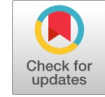


# Course Outcome Attainments in OBE for Weak Students



Akash Rajak, Ajay Kumar Shrivastava, Divya Prakash Shrivastava

**Abstract:** The outcome-based education is implemented in all the technical institutions of India as per the guidelines issued by AICTE, India. The outcome-based education deals with achieving the targets of different courses related to a particular UG or PG program. The targets are based on attainments of course outcomes of a various subjects in the program. The course outcomes of different courses are defined and these course outcomes are assessed through different internal examinations. The targets of different course outcomes are checked on the basis of performance of students in examinations whether they are attained or not. In this paper we will discuss how gap analysis is performed if a particular course outcome does not meet to its target. The analysis of non-attainment and corrective actions to be taken will be discussed in this paper.

**Keywords:** outcome-based education; course outcome; gap analysis; program outcome; outcome-based learning.

## I. INTRODUCTION

The outcome based education is based on measuring the attainments for a particular program. The outcomes of different courses or subjects are defined by the course expert or subject teacher in form of few statements. The course outcome defines the outcome of a particular course that the students will go to learn. The course outcomes are in turn validated by department board of studies and are also communicated to various stakeholders of a particular program. The stake holders of program are students, alumni, parents, employer, management etc. A feedback is also collected from these stake holders and suggestions must be incorporated in course outcome statements. The course expert also defines targets for each course outcome and is finally evaluated to check whether they are attained or not. In case of non-attainments, the course teacher has to analyse for non-attainment and appropriate actions must be taken to attain that course outcome. If all the course outcomes are attained the course expert or teacher may increase the targets.

## II. BACKGROUND

El-Maaddawy discussed outcome based learning in civil engineering education. They implemented outcome based learning at senior- and graduate-level courses to support student learning and their improvement for understanding of course topics [1]. Rajak et al. discussed about how to calculate attainments for PG courses. They discussed the process for which begins from defining the course outcomes

along with program outcomes and end with final attainments of program outcomes and program educational objectives [2]. Tiwari et al. discussed the gap in curriculum and industry has created unemployment of engineering graduates. They designed a new curriculum based on industry needs to reduce that gap and to establish better correlation between traditional and outcome based engineering education [3]. Rajak et al. discussed automating outcome based education through the attainments of course and program outcomes. They does a comparative study based on the attainments of last three passed out batches of MCA program [4,11]. Bassi et al. carried out assessment of course HVE. They did analysis of students whose targets were not achieved. MS-Excel was used as a tool for calculations [5]. Terang et al. discussed the attainment process especially focusing on the identification of weak students for the subject EEC-II. Analysis is done to see how clearly the stakeholders understood the OBE process [6]. Chandna et al. summarized the methodology for the assessment of course outcome by calculating the attainments of individual students against predefined targets [7]. Roy et al. assessed the course outcome of subject Power Quality and its relationships with program outcomes. The assessment is based on internal marks, assignments and tutorials [8]. Bansal et al. discussed a framework which construct curriculum or course plan along with assessment strategies [9]. Tshai et al. highlighted formulation of PEO along with stakeholders. The strategies were also suggested by author how to improve program educational objectives in case of low attainments [10].

## III. COURSE OUTCOME AND QUESTION PAPER

The course outcomes are few statements of a particular course defined by subject expert and are communicated to various stakeholders and these statements are in turn approved by board of studies of a program. The program may be an undergraduate degree or postgraduate degree. The course outcome for the subject “Computer Concepts & Principles of Programming” given in Table I. This subject is in post graduate program MCA. The format of question paper is given in Table II. In the question paper we can see that all the questions are course outcome based.

**Table I: Course outcome of subject “Computer Concepts & Principles of Programming”.**

CO1:	The concept of programming language, designing of solution to a problem using flowchart & algorithm.
CO2:	The concept of Arrays, modular programming, Looping, Condition Checking, Records & their implementation.

Manuscript published on 30 September 2019.

\*Correspondence Author(s)

Akash Rajak\*, KIET Group of Institutions, Ghaziabad, India.

Ajay Kumar Shrivastava, KIET Group of Institutions, Ghaziabad, India.

