# University of Mysore

# HANDBOOK ON
# LEARNING OUTCOMES-BASED EDUCATION (LOBE)



## Internal Quality Assurance Cell (IQAC)
### Manasagangotri, Mysuru – 570 006

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**UNIVERSITY OF MYSORE**

**HANDBOOK ON
LEARNING OUTCOMES-BASED EDUCATION (LOBE)**



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# INTRODUCTION

A high priority task in the context of future education development agenda in India is fostering quality higher education. Improvement of quality of higher education is considered critical for equipping young people with the skills relevant for global and national standards. At present, most of the graduates are not employable as the system orients learners towards achieve marks in the examination. This should shift to learning that would focus on enriching the learners with knowledge, understanding, attitude, skills and values. Sustained initiatives are required for institutionalizing an outcome based higher education system and enhancing employability of graduates.

The University Grants Commission (UGC), under its Quality Mandate (QM) has taken various initiatives to bring in academic reforms in the Higher Education Institutions (HEIs) in India, with an aim to equip the graduates from UG/PG programs with knowledge, understanding, attitude, skills and values. In order to accomplish meaningful learning, evaluation should be linked to 'Learning Outcomes' and 'Institutional goals'. In accordance to it, UGC has developed Learning Outcomes-Based Curriculum Framework (LOCF) and recommended HEIs to implement 'Learning Outcomes-Based Education (LOBE)', under the international standards of Outcomes-Based Education (OBE). OBE enhances the quality of education to international standards as its output will be more valid, reliable and productive. Most of the premier institutes of higher education around the world have adopted OBE.

India's National Education Policy (NEP) - 2020 and National Assessment and Accreditation Council (NAAC) have emphasized the implementation of Outcome-Based Education (OBE) at all HEIs. Current credit system practiced in institutions needs comprehensive reforms as they are less learner-centric and offer very little flexibility and choice. The core philosophy of LOBE rests in adhering to student centric learning approach used to measure student's performance based on pre-determined set of outcomes.

# Glossary

- **Assessment:** It is the systematic process of collecting, recording, scoring, describing and interpreting information about students' learning.
- **Attainment:** In LOBE, Attainment is the academic score of a student or class or institution, against a certain outcome, on the same scale used for mapping.
- **Course Learning Outcomes (CLOs):** These are the outcomes/ knowledge every student is expected to attain after the completion of the course (subject).
- **Course:** A basic unit of education and/or training. A course or collection of courses forms a program of study.
- **Curriculum:** Curriculum is the sum total of the academic and non-academic experiences of an institution. It is based on educational intended outcomes to fulfill the personal and social growth of the learners.
- **Discrimination Index:** (of a question) A measure of how well the question is able to distinguish between a student who has achieved the outcome and those who have not.
- **Evaluation** is the process of making judgments based on evidences and interpretations gathered through examination and assessment on the basis of agreed upon criteria.
- **Graduate Attributes (GAs):** GAs are a set of desired capabilities that help to strengthen learner's abilities for widening current knowledge base and skills, gaining new knowledge and skills, undertaking future studies, performing well in a chosen career and playing a constructive role as a responsible citizen in the society.
- **Learning Outcomes-based Education (LOBE):** Adherence to student-centric learning approach focused on measurable student's performance based on pre-determined set of outcomes.
- **Mapping:** Mapping may be defined as quantifying the relationship between various elements of LOBE.
- **Outcomes:** Intended results of education to be demonstrated by students at the end of the teaching – learning experience. The are performances that embody and reflect learner competence in using information successfully.
- **Program:** A collection of courses in which a student enrolls and which contributes to meeting the requirements for the awarding of one or more Certificates/ Diplomas/ Degrees.
- **Program Education Objectives (PEOs):** Broad statements that describe what graduates are expected to attain within a few years of graduation.
- **Program Learning Outcomes (PLOs):** They represent the knowledge, skills and attitudes a student should attain at the end of the program.
- **Program Specific Learning Outcomes (PSLOs):** These are program-specific statements, which refer to what a student should know and be able to do on completion of the program.
- **Rubric (Assessment Rubric):** A rubric for assessment, also called a scoring guide, is a tool used to interpret and grade students' on any kind of work against criteria and standards that are assessed through descriptors for each level.

1. **Outcome Based-Education (OBE)**

    Outcomes-based education as defined by Spady (1994) means "clearly focusing and organizing everything in an educational system around what is essential for all students to be able to do successfully at the end of their learning experience." Technically, OBE integrates psychological, philosophical, sociological and Technological principles and practices into education. This educational system designs its curriculum and instructional methods backwards. Its process consists of writing course outcomes (what the students should be able to do), designing assessment (how to measure the ability of students to do what they are expected to do), and instruction (how the teacher proposes to facilitate the students to acquire the ability to do what they are supposed to do). This approach shifts the focus from teaching content to teaching skills and competencies, thereby ensures that students are well prepared for success in their careers in the modern world. The faculty may adapt the role of instructor, trainer, facilitator and/or mentor, based on the outcomes targeted.

## 1.1 Benefits of OBE

    OBE enhances the quality of our education to international standards as its output will be more **valid, reliable, realistic and productive**. Hence, most of the premier institutes of higher education around the world have adopted it. This system driven by **clarity of focus** is highly **student-centered,** provides more room for **flexibility** to the teacher in designing the curriculum **and** makes the student more **responsible** for their learning activities. It provides the student an **authentic quantified profile and** also helps for **validating the performance of the institution** in terms of its Vision, Mission, Program Educational Objectives (PEOs), Program Outcomes (POs), Program Specific Outcomes (PSOs) and Course Outcomes (COs). It works on the assumption that all students can achieve the intended outcomes with appropriate support.

## 1.2 LOBE (Learning Outcomes-Based Education) Framework of UGC

    UGC has specified the educational outcomes described under OBE as 'Learning Outcomes.' Learning outcomes are detailed specific abilities students gain, focusing on *what students can do*. They are more often action oriented and measurable than general goals. Accordingly, UGC has designed the LOBE framework under the international standards of OBE model and recommended HEIs to implement LOBE.

## 2. Bloom's Taxonomy Framework – Its Application in LOBE

Bloom's Taxonomy is crucial in LOBE, because it provides a hierarchical framework for defining clear, measurable learning outcomes, guiding instructional design, aligning teaching with assessments, and fostering Higher-Order Thinking Skills (HOTS) from basic recall (Remembering) to complex creation (Creating), ensuring students achieve deeper, applicable understanding beyond rote memorization. It bridges what teachers *teach* with what students *can do*, ensuring outcomes progress from foundational knowledge to real-world application, making learning progressive and measurable.

Bloom's Taxonomy, a classification of intellectual behavior levels was developed in 1956 under the leadership of educational psychologist Benjamin Bloom in order to promote higher forms of thinking in education, such as analyzing and evaluating concepts, processes, procedures, and principles, rather than just remembering facts. This classification is most often used when designing educational, training, and learning processes. This taxonomy of learning has three overlapping domains: cognitive, affective and psychomotor. Educators often refer to them as KSA (Knowledge [cognitive], Skills [psychomotor], and Attitudes [affective]). After a learning experience, the learner should possess a new skill, knowledge, and/or attitude. Well-rounded and fully functioning people need development in all the three domains. Within each of cognitive, affective and psychomotor domains, learning can take place at a number of levels ranging from simple to complex.

