Internal Quality Assurance Cell
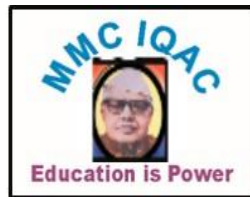
Learning Outcome Attainment Quantification

Introduction:

Demand for quality of education and employable human resource is continually increasing globally.Outcome-based education keeps learner at the center of the education system and it emphasis on skill and knowledge oriented development of the learner. It has been always promoted to bridge the 'academic- industry/market gap' and enables better employment prospects for graduates. It has been emphasized to build curriculum to improve not only the academic skills but also the soft-skills to the graduates, which in-turn can increase the employability of graduates. By imbibing the outcome based education, the institutions can meet the global standards and get recognition. Considering this scenario of the education system the IQAC has taken a step forward for the implementation of the outcome based education.

Learning Outcomes:

Bloom's six cognitive levels	Levels of learning

Learning outcomes are an essential part of any unit outline. A learning outcome is a clear statement of what a learner is expected to be able to do, know about and/or value at the completion of a unit of study, and how well they should be expected to achieve those outcomes. It states both the substance of learning and how its attainment is to be demonstrated. Learning outcomes not only serve the purpose of directing the content and design of a unit of study, they form the basis of assessment and are also linked to the larger outcomes of learning in the form of generic and/or course/discipline-specific graduate attributes. Because of their clear linkage to assessment, students will achieve the learning outcomes to differing degrees.

For teaching staff: It is useful as follows
- To know the content of teaching
- To use the teaching strategies
- To set the sorts of learning activities/tasks for your students
- To set appropriate assessment tasks
- The course evaluation.

For students:
The set of learning outcomes provides them with:
- A solid framework to guide their studies and assist them to prepare for the assessment
- A point of articulation with graduate attributes at course and/or university (i.e. generic) level.

From this, effective learning outcomes statements should:
- identify important learning requirements (the 'content' of learning – the range and type of knowledge, skills and values required)
- use clear language, understandable by students and other potential clients
- link to the generic and/or course graduate attributes
- be achievable and assessable, and
- Relate to clear statements of achievement (e.g. level of understanding required).

The college has decided to list the program outcomes, program specific outcomes, course outcomes and course specific outcomes as follows

Knowledge (lowest level)	Knowledge
Comprehension	Comprehension
Application	Application
Analysis	Critical Thinking
Synthesis	
Evaluation (highest level)	

Course Outcomes:

It will state the capabilities the students will acquire after completion of the course.

The statements must be clear and written based on Bloom's taxonomy.

At least 4-6 outcomes must be stated. The outcomes must be attainable and measurable.

Every course teacher has to formulate the outcomes with the help of head of the department and senior colleagues.

The following table provides a quick reference to Bloom's Taxonomy, relating his categories in the cognitive domain to a simplified list appropriate to the higher education environment.

Course Specific outcomes:

It will state the capabilities the students will acquire after completion of the each unit in the course.

The outcomes must be attainable and measurable.

The CSO will be listed along with the teaching methodologies used for the unit e.g. lecture method, use of ICT, constructivism, tutorial, flipped classroom, discussion, Peer learning group learning etc.

Every course teacher has to formulate the outcomes and get it reviewed by the head of the department.

Program Outcomes:

It will state the capabilities the student can acquire after completion of his degree (UG/PG).

This can include the generic capabilities and skills.

The head of the department/ faculty in charge has to write the outcomes with help of senior faculty and get reviewed by the IQAC.

Program Specific Outcomes:

It will state the discipline specific capabilities the student can acquire after completion of his/her degree (UG/PG) e.g. Capabilities /technical skills/programming skills etc. related to computer science field for BSc computer science.

This includes the generic capabilities and skill sets related to their specialization.

The head of the department has to write the outcomes with help of senior faculty and get reviewed by the IQAC.

Writing learning outcomes statements:

Here are some guide lines to help the teachers in writing learning outcomes statements:

- consider the student's perspective when writing learning outcomes and stress on what should the student be able to know, do at the end of this unit that they could not do at the beginning.

- The learning outcome statements must start with an **action**verb. For cognitive outcomes use verbs that go beyond knowledge and comprehension that is students will be able to evaluate, analyze, synthesize and critique. The use of these verbs ensures that the learning is measurable.
- There may be some more appropriate, discipline-specific action verbs as well.
- Try to keep to one distinct learning outcome per statement, unless they are closely related.
- An outcome statement should capture in an integrated way the abilities, skills, attitudes and/or values that will demonstrate the attainment of that outcome.
- It is very important to reflect the objectives of syllabus, graduation attributes, vision and mission of the college while writing the outcomes.
- The learning outcomes must be linked with the teaching strategies and assessment tools/methods.
- It is not possible to measure the attainment of every outcome but link most of the outcomes to assessment.

