Taxonomies of Learning Objectives

Learning objectives play a crucial role in the design of instructional units or courses. These objectives typically span across **three domains** of learning: **Cognitive**, **Affective**, and **Psychomotor**. Each domain outlines specific types of learning outcomes related to **knowledge (thinking)**, **attitudes (feeling)**, and **skills (doing)**.

Instructional designers and subject matter experts (SMEs) utilize **learning taxonomies** as frameworks to structure and articulate these objectives. These frameworks bring clarity and help in aligning teaching strategies with desired learning outcomes.

Purpose of Learning Taxonomies

Taxonomies provide a systematic way to:

- Classify learning behaviours from simple to complex.
- Define clear instructional goals.
- Design measurable and observable learning outcomes.
- Align teaching methods with learner expectations.

Three Domains of Learning

Domain	Developed By	Focus Area
Cognitive	B.S. Bloom et al. (1956)	Intellectual skills and knowledge
Affective	Krathwohl et al. (1964)	Attitudes, values, and emotions
Psychomotor	Anita Harrow (1972)	Physical and motor skills

Each domain contains:

- **General Objectives**: Broad goals for a course or program.
- **Specific Objectives**: Measurable and observable behaviours that students should exhibit after instruction.

Example:

In a **Food and Nutrition** course:

- **General Objective**: Understand components of a balanced diet.
- **Specific Objective**: Identify at least five principal components of a balanced diet or define "balanced diet".

Each specific objective begins with **action verbs** such as *identify*, *define*, *describe*, etc., that describe clear and observable outcomes.

Cognitive Domain (Bloom's Taxonomy)

The **Cognitive Domain** involves the development of intellectual abilities and is concerned with the recall or recognition of knowledge and application of thinking skills.

Six Levels of Cognitive Learning Outcomes

Level	Description	Example Action Verbs
1. Kowledge	Recall of previously learned material, from facts to theories.	names, defines, labels, states, selects
2. Understanding	Grasping the meaning of material; interpreting and summarizing content.	interprets, translates, summarises, compares
3. Application	Using learned material in new and concrete situations; applying concepts or rules.	solves, uses, relates, produces, predicts
4. Analysis	Breaking down complex material into parts and understanding their relationship or structure.	identifies, differentiates, illustrates, subdivides
5. Synthesis	Combining elements to form a new structure or plan; producing new output.	categorises, designs, rearranges, reconstructs
6. Evaluation	Making value judgments based on criteria and standards; highest level of cognition.	appraises, justifies, supports, compares

Note: Higher levels (e.g., Evaluation) include cognitive tasks from lower levels and incorporate decision-making based on criteria.

Application in Instructional Design

- These taxonomies guide **teachers** in formulating instructional objectives for both **face-to-face** and **distance learning** contexts.
- **Specific Learning Objectives** (also known as **Instructional Objectives**) help in evaluating whether the learner has achieved the intended outcome.
- Objectives should always be **behaviourally stated**, meaning they describe observable and measurable actions by the learner.

Affective and Psychomotor Domains

1. Affective Domain (Krathwohl et al., 1964)

The **Affective Domain** focuses on **attitudes, emotions, values**, and **interests** that influence learning. Developed by **Krathwohl and colleagues**, it emphasizes **attitudinal change** and emotional development.

Key Features:

- Involves **interest, appreciation, values, and emotional responses**.
- Closely related to both **cognitive** and **behavioral** changes.
- Essential for effective learning and often integrated with face-to-face instruction or audio-visual media, especially in **distance education**.