The cognitive domain of Bloom's taxonomy is concerned with intellectual or mental skills and the development of knowledge in individuals. Bloom identified six levels within the cognitive domain, from the simple recall or recognition of facts as the lowest level, through increasingly complex and abstract mental levels, to the highest order, evaluation. The six progressive stages of cognitive thinking identified are, knowledge (recall), comprehension, application, analysis, synthesis, and evaluation.

The affective domain of Bloom's taxonomy refers to emotional and social aspects of learning, including attitudes, beliefs, and values. It is concerned with the development of values, attitudes and beliefs that will influence behaviors and guide decision making. The affective domain is important because, it helps students to develop a sense of responsibility, self awareness and respect for others. By

integrating the affective domain into teaching and learning, educators can help students to develop a deeper understanding of themselves and others, as well as a stronger sense of social responsibility and citizenship.

The psychomotor domain of Bloom's taxonomy refers to the skills and abilities that individuals acquire through physical activity and practice. These skills are related to the use of muscles and the coordination of body movements. Examples of psychomotor skills include riding a bike, typing or playing a musical instrument.

The cognitive domain is most widely used, while the affective and psychomotor domains are less frequently used in educational settings. The psychomotor domain is often associated with vocational or technical education, but it is also relevant to a wide range of fields, including sports, performing arts and healthcare.

## 2.1 The Revised Bloom's Taxonomy

Anderson *et al.* (2001) presented Revised Bloom's Taxonomy incorporating new knowledge and thought produced since 1956.

The revised Bloom's Taxonomy of cognitive domain was two-dimensional in contrast to the single dimension of the original taxonomy. The suggested two dimensions are cognitive process and knowledge. The cognitive process dimension contains six categories: Remember, Understand, Apply, Analyze, Evaluate, and Create. These cognitive processes are organized hierarchically as per cognitive complexity from lower level to higher level thinking. Each of these processes is further broken down in to four knowledge categories, including Factual knowledge, Conceptual knowledge, Procedural knowledge, and Metacognitive knowledge.

### 2.1.1 Cognitive Processes

**(i) Remember:** It is the ability to recall information or previously learned concepts. It involves the retrieval of information from long term memory such as names, dates, places and definitions. Four subcategories of remember level are, recognising, recalling, reproducing and repeating. Remembering is an essential building block for Higher Order Thinking (HOT) skills. It is important for students to have a strong foundation of facts and knowledge before moving on to more complex cognitive processes such as Analyse, Evaluate and Create. Teachers can help students develop their remembering skills by providing opportunities for repetition, practice, and retrieval of previously learned material. They can also use various techniques such as mnemonics, acronyms, and visual aids to aid in memory retention.

**(ii) Understand:** It is the ability to comprehend the meaning of the information being learned and demonstrate the ability to explain it in own words. Five subcategories of understand level are Interpretation, Categorization, Summarization, Comparison and Explanation. In teaching and learning the understanding level is important because it helps learners connect new information with their prior knowledge and experiences. Teachers can facilitate understanding by providing opportunities for learners to explain concepts in their own words, compare and contrast ideas, and summarize key points. Examples of teaching strategies that promote understanding include concept mapping, brainstorming, and discussions.

**(iii) Apply:** It is the ability to use or apply knowledge in a new or different situation. This involves taking knowledge and using in a practical or real world context. Three types of apply cognition are, apply to familiar situations, apply to unfamiliar situations and analysing and synthesizing. Teachers can promote applying cognition by providing students with opportunities to practice using their knowledge in real life situations. This can include lab experiments, simulations, case studies and problem solving activities that require students to apply their knowledge and skills in new and unfamiliar situations.

**(iv) Analyze**: It is the ability to breakdown complex concepts into smaller parts and identify the relationships and pattern between those parts. Some key skills involved in analyze level are differentiating, comparing, contrasting, classifying and organizing. By engaging in analyzing cognition, learners develop critical thinking skills and the ability to evaluate information independently. These skills are essential for success in academic and professional contexts.

**(v) Evaluate:** The ability to make judgments or decisions based on criteria and standards. At this level, students can assess the value or quality of ideas, materials, or work based on a set of criteria. It involves making informed judgments about the worth, validity, or effectiveness of something, and it requires students to use critical thinking skills and knowledge of the subject matter.

To develop evaluating skills in students, teachers can create activities and assessments that require students to apply critical thinking skills and make informed judgments based on established criteria. They can also provide feedback and opportunities for reflection to help students understand how to improve their evaluation skills.

**(vi) Create:** It is the highest level of the cognitive domain in Revised Bloom's Taxonomy. It is the ability to use knowledge and skills to produce something new, to combine information in a unique way, or to produce an original product. This level requires not only the application of knowledge and skills, but also the use of critical thinking and creativity. Important subcategories of creating cognition are, designing, constructing, inventing, composing generating and planning. Creating cognition is an important skill in today's world as it encourages innovation and problem solving. It allows individuals to think outside the box and come up with new solutions to complex problems. By fostering the ability to create, individuals are better equipped to adapt to the ever changing demands of the world.

The above said, six cognitive domain levels are grouped as Low Order Thinking (LOT) and High Order Thinking (HOT) cognitive processes. In this process, students are assessed for fundamental concepts under LOT and advanced learning under HOT. This process helps in defining the course outcomes to what level the students are expected to develop skill sets. The goal of an educator's using Bloom's taxonomy is to encourage High Order Thinking (HOT) in their students by building up from lower-level cognitive skills.

**2.1.2 Knowledge Categories**

Knowledge categories refer to the types of knowledge that learners acquire through their educational experience. Knowledge category is a crucial component of Bloom's taxonomy and an important aspect of teaching and learning. By understanding the different categories of knowledge, teachers can design effective lesson plans and help students develop a deep understanding of the subject matter. There are four dimensions of Knowledge-factual, conceptual, procedural and metacognitive.

**(i) Factual Knowledge:** This is the knowledge of basic facts, concepts and information that are essential to understand a subject. It is the knowledge of specific details, concepts, terminology, principles, and facts that are relevant to a particular subject. Factual knowledge can be acquired through various methods such as reading, lectures, discussions and hands-on activities. Teachers can use various strategies to help students develop factual knowledge, such as providing relevant reading material, creating engaging lectures, and using visual aids like diagrams and charts to help students understand complex concepts. Additionally, teachers can use

assessment tools like quizzes and test to measure the student's acquisition of Factual Knowledge.

**(ii) Conceptual Knowledge:** This is the knowledge of the underlying principles and relationships that govern a subject. It refers to the understanding of concepts, principles, and relationships between ideas. It involves the ability to organize and categorise information into a coherent framework that can be used to solve problems and make decisions. Conceptual knowledge is important in developing critical thinking skills and problem solving abilities. To teach conceptual knowledge effectively, instructors should provide opportunities for students to make connections between concepts, use metaphors or analogies to explain concepts, and help students build mental frameworks to organize and represent their knowledge.

**(iii) Procedural Knowledge:** This is the knowledge of how to perform tasks or procedures associated with a subject. In teaching, procedural knowledge can be taught through a variety of methods including, demonstrations, practice exercises and simulations. By providing opportunities for students to practice and apply procedural knowledge, they can develop the skills necessary to perform tasks and solve problems effectively.

**(iv) Metacognitive Knowledge:** It refers to the knowledge about one's own thinking processes and the ability to regulate and control one's own thinking. It includes the ability to set goals, monitor progress towards those goals,, and evaluate outcomes.

