 (7).

Spady, W. (1994). Outcome-based education: Critical issues and answers. Arlington, VA: American Association of School Administrators.

Alderson, A., Martin, M. (2007) Outcomes-based education: where has it come from and where it is going? Issues in Education, 17(2), 161-182.

Jakhale, A., Attar, A. (2015) A Novel Approach towards Outcome Based Engineering Education for Continuous Quality Improvement: A Case study, Journal of Engineering Education Transformations, Special issue.

Vijayalakshmi, M., Padmashree, D. and Joshi,G. (2012) An innovative approach to problem identification and design for capstone projects, Engineering Education: Innovative Practices and Future Trends (AICERA).

http://www.aspiringminds.in/docs/national_employabilityReport_engineers_annual_report_2014.pdf

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