Divya Prakash Shrivastava, Higher Colleges of Technology, Dubai,

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an open access article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

Retrieval Number: K14210981119/19@BEIESP

DOI: 10.35940/ijitee.K1421.0981119

Journal Website: [www.ijitee.org](http://www.ijitee.org)

Published By:

Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP)

© Copyright: All rights reserved.



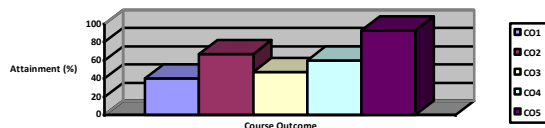
## Course Outcome Attainments in OBE for Weak Students

CO3:	The functional units of computer, its operations, the number system used in computer and their conversions.
CO4:	The concept of operating system and various computing models.
CO5:	The OOP concept like Abstraction, Encapsulation, Inheritance, Polymorphism, Static and Dynamic scope and concept of Recursion.

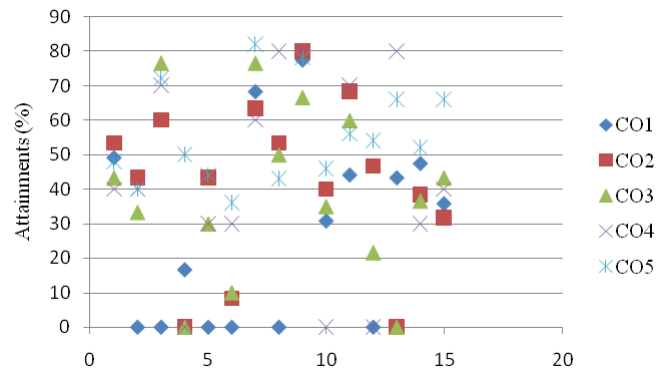
**Table II: Sample question paper of "Computer Concepts & Principles of Programming"**

Subject: Computer Concepts & Principles of Programming				
Note: Attempt all the questions of all the sections.				
Section-A (2X10=20)				
Q. No.	Question	Marks	CO	
1				
A	What do you mean by system software? Give some examples of it.	2	3	
..	..	..	..	
J	How a string is initialized?	2	1	
Section-B (5X4=20)				
Q. No.	Question	Marks	CO	
2	Write a program in C to find the sum of numbers stored in an one dimensional array. OR Write a program in C to sort the numbers in an array	5	1	
..	..	..	..	
5	Convert the following a. $(11001100)_2 = ( )_{10}$ b. $(A23)_{16} = ( )_2$ c. $(345)_8 = ( )_2$ OR Do the following using 2's complement representation a. $83 - 16$ b. $16 - 83$	5	3	
Section-C (10X2=20)				
Q. No.	Question	Marks	CO	
6	Define the term structured data type. How they are implemented in c? OR Write a program in C to search a number in a given array of numbers	10	1	
7	With a neat diagram explain memory hierarchy OR How computers are classified according to size?	10	3	

Outcome for each student is set to 40% if the value is greater than or equal to 40% then Target level is set to "Y", otherwise "N". Now we have to assess that whether each course outcome is achieved or not. The results are shown in Table IV.



**Figure 1. The figure shows overall attainment of each course outcome.**



**Figure 2. The figure shows assessment of each student on the basis of course outcome.**

### IV. ATTAINMENTS OF COURSE OUTCOME

The Table III shows the assessment of student on the basis of target achieved or not. Similarly, the analysis is carried out for the entire class strength. The Table IV shows the analysis of entire class. The percentage of entire class is taken and overall attainment is calculated. If the value is greater than or equal to 50% than the course outcome is attained otherwise it is not attained. As shown in Table IV, the CO1 of CT-1 is not attained and CO3 of CT-2 is not attained. The Figure 1 gives the graphical representation of each course outcome. The assessment of each student on the basis of course outcome is shown in Figure 2.