In the context of teaching and learning, developing metacognitive knowledge can help students become more effective learners by enabling them to regulate their own thinking and learning processes. Teachers can support the development of meta-cognitive knowledge by providing opportunities for students to reflect on their learning, set goals, and monitor progress towards those goals.

### 2.1.3 Bloom's Action Verbs

Bloom's initial work was followed up with research that resulted in a list of Action Verbs (known as Bloom's action verbs) representing intellectual activity on each cognitive domain's respective level. Bloom's Taxonomy verbs are action words used to define learning outcomes for different cognitive levels, from basic recall (Remember: define, list) to higher-order thinking. These verbs help educators structure lessons and assessments, guiding students from simple knowledge

acquisition to complex problem-solving and original idea generation, organized in a hierarchy of increasing complexity.

These action verbs help faculty and syllabus creators to define clear and measurable course outcomes that align with the desired level of cognitive development. Some selected action verbs of six cognitive processes are tabulate below.

| Remember | Understand | Apply | Analyse | Evaluate | Create |
|---|---|---|---|---|---|
| define, list, tell, describe, recite, recall, identify, show, label, tabulate, quote, name, who, when, where, why, what, which | describe, explain, paraphrase, restate, associate, contrast, summarize, differentiate interpret, discuss<br><br>syntesize | calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, experiment, show, examine, modify | calculate, predict, apply, solve, illustrate, use, demonstrate, determine, model, experiment, show, examine, modify | classify, outline, break down, categorize, analyze, diagram, illustrate, infer, choose, select<br><br>validate defend estimate | design, formulate, build, invent, create, compose, generate, derive, modify, choose, develop, integrate invent plan |

It may be noted that some of the verbs in the above table are associated with multiple Bloom's Taxonomy levels. These verbs are actions that could apply to different activities. We need to keep in mind that it's the skill, action or activity we need students to demonstrate that will determine the contextual meaning of the verb used in the assessment question.

**2.1.4 Bloom's Taxonomy Table**

The two-dimensional nature of the Bloom's Revised Taxonomy allows a more natural expression of an outcome statement. By combining the Knowledge (Noun) and Cognitive (Verb) components, outcome statements can be created that clearly define what students are expected to know and be able to do. This combination ensures that the statement are both measurable and effective, as they encompass both the content knowledge and the cognitive skills that students need to acquire and demonstrate. The taxonomy table is a matrix that includes different combinations of action verbs (representing cognitive process) and nouns (representing knowledge or content areas). Each cell in the table represents a specific combination of a cognitive level and a knowledge domain.

For example, a cell in the table might include the combination "analyse concepts" or "evaluate arguments". This indicates that at a certain cognitive level, such as analyzing or evaluating, the focus is on applying that cognitive process to a specific knowledge domain, such as concepts and arguments.

| Knowledge Dimension | | Cognitive Process Dimension | | | | | |
|---|---|---|---|---|---|---|---|
| | | Remember | Understand | Apply | Analyse | Evaluate | Create |
| A | Factual | | | | | | |
| B | Conceptual | | | | | | |
| C | Procedural | | | | | | |
| D | Metacognitive | | | | | | |

The taxonomy table allows educators to choose appropriate action verbs and knowledge domain that align with their learning objectives and instructional context. It provides a systematic way to link cognitive processes and knowledge areas, helping to guide the design of learning activities, assessments, and instructional strategies.

Overall, the Revised Bloom's Taxonomy framework provides a systematic approach for faculties to organize and align their instruction, objectives, and assessments.

### 3. LOBE Framework:

Learning Outcomes-Based Education (LOBE) framework encompasses the structure and components of an educational system designed to align with the principles and goals of OBE. With a dynamic and flexible framework LOBE model, allows institutions to design their goals to evolve continuously along with the evolution of social systems, ever changing national and regional interests. Embarking on the journey of implementing LOBE requires a strategic approach and meticulous planning. There are five core components of LOBE Framework, which are as follows**:**

i. **Intended Learning Outcomes** : Learning outcomes are the foundation of LOBE. They are clear and measurable statements that describe what students will know and be able to do upon completion of a course or program.

ii. **Curriculum Design**: It is the process of structuring teaching-learning activities around achieving learning outcomes.

iii. **Teaching-Learning Activities**: Engaging students through activities designed to foster the required learning outcomes.

iv. **Assessment Tasks**: Using varied methods of assessments with rubrics to measure how well students meet the Learning outcomes.

> **v.** **Continuous Quality Improvement**: Analyzing assessment data to find gaps and refine the curriculum, teaching, and outcomes for future cycles.

**3.1 Interrelationships of Learning Outcomes:** It is imperative for institutions to set the PEOs, PLOs, CLOs, Competencies and Indicators consistent with its Vision and Mission statements. The first step in developing the PLOs is to develop clear PEOs which depend upon the goals, mission and vision statements of the institution/organization along with the inputs from all its stakeholders like parents, students, society, environment, regional and national interests. Once an institution defines PEOs, these objectives will lead to the development of PLOs. Program Learning Outcomes lead to the identification of one or many different competencies and from competencies one may derive one or more measurable components called Performance Indicators to assess competencies objectively. Program Learning Outcomes also lead to design and development of a curriculum containing multiple courses with specific objectives (Fig. 1).
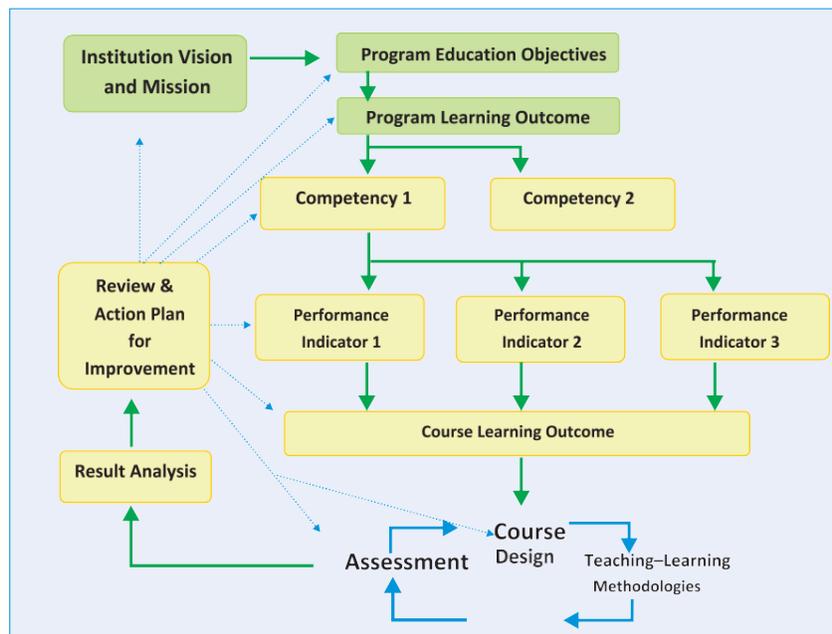