Five Stages of Affective Learning

Level	Description	Example Action Verbs
1. Receiving (Reception)	Willingness to attend to particular stimuli (e.g., text, activity). Learner becomes aware and sensitive to the existence of stimuli.	chooses, describes, identifies, selects, replies
2. Responding	Active participation and involvement in learning activities. Learner shows motivation and interest (e.g., attending classes, participating in discussions).	discusses, performs, answers, presents, writes
3. Valuing	Learner attaches value or worth to an object, behaviour, or phenomenon (e.g., respecting civic duties).	reports, completes, explains, justifies, studies
4. Organization	Integrating different values, resolving conflicts, and forming a consistent value system (e.g., creating a career plan with social and economic balance).	arranges, combines, modifies, prepares
5. Characterization by a Value Complex	Internalization of values into consistent behaviour patterns. These values shape the learner's personality and way of life.	displays, listens, revises, solves, uses, verifies

2. Psychomotor Domain (Anita Harrow, 1972)

The **Psychomotor Domain** addresses the development of **physical and motor skills**, involving **movement**, **coordination**, and **use of motor-skill areas**.

Key Features:

- Concerned with **skill-based learning** (e.g., driving, painting, swimming).
- Often requires **face-to-face instruction** for mastery, especially in distance education.
- Learning progresses from simple motor actions to complex, coordinated behaviours.

Three Characteristics of Psychomotor Learning

- **Response Chains**: Sequential motor movements (e.g., swimming strokes).
- **Movement Coordination**: Integration of sensory input and motor output (e.g., riding a bicycle).
- **Response Patterns**: Mastered behaviours performed smoothly and without error (e.g., typing without looking).

Seven Stages of Psychomotor Learning

Stage	Description	Example Action Verbs
1. Perception	Using sense organs to guide physical activity. Becoming aware of sensory cues that direct movement.	chooses, identifies, selects, relates
2. Set	Readiness to take action. A mental, emotional, or physical disposition to act.	begins, moves, reacts, volunteers
3. Guided Response	Early skill development under instruction. Includes imitation and trial-error learning.	assembles, builds, sketches, manipulates, constructs
4. Mechanism	Learned response becomes habitual with increased confidence and efficiency.	displays, measures, organizes, builds
5. Complex Overt Response	Skilled performance of complex motor tasks with accuracy and efficiency.	assembles, constructs, fixes, manipulates, organizes
6. Adaptation	Ability to modify motor skills to fit special situations or solve problems.	adapts, rearranges, reorganizes, revises
7. Origination	Creating new movement patterns to address unique tasks or challenges.	arranges, combines, designs, originates

Structure of Observed Learning Outcomes (SOLO) Taxonomy
Developed by: *John Biggs and Kevin Collis (1982)*
Purpose: To systematically describe how student understanding grows in complexity during the learning process.

Key Features:
- SOLO taxonomy categorizes learning outcomes based on their **structural complexity**.
- It applies to both **quantitative** and **qualitative** aspects of learning.
- Describes learning as a **hierarchy**, moving from simple to complex levels of understanding.

SOLO Taxonomy Levels

Level	Description	Typical Learning Outcomes
1. Prestructural	Learner gathers disconnected pieces of information with no organization or meaning.	Identifies missing points, gathers unrelated facts.
2. Unistructural	Makes basic, obvious connections; focuses on one concept but lacks deeper understanding.	Naming, defining, using simple terms.
3. Multistructural	Recognizes multiple concepts but fails to connect or integrate them meaningfully.	Lists, describes, combines, enumerates.
4. Relational	Integrates various parts into a meaningful whole; understands relationships between elements.	Analyzes, relates, compares, applies.
5. Extended Abstract	Generalizes and transfers knowledge across domains; applies concepts in new contexts.	Theorizes, generalizes, reflects, hypothesizes.

Application Example (Louise Starkey, 2012)
Concept: *Sustainability*
This example illustrates how students progress through SOLO levels:

SOLO Level	Activity Description
Prestructural	Students learn basic facts about mining and oil extraction via interactive videos.
Unistructural	Learn about the limitations of natural resources using an interactive timeline.
Multistructural	Track weekly household consumption using scanning tools and energy databases; identify patterns.
Relational	Analyze input origins (mined, grown, manufactured) and relate them to environmental impact and broader sustainability concerns.
Extended Abstract	Track school's input-output systems; make cross-contextual generalizations and propose sustainable solutions at broader levels.

Steps for Designing Learning Outcomes Using SOLO (Biggs, 1999)
1. **Identify the type of knowledge involved** (factual, conceptual, procedural, metacognitive).
2. **Select the learning topic.**
3. **Determine the desired level of understanding** students should reach.
4. **Link learning outcomes to assessment tasks** for effective evaluation.