Linking Learning Outcomes, Teaching and Learning Activities and Assessment: (3)
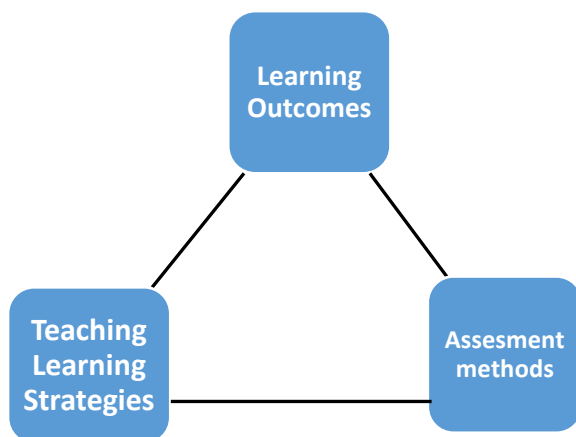
The teacher has to form the linking table for the given course as follows:

Learning Outcomes	Teaching learning strategies /Activities	Assessment tasks/tools

Attainment of COs, POs and PSOs (2)

The process of attainment of COs, POs and PSOs starts from writing appropriate COs for each course of the program from first year to last year in UG/PG degree program. The course outcomes are written by the respective faculty member using action verbs of learning levels suggested by Bloom] and Anderson.

Then, a correlation is established between COs, PSOs 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 including the elective subjects. The course outcomes written and their mapping with POs are reviewed frequently by a committee of senior faculty members before they are finalized. The following tables show the COs and the CO-PO mapping matrix for a sample course:

Course Name: --------------------

Table 1:

Course Outcome #	Course Outcome
CO 212.1	
CO 212.2	
CO 212.3	
CO 212.4	

Table 2:

CO #	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4
CO 212.1	2	2	2	-				
CO 212.2	3	2	-	-				
CO 212.3	3	2	2	-				
CO 212.4	3	2	2	-				
CO 212	2.75	2	1.5	-				

From the mapping matrix of COs and POs for all the courses as above, a 'Program level course-PO matrix' of all the courses including first year courses is prepared. Table below shows 'Course-PO' mapping matrix.

Program level Course-PO matrix for all the courses including first year courses

Table 3:

COURSE	PO1	PO2	PO3	PO4	PSO1	PSO2	PSO3	PSO4
CO 111	2	2	2	-				
CO 112	3	2	-	-				

CO 211	3	2	2	-				
CO 212	2.75	2	1.5	-				
CO 411								
CO 412								

Attainment of COs(2)

As per the CBCS 2019 pattern the internal assessment of 15 marks and university assessment of 35 Marks. The attainment calculation includes both internal assessment and university assessment by using direct method. The Internal assessment component consist of two tools one tool of 5marks and second tool which is the test of 10 marks . For example If you have five course outcomes lets us say tool1 tests two outcome viz. CO1 and CO2 and tool2 tests CO2 CO3 CO4 and CO5. Similarly, after the declaration of the university results, the percentage of students who attained the COs is computed. Here, it is assumed that the questions answered by a student cover all the course outcomes defined for that course. The attainment of COs can be calculated by direct method as follows:

Table 4:

	POs	PO1-PO4		PO1-PO4			
		Tool1	Target	Tool2	Target	University Result	Target
	COs	CO1 & CO2	>= 50 %	CO2,CO3,CO4,CO5	>= 50%	CO1-CO4	>=40%
Sr.No	**Name of student**	**(5 Marks)**		**(10 Marks)**		**(35Marks)**	
1	XYZ	4	Y	8	Y	25	Y
2	PQR	3	Y	7	Y	16	Y
3	ABC	ABSENT	NA	6	Y	15	Y
	Y	2	Y	3	Y	3	
	N	0	N	0	N	0	
	NA	1	NA	0	NA	0	
		CO attainment	2/3 = 0.66	CO attainment	3/3= 1.0	CO attainment	3/3=1.0
Average Attainment = 0.83						AVG ATTN = 1.0	
Attainment level (IA) 3.0						Attainment level(UR) 3.0	