**Fig. 1: Interrelationships of Vision, Mission and Learning Outcomes**

**3.2 Systems Engineering Process Model for LOBE**

Applying the systems approach, a Systems Engineering Process Model for LOBE is designed by UGC, which not only describes the phases and traceability elements, but also describes the importance of assessments after the course curriculum has been

implemented. The process model outlined below is a V-shaped model in which the work flow is from the left, top to bottom, to the right, bottom to top (Fig. 2).
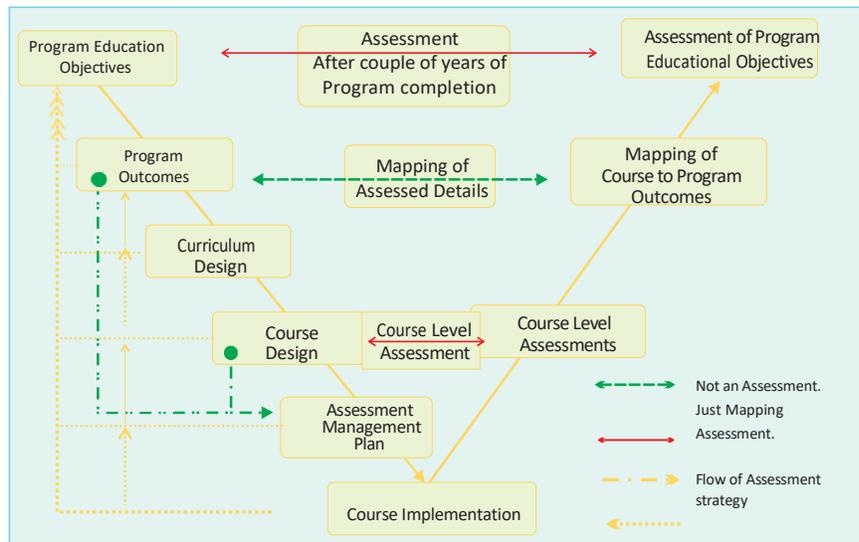


**Fig. 2: Systems Engineering Process Model for LOBE**

In figure 2 above, the left half illustrates different phases as well as set of deliverable work products each of which is traceable to the work product generated from the previous phase; for instance, the traceability of CLOs to PLOs and PLOs to PEOs. Iteration between phases is necessary for refinement. The right half of the Process Model details the assessment activities as per the assessment management plan. In the initial phase, assessments are performed at the course level. The assessment results are mapped to the program level and the performance is reported in an appropriate format. In the last phase, assessment is performed over few years after graduation. This assessment is performed based on feedback from students who have graduated from the university, from employers and from stakeholders dependent on the PLOs.

## 4. LOBE Implementation

The journey of implementation of LOBE begins by establishing clear vision and mission statements. This foundational step sets the tone for Department's commitment to LOBE, providing a roadmap for educational success.

### 4.1 Vision and Mission Statements

The vision statement of a program describes the goals while the mission statement of a program describes the objectives of that specific program. The vision is the long-term aspiration, and the mission describes the actions taken to achieve it, focusing on observable student abilities. Both the statements must be outcome-oriented, stakeholder-inclusive, and should align with the principles of continuous improvement.

**The Vision Statement should** be a concise, aspirational, and futuristic statement describing the ultimate desired position or impact of the institute in the long term (5-10 years) with focus on "What do we want to become known for?" and aiming for excellence in producing graduates who can make a difference in society or a specific field.

**The Mission Statement/s should** outline the department's core purpose, values, and the current actions/strategies used to achieve the vision. It should focus on "What do we do, for whom, and why?" *and* should focus on the *processes* and *methods* that ensure students acquire the necessary knowledge, skills, and attitudes. The number of mission statements per program may be three and named as M1, M2 and M3.

The Department Council (DC) of the concerned department should initially craft the Vision and Mission statements of the department by:

- Aligning them with the Vision and Mission statements of the University.
- Having a clear idea of what students should know and be able to do upon graduation (the "outcomes").
- Gathering inputs from all internal (faculty) and external (students, alumni, industry experts, parents, etc.) stakeholders on the institution's core values, strengths, and future aspirations to ensure a shared understanding and relevance to societal and industry needs.
- Employing Outcome-Oriented Language (action verbs and phrases related to outcomes. For e.g., "develop ethical professionals", "equip students with skills", "foster innovation", "prepare graduates who can solve problems".

The department will submit the draft statements before the Board of Studies (BOS). The BoS deliberates on the draft statements and then submits the finalized statements to Academic Council (AC) for approval. On approval, the Vision and Mission statements of the Department/School are circulated and disseminated.

The statements should be periodically reviewed and revised based on feedback and assessment data to ensure they remain relevant to evolving needs.

## 4.2 Program Educational Objectives (PEOs)

PEOs are broad, long term statements that describe the career and professional accomplishments that the program is preparing the graduates to achieve. These may be guided by global and local needs, vision of the institution, long term goals, etc. They help to develop critical, analytical, innovative, creative and problem-solving abilities among the graduates. They are assessed after (around 4-5 years) graduation, indirectly through graduate surveys.

The faculty members of the department, as key stakeholders continually interact with all other stakeholders, receive and evaluate the feedback and propose improvements in PEOs. The Department Council of the concerned department should collate the inputs from the stakeholders and draft manageable, achievable and program specific PEOs. Then these draft statements are to be placed before the Board of Studies (BoS). The BoS deliberates and finalize the PEOs. The, the final version are to be presented to Academic Council for approval.

Usually 3- 5 PEOs are to be drafted for each program. PEO's can be measured by a PO-PEO matrix.

University Grant Commission, to encourage and facilitate the adoption of the LOBE model across all disciplines, has identified a list of Generic PEOs from the higher education policy and has appendixes in its document entitled "Evaluation reforms in Higher Educational Institutions". These generic PEOs are tabulated below.

| Generic Higher Education PEOs (Some Examples) | | |
|---|---|---|
| **Academic Objectives** | **Moral and Spiritual Values** | **Social Sensibilities** |
| • Intellectual Strength<br>• General Knowledge<br>• Scientific Temper<br>• Self Reliance<br>• Inter Disciplinary Exposure<br>• Aptitude<br>• Independent Thinking<br>• Reasoning Ability<br>• Habit of Learning | • Emotional Maturity<br>• Ethical Values<br>• Simple Living<br>• Selfless Service<br>• Humility<br>• Truthfulness<br>• Dignity of Labour<br>• High Moral Character<br>• Physical & Mental Wellness | • Awareness about National Culture & Heritage<br>• Tolerance for Diversity<br>• National Integration<br>• Understanding Rural Life<br>• Civic Sense<br>• Respect for Rights<br>• Awareness about Duties |

It is suggested that Department/school may formulate the PEOs based on these generic PEOs.

**4.3 Graduate Attributes (GAs)**

GAs are a set of individually assessable outcomes that are indicative of the graduate's potential to acquire competencies in that program. The GAs are the attributes expected of a graduate from a program in terms of knowledge, skills, attitude and values. Graduate attributes are fostered through meaningful learning experiences made available through the curriculum, the total college/university experiences and a process of critical and reflective thinking. The graduate attributes reflect both disciplinary knowledge and understanding, generic skills, including global competitiveness all students in different academic fields of study should acquire/attain and demonstrate.

Fifteen GAs identified by UGC in LOCF are as follows:

***Disciplinary Knowledge:*** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of a program of study.

***Communication Skills:*** Ability to express thoughts and ideas effectively in writing and orally; communicate with others using appropriate media; confidently share one's views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.

***Critical Thinking:*** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.

***Problem Solving:*** Capacity to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one's learning to real life situations.

***Analytical Reasoning****: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyse and synthesise data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.

***Research-related Skills:*** A sense of inquiry and capability for asking relevant/ appropriate questions, problematising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation.