Revised Bloom's Taxonomy (Anderson & Krathwohl, 2000)

Original Bloom's Taxonomy:
Unidimensional structure combining verb (action) and noun (content) into one level.
Example: *Identify* (verb) *three components of instructional objectives* (noun).

Revised Version:
Proposed by Anderson and Krathwohl, the **revised taxonomy splits the structure into two dimensions**:
- **Knowledge Dimension** (noun)
- **Cognitive Process Dimension** (verb)

Hierarchy in Revised Bloom's Taxonomy

Level	Description	Learning Outcomes (Action Verbs)
1. Remember	Recall or retrieve knowledge from memory.	Recognize, recall
2. Understand	Comprehend meaning of material using explanations, interpretations, or summaries.	Classify, summarize, interpret, explain, compare
3. Apply	Use knowledge or procedures in new situations.	Execute, implement
4. Analyze	Break material into parts to understand its structure and relationships.	Organize, differentiate
5. Evaluate	Make judgments based on criteria and standards.	Examine, check, assess
6. Create	Combine elements into a new whole or propose original solutions.	Generate, plan, produce

Comparison: Original vs Revised Bloom's Taxonomy

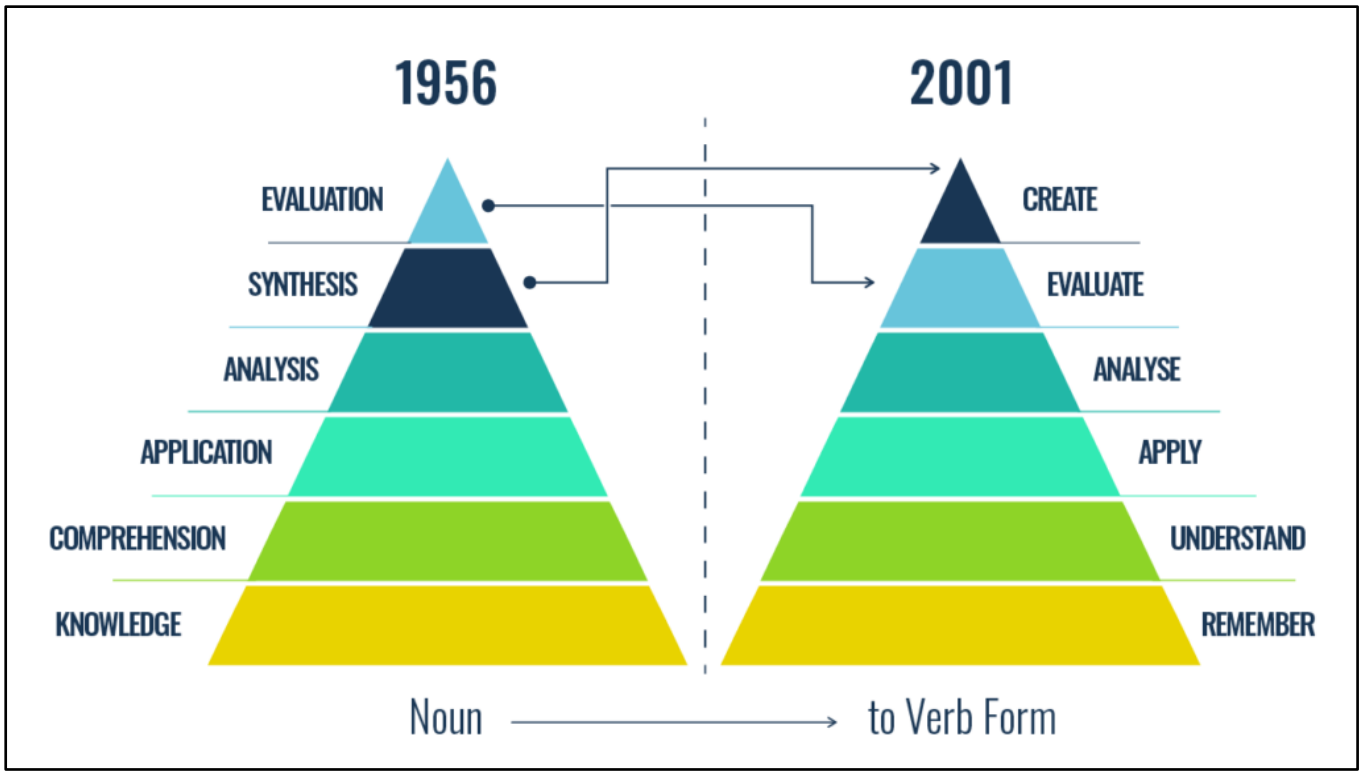
Original (1956)	Revised (2000)
Knowledge	Remember
Comprehension	Understand
Application	Apply
Analysis	Analyze
Synthesis	Create (moved above Evaluation)
Evaluation	Evaluate