### V. GAP ANALYSIS AND ACTIONS TAKEN

As shown in the figure 1 some of the course outcomes are not attained. The course outcomes that which are not achieved for that gap analysis is to be carried out. The subject teacher has to perform gap analysis by justifying the reasons for the non-attainment of course outcome. A corrective action plan is to be performed for the non-attainment of targets so as to reduce this gap. As shown the gap analysis is to be done for CO1 and CO3. The Table V discusses the gap analysis and corrective actions. The corrective actions could be conducting remedial classes for the students, giving some extra assignments based on particular course outcome so that the students could have more understanding etc. The actions taken could be implemented during the semester and the assessment can be made at the end of semester through the performance of student in final examinations.

**Table IV: Assessment of each course outcome for entire class, the Target level achieved is set to minimum 50% for the entire class.**

Items	CT-1	CT-2		CT-3	
	CO1	CO2	CO3	CO4	CO5
No. of Students Attained 40% Target	6	10	7	9	14
No. of Students Failed to Attained 40% Target	9	5	8	6	1
Percentage of Attainment	40	67	47	60	93
Overall Attainment (Y/N, (if >=50%))	N	Y	N	Y	Y



Table V: Gasis and corrective actions.

Items	Class Test-1	Class Test-2	Class Test-3
Findings	CO1-40%	CO2-67% CO3-47%	CO4-60% CO5-93%
Analysis	CO1 is not achieved. The CO1 is based on numerical problems and students failed to understand the concepts	CO2 is achieved. CO3 not achieved. The students focused less during the last few lectures as they were preparing for placements.	CO4 and CO5 are achieved.
Actions	The subject teacher will conduct remedial classes to fulfil the gap of CO1.	The teacher will provide extra notes and assignments based on CO3 to fulfil this gap.	Not Applicable, as all course outcomes are achieved.

From the next academic year these findings could be shared with the new subject teacher teaching the particular course, so that he would be familiar about the course outcome which are hard to attained in the last academic year. The course outcome having the high attainment value for that targets could be increased from 40% to 45% or any other value depending on assessments.

VI. CONCLUSION

In this paper we discussed how to formulate the question paper on the basis of course outcomes. The course outcomes based attainment sheet is shown based on the performance of students in internal examinations. The target for each course outcome is set and the course outcomes are identified in case if they are not meeting the targets. A gap analysis is performed and corrective actions are taken in poor attainments. The gap analysis and actions taken would help in continuous monitoring and improvement in attainment process.

Table III: Course outcome based marks distribution of a student on the basis of its performance in various class tests and assessment of each course outcome based on their target set.

Roll No.	CT-1		CT-2			CT-3				
	CO1		CO2		CO3	CO4		CO5		
	M	T	M	T	M	M	T	M	T	
1	29.5	Y	16	Y	13	Y	4	Y	24	Y
2	0	N	13	Y	10	N	4	Y	20	Y
3	0	N	18	Y	23	Y	7	Y	36	Y

4	10	N	0	N	0	N	0	N	25	Y
5	0	N	13	Y	9	N	3	N	22	Y
6	0	N	2.5	N	3	N	3	N	18	N
7	41	Y	19	Y	23	Y	6	Y	41	Y
8	0	N	16	Y	15	Y	8	Y	21.5	Y
9	46.5	Y	24	Y	20	Y	8	Y	39	Y
10	18.5	N	12	Y	10.5	N	0	N	23	Y
11	26.5	Y	20.5	Y	18	Y	7	Y	28	Y
12	0	N	14	Y	6.5	N	0	N	27	Y
13	26	Y	0	N	0	N	8	Y	33	Y
14	28.5	Y	11.5	N	11	N	3	N	26	Y
15	21.5	N	9.5	N	13	Y	4	Y	33	Y