***Cooperation/Teamwork****:* Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team.

***Scientific Reasoning:*** Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.

***Reflective Thinking:*** Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.

***Information/Digital Literacy:*** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.

***Self-directed Learning:*** Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.

***Multicultural Competence:*** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.

***Moral and Ethical Awareness/Reasoning:*** Ability to embrace moral/ethical values in conducting one's life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstrating the ability to identify ethical issues related to one's work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.

***Leadership Readiness/Qualities:*** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a

team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.

*Lifelong Learning:* Ability to acquire knowledge and skills, including 'learning how to learn', that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling.

It is suggested that the Department/school may formulate the GAs based on these generic GAs.

## 4.4 Program Learning Outcomes (PLOs)

PLOs are broad statements that describe the knowledge, skills, analytical ability, attitudes and behavior that students are expected to demonstrate upon completion of a program. They encompass a range of competencies relevant to the discipline or field of study, such as critical thinking, communication skills, problem-solving abilities, and ethical awareness.

PLOs should be aligned with the PEOs of the program and should also serve as a framework for curriculum development, program assessment and continuous improvement efforts. They are broader than CLOs, describing general graduate attributes, not specific course content and will guide the development of narrower **CLOs**, ensuring every course contributes to the overarching program goals. They are measurable and can be assessed through course performance, projects, or feedback. Each PLO should be linked to specific CLOs within the curriculum (using a CLO-PLO/PSLO matrix) to show how they are achieved across different courses. The proper definition and the attainment of PLOs contribute to the attainment of PEOs.

PLOs shall be based on Graduate Attributes (GAs) of the program.

UGC, to encourage and facilitate the adoption of the LOBE model across all disciplines, has identified a list of generic PLOs and has Appendixes in its document entitled "Evaluation reforms in Higher Educational Institutions". These generic PLOs are tabulated below.

| Generic Graduate Program Learning Outcomes (Some Examples) | | |
|---|---|---|
| **Academic** | **Moral and Spiritual Values** | **Social Sensibilities** |
| • Professional Knowledge<br>• Problem Analysis<br>• Design and Development of Solutions<br>• Conduct Investigations of Complex Problems<br>• Innovation and Entrepreneurship<br>• Individual and Teamwork Communication<br>• Vocational and Industry Exposure<br>• Life-long Learning | • Professional Ethics<br>• Integrated Value System<br>• Physical and Mental Wellness | • Education and Society<br>• Environment and Sustainability<br>• National Constitution<br>• Culture and Heritage<br>• Social Sensibilities<br>• Rural Development |

It is suggested that the Department/school may formulate the PLOs based on these generic PLOs.

### 4.4.1 Procedure to formulate PLOs:

The Department Council of the concerned department should gather inputs and drafts the statements of PLOs by:

- brainstorming with industry experts, alumni, faculty, management and employers to understand industry/societal needs and graduate competencies.

- describing what graduates should know and be able to do

- using higher level action verbs (e.g., apply, analyze, design, communicate) and align with Bloom's Taxonomy levels.

- aligning them with PEOs and department's overall goals.

Then, the draft statements shall be submitted for review and approval by the Department Advisory Board which in turn places them before the Board of Studies (BOS). BOS deliberates and finalize the PLOs. The final version are to be presented to Academic Council for approval.

### 4.4.2  Program Specific Learning Outcomes (PSLOs):

PSLOs are statements that describe the specialized knowledge, skills, and competencies that are specific to a particular program or specialization within a program. They should align with the PEOs of the program and be designed to

prepare graduates for specific roles or responsibilities and may include competencies related to technical expertise, teamwork, and professional ethics. They may be formulated in consultation with industry partners, professional associations, regulatory bodies, and other relevant stakeholders to ensure that they reflect current and emerging trends in the field. In essence, PSLOs bridge the gap between general graduate attributes (PLOs) and the specific demands of a profession, ensuring graduates are well-equipped for their specialized careers.

**Key Aspects of PSLOs in PG Programs**

- **Discipline Focus:** PSLOs articulate abilities directly related to the core subject matter

- **Industry Relevance:** PSLOs are designed to meet specific industry demands and societal needs within that specialized field, making graduates employable.

- **Departmental Ownership:** PSLOs reflect their unique vision and curriculum of the department.

Usually there will be 2-4 PSLOs for a program. The PSLOs shall be formulated through the same process followed to formulate the PLOs in the department.

## 4.5 Course Learning Outcomes (CLOs)

Course Learning Outcomes are narrower statements of knowledge/skills/ abilities that describe what students are expected to know, and be able to do at the end of completion of each course (subject). These are the measurable parameters that evaluate the student performance for each course that the student undertakes in every semester. Based on CLOs the course curriculum shall be finalized.

Faculty members of the department will develop the CLOs. They are finalized through discussions with all the course teachers. They are regularly reviewed and revised based on feedback, assessment data, and changes in curriculum standards or industry requirements.

Typically 4-6 CLOs may be identified for each course based on its weightage. Each CLO is defined in the form of statements comprising of the identified action verb and specific skill/knowledge/disposition.

### 4.5.1 Characteristics of a Good CLO

- CLO must be action oriented and begin with "*the verb that most precisely describes the actual, preferred outcome behaviour to be achieved*". This is very important because very often faculty may use an imprecise action verb that appears to be a simpler or more complex cognitive process.
- CLO should focus on what the *student* will be able to do.
- CLO must be SMART (Specific: Students can state what they should be able to achieve from reading the outcomes. Measurable: Students can be able to recognize when they have achieved the outcomes. Achievable: It is genuinely possible to attain the outcomes in the specified time and with the resources available. Realistic: Outcomes are appropriate for the student. Time-bounded: Outcomes have a time limit for attainment).
- CLOs should contribute to attain PLOs in such a way that each CLO should address at least one of the PLOs. Also, each PLO must be reasonably addressed by adequate number of CLOs.

### 4.5.2 Key Steps to Formulate (CLOs)

- **Step 1:** Identify the key learning objectives of the course which outline the essential knowledge, skills, and competencies that students should gain in *this specific course* to contribute to the PLOs.
- **Step 2:** Break each learning objective down into smaller, more manageable components. These components form the basis for formulating specific CLOs.
- **Step 3:** Select appropriate action verbs (e.g., analyze, evaluate, create, apply) from Bloom's Taxonomy to describe essential knowledge, skills, and competencies, moving from lower to higher cognitive levels.
- **Step 4:** Combine the topic with the action verb to create a clear CLO.
- **Step 5**: Incorporate relevant input gathered from various stakeholders to ensure that CLOs are relevant and comprehensive.
- **Step 6:** Align CLOs with curriculum standards, program outcomes, and institutional goals. This ensures that the course is in line with broader educational objectives.
- **Step 7:** Create a CLO-PLO/PSLO mapping matrix to show how each CLO contributes to achieving specific PLOs/PLOs, ensuring logical flow.

## 5. Mapping of Outcomes (CLO-PLO/PSLO Mapping)

The final assessment in an LOBE approach is the estimation of the level of attainment of PLOs. These outcomes are estimated from the estimates of all CLOs and Activity Outcomes (AOs) of the entire program. Hence, every CLO and other Activity Outcomes (AOs) have to be mapped onto the respective PLOs in terms of the strength of mapping. After CLO statements are developed by the respective course in-charge, CLO-PLO/PSLO matrix will be derived with each CLO that will map with possible PLOs/PSLOs based on the relationship that exist between them. But the PLOs/PSLOs that are not necessarily mapped with any CLO may be left blank. It is mandatory that all CLOs should be mapped with any one of the PLOs/PSLOs and these PLOs/PSLOs are mapped with PEO which is specified in the program.