Overall course Attainment = 0.5 x IA attainment + 0.5 x UR attainment

$$= 0.5X3 + 0.5 X 3$$
$$= 3$$

To find PO attainment:
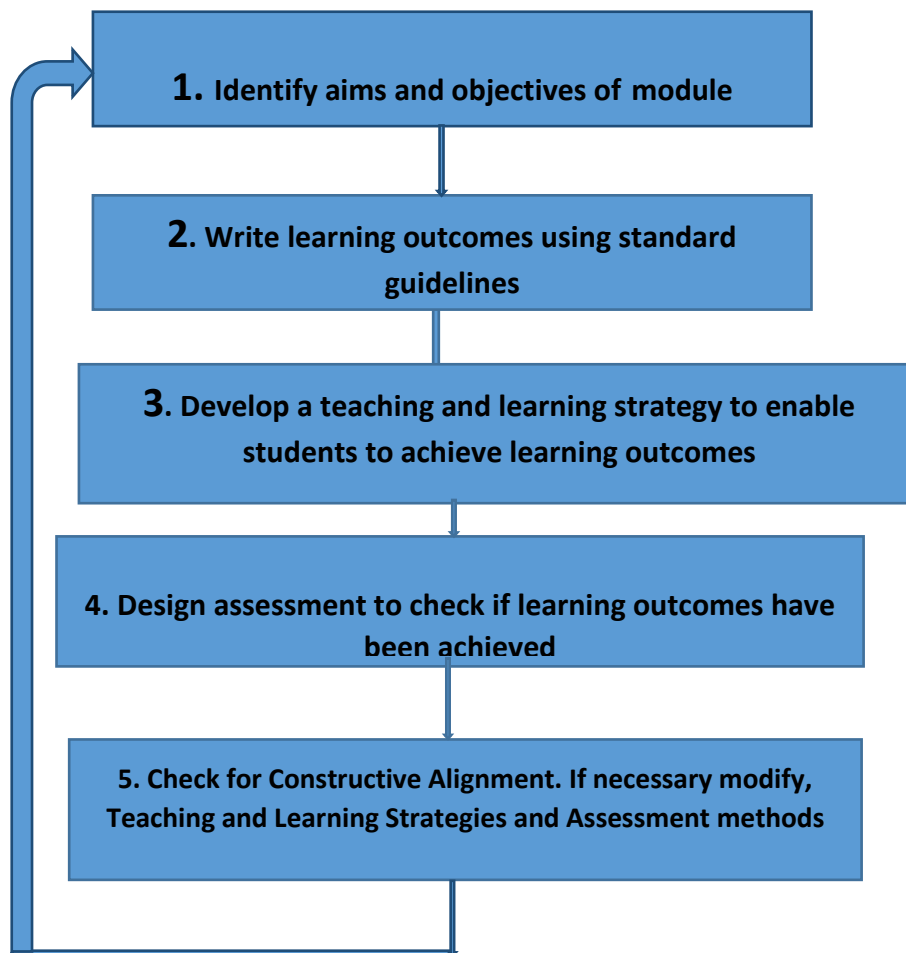**To find PO attainment for example**
PO1 = (corresponding cell value in table 3 X overall CO attainment value)/3

$= (2.75 \text{ X } 3)/3 = 2.75$

Thus find the attainment values for all POS and PSOs for all courses and finally calculate the average PO and PSO attainment values.

"Bottom up" approach for existing modules: (3)

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│ 1. Identify aims and objectives of module       │
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┌─────────────────────────────────────────────────┐
│ 2. Write learning outcomes using standard       │
│                 guidelines                       │
└─────────────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────────────┐
│ 3. Develop a teaching and learning strategy to  │
│   enable students to achieve learning outcomes   │
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                    ↓
┌─────────────────────────────────────────────────┐
│ 4. Design assessment to check if learning       │
│        outcomes have been achieved               │
└─────────────────────────────────────────────────┘
                    ↓
┌─────────────────────────────────────────────────┐
│ 5. Check for Constructive Alignment. If          │
│   necessary modify, Teaching and Learning        │
│   Strategies and Assessment methods              │
└─────────────────────────────────────────────────┘
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Reference:
1) *the University of Queensland guidelines for outcomes*
2) *Measuring Attainment of Course Outcomes and Program Outcomes – A Simplified Approach as per Self-Assessment Report -June 2015 Article in International Journal of Research & Method in Education · August 2016DOI: 10.9790/7388-0604041318*
3) *Linking Learning Outcomes to Teaching and Learning Activities and to Assessment Presentation 3 23 May 2017 Erasmus+ LOAF Project, Vilnius, Lithuania Dr Declan Kennedy, Department of Education, University College Cork, Ireland.*

The link for video lecture of the Attainment calculation in regional language prepared by college:

https://www.youtube.com/watch?v=-0ffHU56c_s