REFERENCES

1. T. El-Maaddawy, H. El-Hassan, H. Al Jassmi and L. Kamareddine, "Applying Outcomes-Based Learning in Civil Engineering Education," 2019 IEEE Global Engineering Education Conference (EDUCON), Dubai, United Arab Emirates, 2019, pp.986-989. doi: 10.1109/EDUCON.2019.8725164
1. Rajak, A.K. Shrivastava, S. Bhardwaj, A.K. Tripathi, "Assessment and Attainment of Program Educational Objectives for Post Graduate Courses", International Journal of Modern Education and Computer Science (IJMECS), Vol.11, No.2, pp. 26-32, 2019. DOI: 10.5815/ijmecs.2019.02.04
2. Tiwari, A. Singh, S. Shukla, S. Mishra, E. Goyal and B. Kumar, "Outcome-Based Education (OBE) Academic Planning-An Insight into All Round Development of an Engineer," 2018 5th IEEE Uttar Pradesh Section International Conference on Electrical, Electronics and Computer Engineering (UPCON), Gorakhpur, 2018, pp. 1-5. doi: 10.1109/UPCON.2018.8597043
1. Rajak, A.K. Shrivastava, D.P. Shrivastava, "Automating Outcome Based Education for the Attainment of Course and Program Outcomes", The Fifth HCT Information Technology Trends (ITT 2018), Dubai, UAE, pp. 373-376, 2018.
3. S. Bassi, V. K. Chandna, S. Singh, "Analysis of course outcomes of HVE-a tool for assessment of programme outcomes", MOOCs Innovation and Technology in Education (MITE), 2015 IEEE 3rd International Conference on, pp. 35-37, 2015.
4. P.P. Terang, S.K. Bisoyi, V.K. Chandna, "Weightage factor analysis between programme Outcomes and course Outcomes: A case study", MOOCs Innovation and Technology in Education (MITE) 2015 IEEE 3rd International Conference on, pp. 84-87, 2015.
5. V. K. Chandna, "Course outcome assessment and improvement on weak student", MOOCs Innovation and Technology in Education (MITE) 2015 IEEE 3rd International Conference on, pp. 38-40, 2015.
1. K. Roy, G. Varshney, V.K. Chandna, "Learning through modern tools in power quality to evaluate course outcome", MOOCs Innovation and Technology in Education (MITE) 2015 IEEE 3rd International Conference on, pp. 96-99, 2015.
6. S. Bansal, A. Bansal, O. Dalrymple, "Outcome based Education Model for Computer Science Education", Journal of Engineering Education Transformations, vol. 28, no. 2 & 3, pp. 113-121, 2015.
7. K.Y. Tshai, J.-H. Ho, E.H. Yap, H.K. Ng, "Outcome based Education -The Assessment of Programme Educational Objectives for an Engineering Undergraduate Degree", Engineering Education, vol. 9, no. 1, 2014.
1. Rajak, A.K. Shrivastava, A.K. Tripathi, "An Approach to Evaluate Program Outcome and Program Educational Objectives through Direct and Indirect Assessment Tools", International Journal of Emerging Technologies in Learning (1863-0383), Accepted for Publication.



### AUTHORS PROFILE



**Akash Rajak** is working as Associate Professor in KIET Group of Institutions, Ghaziabad, India. He is having 17 years of teaching and research experience. He completed Ph.D in computer science from Barkatullah University, Bhopal in the field of temporal data mining. He did M.C.A from U.T.D Campus, Dr. H. S. Gour University, Sagar (M.P) in 2002. Dr. Rajak published various research papers in reputed journals and conferences. His research interest includes AI and Data mining.



**Ajay K Shrivastava** is working as Professor in KIET Group of Institutions, Ghaziabad, India. He is having 17 years of teaching and research experience. He completed Ph.D in computer science from Dr. H. S. Gour University, Sagar in the field of Embedded Systems. He did M.C.A from U.T.D Campus, Dr. H. S. Gour University, Sagar (M.P) in 2002. He is a member of various professional societies like IEEE, ACEEE, IACSIT etc. He is a member of the editorial boards of International Journals and Reviewer of the various journals and conferences organized by ACEEE.



**Divya Prakash Shrivastava** basic qualifications B.Sc (Computer and Electronics Instrumentation), Master of Computer Application (MCA), M.Tech (IT) and Ph.D. in Computer Science from reputed Indian Universities. He earned Microsoft Certified Professional (MCP), ITIL and Cloud Computing. Shrivastava posses more than 22 years teaching Computer Science to post-graduate, undergraduate and Diploma students. Shrivastava has Industrial experience as Information Technology Manager for four years. At present, working at Higher Colleges of Technology, Dubai, UAE. He has a vast experience in the academic activities - include contribution to educational innovation, design of new curricula and courses, and technology, assessment of training needs for professional and vocational education , and the ability to contribute to the development and raising the educational standard of the Organization. This carried out in various organizations and industries.