When designing the CLOs, faculty handling the course should map their COs to the appropriate PLO/PSLO in order to ensure that all PLOs/PSLOs are delivered throughout the period of study. A good way to do CLO-PLO/PSLO mapping is to carefully read a PLO/PSLO and then very carefully compare it with all CLOs in a course. In order to complete the CLO-PLO/PSLO articulation matrix, identify the action verbs/keywords of PLOs/PSLOs to each CLO and then make a corresponding mapping table at the corresponding cell as shown in the table below.

| Table : CLO- PLO//PSLO mapping matrix | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Course Learning Outcomes (CLOs) | Program Learning Outcomes and Profram Specific Learning Outcomes (PLOs and PSLOs) | | | | | | | | |
| | PLO 1 | PLO 2 | PLO 3 | PLO 4 | PLO 5 | PLO 6 | PLO 7 | PSLO 1 | PSLO 2 |
| CLO 1 | X | X | X | X | X | X | | | X |
| CLO 2 | X | | X | X | | X | | | |
| CLO 3 | | X | | X | X | X | | | X |
| CLO 4 | | X | | X | X | X | | | |
| CLO 5 | X | | X | | X | | | | X |
| CLO 6 | X | | X | | X | X | | | X |

CLO-PLO/PSLO mapping of every course should be documented as a departmental document along with the program matrix for each program.

## 5.1 Correlation level to CLO-PLO/PSLO mapping matrix

Correlation strength (Level) of CLO may be determined on the basis of Key words/action verbs of the CLO, contact hours of teaching and also on the number of Assessment tools used for CLO-PLO/PSLO mapping.

A.  The correlation level to CLO-PLO/PSLO matrix can be assigned as stated in Table below:

| Action verb/ Keywords Used in Writing COs | Mapping Level |
|---|---|
| Keywords/action verb of the CLO is not related to the action verb of PLO/PSLO | " – " |
| Part of PLO/PSLO is reflected through keywords/action verbs of CLO | '1' (Low) |
| Major part of PLO/PSLO is reflected through keywords/action verbs and moderate level performance is expected from student to achieve CLO | '2' (Medium) |
| Exact action verb of PLO/PSLO and critical performance expected from student to achieve CLO | '3' (High) |

Do not assign a high mapping strength of CLOs in any foundation courses with any PLOs/PSLOs because the foundation courses will not be able to address the issues of complex problem-solving, research, etc., related to that program/field.

B.  Contact Hours: Lectures, Tutorials and Practicals

| Contact hours (%) (including Lecture, Tutorial & Practical) | Mapping Level |
|---|---|
| < 5% | No mapping (-) |
| 5- 15% | Low (1) |
| 15- 25% | Medium (2) |
| >25% | High (3) |

Description:

Number of Lectures = 3per week x 16 weeks = 48 Hours
Tutorial = 1Hr x 16 Weeks = 16 Hours
Practical = 2Hr x 16 Week = 32 Hours
Total Hrs = 48+16+32 = 96 Hrs
Example: If, CO1 related contact points are engaged in 10 Lectures + 1 Tutorial and 2 Practical Hours
Then contact hours = 10+1+2x2 = 15 hours
Therefore, contact hours in percentage = (15/96) x 100 = 15.65 %. Medium mapping (2)

C.  Number of Assessment Tools used

| Assessment tools used to assess the CLO | Mapping Level |
|---|---|
| 0 | No mapping (-) |
| 1 or 2 | Low (1) |
| 3 | Medium (2) |
| 4 or more | High (3) |

## 6. Designing of Curriculum and Course

In LOBE curriculum design is a student-centered, backward-planning process where learning goals (outcomes) are defined first, then the content, teaching methods, and assessments are chosen specifically to ensure students achieve those results, focusing on real-world skills, competencies, and application rather than just content delivery. It's a flexible and structured plan to ensure that the graduates possess defined knowledge, skills, and attitudes for future success.

### 6.1 Key Features of Curriculum Design

- Clearly defines what students should *know*, *understand*, and *be able to do* (outcomes) before planning any lessons.
- Design backwards from the desired outcomes to selection of activities and content that directly support achieving the specified outcomes.
- Encourages active participation of students and focusing on developing competencies for real-life application.
- Emphasizes transferable skills (critical thinking, problem-solving, communication) alongside subject knowledge.
- Allows teachers to choose effective methods and tasks to meet outcomes and ensures that the curriculum stays relevant to societal and industry needs.
- Uses varied assessments to measure achievement of outcomes and not just content recall.

### 6.2 Major Steps in Designing Curriculum

1. Determine broad graduate attributes and specific course goals.
2. Plan Learning activities, projects, and lectures that build towards those outcomes.
3. Create authentic assessments (projects, presentations, portfolios) to verify whether students can demonstrate the required outcomes.
4. Regularly evaluate outcomes and curriculum effectiveness to refine the design.

In essence, OBE curriculum design shifts focus from "what to teach" to "what students should achieve," creating a practical, goal-oriented learning journey.

### 6.3 Course Design

A course design is a layout of the guided plan of the various components of the course. This helps in generating a conducive environment for learning in lines with the LOBE principles and a check of various components of the curriculum in terms of the CLOs. The cardinal principle behind a LOBE course design is the principle of **constructive alignment**, i.e. streamlining the learning experiences and assessments to the intended learning outcome.

### 6.3.1 Steps for the Development of Course Design

- Gather information about the course content, available resources related to the content, the respective CLOs, course expectations, and students learning needs.

- Divide the module into functional units or frames and decide upon the intended learning outcomes and performance indicators for the course units.

- Select content, fundamental concepts related to the content, appropriate learning activities, instructional method, support system relevant for the learning environment, and constructively align it to the intended learning outcome.

- Develop suitable performance indicators (assessment methods) that directly reflect the attainment of the intended learning outcomes.

- Implement the course plan as per the design creating a learning environment for the students of the course.

- Revise the plan periodically after the assessment and evaluation. This evaluation should be based on intended learning outcomes and actual learning outcomes, feedback from the students, peers, and self-reflection.

### 7. Learner–Centered Pedagogy

In an OBE environment, the role of the teacher is that of an engineer who designs an environment for learning that aligns with student's interests and abilities and that fosters learner engagement, autonomy, motivation, critical thinking and higher order cognitive skills. Here the learner is actively involved in the learning process for the attainment of the intended learning outcomes. Henceforth, for designing an effective and enjoyable environment for facilitating holistic development of the learner learning a sound knowledge of activity-based learning strategies are essential.

Few strategies based on Learner–Centered Pedagogy are MOOC, Flipped Classroom, Supervised Learning, Think Pair Share, Think Pair Solo, Round Robin,

Collaborative Learning, Puzzles, Programmed Instructions, Matrix Method, Peer Learning, Work-Based Learning, Problem-Based Learning, Personalized Learning, Group Discussion, Debate, Case Studies, Fishbowl, Reciprocal Teaching, etc.