Integrating Taxonomies for Effective Learning Design

Educators can enhance curriculum design by combining multiple taxonomies:

- **Cognitive Learning** → Bloom's / Revised Bloom's Taxonomy
- **Attitudinal Learning** → Krathwohl's Affective Domain
- **Skill-Based Learning** → Harrow's Psychomotor Domain
- **Holistic Understanding** → SOLO Taxonomy

According to **Starkey (2012)**, educators should create **learning activities that build both knowledge and skill**. This includes tasks like essays, podcasts, presentations, or skits that promote **conceptual understanding, application, and generalization**, corresponding to the higher levels of the SOLO and Bloom's frameworks.



Practice Questions

1. Match the Following (Cognitive Domain Levels and Their Descriptions)

Match the levels of Bloom's original taxonomy (Column A) with their correct descriptions (Column B):

Column A	Column B
A. Knowledge	1. Making value judgments based on criteria
B. Analysis	2. Breaking down material into component parts
C. Evaluation	3. Recall of facts, terms, and basic concepts
D. Synthesis	4. Combining parts to form a new whole

Options:

(a) A-3, B-2, C-1, D-4

(b) A-1, B-2, C-3, D-4

(c) A-3, B-4, C-1, D-2

(d) A-2, B-1, C-4, D-3

Correct Answer: A. A-3, B-2, C-1, D-4

Q2. Multiple Correct Options

Which of the following are features of the Revised Bloom's Taxonomy?

A. It introduces a two-dimensional structure separating knowledge from cognitive processes.

B. The highest level is "Evaluation" in the revised version.

C. It uses verbs like "generate", "plan", and "produce" under "Create".

D. The knowledge dimension includes factual, conceptual, procedural, and metacognitive knowledge.

Options:

(a) A and B only

(b) A, C, and D only

(c) A, B, and D only

(d) All of the above

Correct Answer: B. A, C, and D only

3. Multi-Statement Based

Statement I: Revised Bloom's Taxonomy includes both the knowledge type and the cognitive process.

Statement II: This was done to create a unidimensional framework integrating both action and content.

Options:

(a) Both statements I and II are true.

(b) Both statements I and II are false.

(c) Statement I is true, but statement II is false.

(d) Statement I is false, but statement II is true.

Correct Answer: C. Statement I is true, but statement II is false.

4. Chronological/Sequencing Based

Arrange the following levels of the Affective Domain (Krathwohl et al.) in the correct sequence from lowest to highest level of internalization:

1. Organization
2. Receiving
3. Characterization by a Value Complex
4. Valuing
5. Responding

Options:

(a) 2 – 5 – 4 – 1 – 3
(b) 5 – 2 – 4 – 1 – 3
(c) 2 – 4 – 5 – 1 – 3
(d) 1 – 2 – 5 – 4 – 3

Correct Answer: A. 2 – 5 – 4 – 1 – 3

5. Application-Based Scenario Question

A teacher asks students to analyze their school's energy use and propose eco-friendly improvements. Which level of Revised Bloom's Taxonomy is this activity MOST aligned with?

(a) Understand
(b) Apply
(c) Analyze
(d) Create

Correct Answer: D. Create