## 7.1 Teaching-Learning Process

LOBE approach, requires a significant shift from teacher-centric to learner-centric pedagogies, and from passive to active/participatory pedagogies that enhance student engagement. Planning for teaching therein becomes critical. Every program of study lends itself to well-structured and sequenced acquisition of knowledge and skills. Practical skills, including an appreciation of the link between theory and experiment, will constitute an important aspect of the teaching learning process. Teaching methods, guided by such a framework, may include: lectures supported by group tutorial work; practicum and field-based learning; the use of prescribed textbooks and e-learning resources and other self-study materials; open ended project work, some of which may be team-based; activities designed to promote the development of generic/transferable and subject-specific skills; and internship and visits to field sites, and industrial or other research facilities etc.

## 7.2 Core Pedagogical Tools and Strategies

In LOBE pedagogy, learning tools focus on active, student-centered methods like Problem-Based Learning, Project-Based Learning, Collaborative Learning, and Inquiry-Based Learning and adopting rubrics, portfolios, and authentic assessments (projects, presentations) to measure skills, supported by technology like **LMS platforms, digital tools for assessment AI chatbots, and data analytics** for personalized feedback and tracking progress towards defined Graduate Attributes.

## 8. Assessment in LOBE

Assessment has always been the heart of education. In LOBE, assessment is not about *how much content was covered*, but how well outcomes were attained. In LOBE, assessment focuses on measuring specific, predetermined learning outcomes (what students *can do*) through direct (tests, projects, portfolios) and indirect (surveys) methods, aligned with real-world tasks, using criterion-referenced standards rather than comparing students, to ensure mastery of skills and knowledge. Assessment includes both formative (ongoing feedback) and summative (final evaluation) stages, using diverse tools like case studies, presentations, and practical exams, all tied back to clearly defined goals.

**8.1 Formative and Summative Assessments**

At the core of LOBE lie **Formative** and **Summative** assessments which are complementary assessment types.

Formative assessment is **assessment for learning and assessment as learning**. It happens *during* the teaching–learning process and provides continuous feedback to both learners and instructors. Formative assessments ensure that students are **on track** to achieve outcomes *before* it's too late. They help faculty to identify learning gaps early, modify teaching strategies, support diverse learners and build higher-order thinking gradually.

Summative assessment is **assessment of learning**. It is conducted *after* sufficient learning has taken place and is used to **certify achievement** of outcomes. Summative assessments provide **documented, auditable evidence** of outcome attainment, which are critical for academic credibility, transparency, Accreditation (NAAC, NBA, NIRF), and institutional accountability.

In a strong LOBE practice, **formative assessment feeds the summative**. When formative assessments are well-designed, summative success becomes natural—not stressful. When formative and summative assessments work together, education shifts from *marks-driven* to *meaning-driven*. And that's where real outcomes happen.

**8.2 Assessment Process**

1. Clearly state what students should know/do by defining the CLOs and PLOs properly.
2. Map CLOs to broader PLOs.
3. **Design assessment** tools (quizzes, projects, labs, presentations) that specifically target these outcomes, giving them appropriate weight.
4. Use direct (exams, assignments, lab work, presentations) and indirect (surveys, interviews) methods to collect data on student performance.
5. **Calculate attainment of CLOs** often using a mix of assessment data (e.g., 40% internal, 60% end-semester).
6. **Provide feedback to students to** guide them and improve teaching.

**8.3 Assessment Methods**

A variety of assessment methods that are appropriate to a given disciplinary/ subject area and a program of study shall be used to assess progress of students.

Priority shall be accorded to formative assessment. Some of the important assessment methods are as follows: time-constrained examinations; closed-book and open-book tests; problem based assignments; practical assignment laboratory reports; observation of practical skills; individual project reports (case-study reports); team project reports; oral presentations, including seminar presentation; viva voce interviews; computerized adaptive testing; peer and self assessment etc. and any other assessment method as per the pedagogic approaches and the context.

## 8.4 Assessment Planning

While using Bloom's taxonomy framework in planning and designing of assessment of student learning, following points need to be considered:

1. Normally, the first three learning levels; remembering, understanding and applying and to some extent fourth level analyzing are assessed in the Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE), where students are given a limited amount of time. The last three learning levels: analysis, evaluation and creation can be assessed in extended course works or in a variety of student works like course projects, mini/minor projects, internship experience and final year projects.

Bloom's Taxonomy provides an important framework to design appropriate examination questions belonging to various cognitive levels.

2. Before adopting LOBE framework for reforms in examination system of a University/Institution, it is worthwhile to study the present pattern of assessment in each of the course in the program to gain insight about:
    a. Alignment of assessment questions with course learning outcomes
    b. Whether all the learning outcomes are tested; sometimes some learning outcomes are over tested at the expense of others which may not be tested at all.
    c. Overall weightage in the assessment, to each of Bloom's learning levels
    d. Assessment methods used to adequately assess the content and desired learning outcomes

Based on the study, improvement priorities for each of the above factors need to be arrived at. The reform process needs to be well planned and implemented

through institutional strategy and communicated to all stakeholders particularly to the students.

3. Bloom's taxonomy framework helps the faculty to set examination papers that are well balanced, testing the different cognitive skills. If the present examination questions are more focused towards lower cognitive skills, conscious efforts need to be made to include application skills or higher cognitive skills in the assessment.

## 8.5 Assessing Higher-Order Abilities and Professional Skills

Higher-order cognitive abilities like critical thinking, problem-solving and making informed decisions are also crucial for a graduate to succeed in the emerging world. The main challenge surrounding professional skills and higher abilities is that they are difficult to assess through existing conventional examination system.

Some of the educational experiences that are recommended to teach and assess professional outcomes and higher-order cognitive abilities are, course projects, open-ended experiments in laboratories, project-based learning modules, MOOCs, co-curricular experiences, mini/minor projects, final year projects, internship experiences, e-portfolios of student works.

## 8.6 Assessment Rubrics

A rubric for assessment, also called a scoring guide, is a tool used to interpret and grade students' on any kind of work against criteria and standards.

An assessment rubric provides the means to increase objectivity in assessment and reduce subjectivity; presents a clear expectation on the assessments, and relates it to learning outcomes; ensures consistency, transparency and fairness in the marking process across course instructors for the same assessment type; efficiently grades or marks many assessments for a large group of students; defines clear guidelines for moderation; and provides more objective data for analytics.

To evaluate the student works for attainment of CLOs and hence PLOs, it is of utmost importance to have reliable methods/proper assessment tools. Rubrics provide a powerful tool for assessment and grading of student work. Rubrics are scoring, or grading tool used to measure a students' performance and learning across a set of criteria and objectives.

### 8.6.1 Structure of a Rubric

There are three components within rubrics namely: (i) criteria/performance indicator: the aspects of performance that will be assessed, (ii) descriptors: characteristics that are associated with each dimension, and (iii) scale/level of performance: a rating scale that defines students' level of mastery within each criterion.

| Rubric title | | | |
|---|---|---|---|
| Criteria | Level of Performance | | |
| | Score 1 | Score 2 | Score 3 |
| Criterion 1 | | | |
| Criterion 2 | | **DESCRIPTORS** | |
| Criterion 3 | | | |

The **assessment criteria** define the characteristics or traits to be judged which should be derived from the course learning outcomes and indicate what is expected to be demonstrated. **Level of performance** is the rating or measure on the degree of achievement on a particular criterion as specified by the rubric, i.e., excellent/good/satisfactory/poor etc. **Descriptors** identify the qualities required to demonstrate achievement of each level of performance for each criterion. Listed in the form of short explanations, they provide guidance on the actual judgment on the assessment to match students' performance.

### 8.6.2 Developing a Rubric

The steps to be followed are:

- Identify learning outcomes for the assessment
- Decide on criteria based on learning outcomes, i.e., the characteristics on which to judge students' performance.
- Select levels of performance i.e., an appropriate scoring method must be chosen depending on the nature of the assessment and chosen scale.
- Write descriptors, i.e., describe the expected achievement on each characteristic for each level of performance. The descriptions should be specific, clear and consistent.

A Seminar presentation Rubric is illustrated below as an example.

| Criteria | Performance (Marks) | | |
|---|---|---|---|
| | **5** | **3** | **1** |
| **Content** | The material presented was complete , precise and well supported by facts and figures | The material presented was partially complete and was off-topic at some places | The material presented was incomplete and largely off-topic |
| **Knowledge and Understanding** | Seminar demonstrated thorough knowledge and applicability of facts, terms and concepts | Seminar demonstrated moderate knowledge and applicability of facts, terms and concepts | Seminar demonstrated limited knowledge and applicability of facts, terms and concepts |
| **Discussion** | The student actively participated in the discussion and was able to give a convincing reply to questions | The student had a moderate participation in the discussion and was able to give a convincing reply to some questions | The student did not participate in the discussion and was not able to give a convincing reply to most questions |

## 9. Attainment of Learning Outcomes (CLOs and PLOs/PSLOs) in LOBE (Process in Phases)

In LOBE, **attainment** is the crucial process of **measuring and verifying if students have actually achieved the defined learning outcomes** (CLOs and PLOs) through various direct and indirect assessments, indicating mastery of skills, knowledge, and competencies, not just passing grades, to ensure students are ready for professional life. It is about proving what students can *do*, using data from exams, assignments, and feedback, and then taking action if targets aren't met. This systematic process ensures that learning objectives are met and that the educational program evolves effectively.

The process of Attainment in LOBE is as follows:

**Phase 1:** Planning and defining PEOs, PLOs & CLOs and map CLOs to PLOs

**Phase 2:** Designing of assessment methods (Direct & Indirect methods), defining of target levels (e.g., 70% attainment) for each CO and implementing Assessments.

**Phase 3: i)** Calculation of CO attainment score (e.g., Low, Medium, High); using average scores from internal (40%) and university exams (60%) or other weighted methods to get aggregate scores for all CLOs to find the overall CLO attainment level.

**ii)** Calculation of PLO/PSLO attainment using the mapped CLO attainment levels and their weightages to calculate the attainment of each PLO/PSLO.

**iii)** Identification of CLOs/PLOs/PSLOs with low attainment levels.

**Phase 4:** Using of attainment data and student/faculty feedback to review teaching methods, curriculum, and resources for Continuous Quality Improvement.

Develop and implement strategies (e.g., remedial classes, new teaching tools) to improve low-attainment areas for the next cycle.

## 9.1 Procedure for Attainment of Outcomes

A sample computation of attainment of PLOs is provided in the UGC document "Evaluation Reforms in Higher Educational Institutions."

## 10. Feedback and Reflection

OBE emphasizes the importance of providing feedback to students to support their learning and development. Feedback should be timely, specific, and constructive, helping students understand their strengths and areas for improvement. Additionally, opportunities for reflection allow students to think critically about their learning experiences and make connections between theory and practice.

## 11. Continuous Quality Improvement

LOBE is characterized by a cyclical process of continuous improvement. Educators regularly review and revise the curriculum, instructional strategies, and assessment methods based on feedback from stakeholders, assessment data, and changes in educational goals or standards. This iterative process ensures that the educational system remains responsive to evolving needs and priorities.

## 12. Embedding Sustainable Development Goals (SDGs) in LOBE

## 12.1 The Need for Embedding SDGs in Higher Education

The world today faces unprecedented challenges-climate change, inequality, resource depletion, technological disruption, and ethical collapse in decision making. In response, United Nations (UN) adopted 17 SDGs as a global roadmap to build a better future for all – by 2030. Education institutions are being called upon to serve as active contributors to sustainable societal transformation. LOBE gives education institutions the perfect framework to integrate SDGs into what students learn, how they apply knowledge, and who they become as graduates.

## 12.2 Seventeen (17) Sustainable Development Goals Identified by the UN

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
3. Ensure healthy lives and promote well-being for all at all ages
4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
5. Achieve gender equality and empower all women and girls
6. Ensure availability and sustainable management of water and sanitation for all
7. Ensure access to affordable, reliable, sustainable and modern energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
10. Reduce inequality within and among countries
11. Make cities and human settlements inclusive, safe, resilient and sustainable
12. Ensure sustainable consumption and production patterns
13. Take urgent action to combat climate change and its impacts
14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation & halt biodiversity loss
16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

LOBE is not just about outcomes-it is about impact. So, it aligns closely with United Nations SDGs, primarily because both frameworks focus on achieving specific, measurable results and enhancing the quality of learning to prepare students for real-world challenges. So, integrating SDGs allows institutions to:

- Make graduate outcomes socially and environmentally relevant
- Encourage ethical, sustainable decision making in every field
- Equip students to become leaders of change, not just job seekers
- Prepare students for emerging global career opportunities aligned to sustainability, and circular economy.

**12.3 Integration of SDGs in LOBE**

**(i) Curriculum:**

- Embed SDG-aligned themes and problems in core subjects
- Introduce dedicated SDG elective courses
- Align final-year projects with at least one SDG challenge

**(ii) Teaching-Learning Process**

- Frame assignments around SDG scenarios in problem based learning
- Analyze real-world SDG implementation successes and failures through case studies.
- Design interdisciplinary modules to address SDGs

**(iii) Assessment: Design Evaluations that Test**

- Ability to analyze complex problems with SDG lens
- Reflective understanding of ethical and ecological impact.
- Design of solutions that align with sustainability metrics.

**(iv) Student Activities and Clubs**

- Form SDG-focused student clubs (e.g., "Youth for SDG 3")
- Conduct hackathons, debates, street plays around global issues
- Organize social entrepreneurship competitions aligned with SDG-driven innovation

**(v) Research and Innovation**

- Encourage faculty and student research that addresses SDG problems
- Apply for grants form UN bodies, DST, AICTE, MSME, DBT focused on sustainability themes.

**(vi) Stakeholder Engagement**

- Partner with NGO's, local government bodies, and social enterprises
- Conduct community impact projects in nearby villages
- Include SDG alignment in MoUs and industry collaborations

**12.4 Aligning SDGs with Learning Outcomes (LOs)**

Aligning SDGs with Learning Outcomes (LOs) involves integrating sustainability competencies into curricula via mapping, redesigning learning activities, and assessing pedagogical approaches. Methods include embedding target-specific indicators, using Education for Sustainable Development frameworks and linking specific SDGs to course objectives.

Key strategies to align SDGs with learning outcomes include:

- **Curriculum Mapping:** Review existing curriculum to identify where SDGs can be embedded. And mapped to PLOs and/or PSLOs.
- **Competency-Based Learning:** Focus on building cognitive, socio-emotional, and behavioral competencies.
- **Integrating Specific SDGs:** For example, aligning botany courses with SDG 2 or Environmental Science courses with SDG 15.
- **Pedagogical Innovation:** Framing assignments around waste management, urban poverty, case studies and interdisciplinary modules.
- **Assessing Outcomes:** Assessing outcomes related to SDGs along with other LOs.

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