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PRINCIPLES OF ASSESSMENT AND METHODS OF ASSESSING KNOWLEDGE

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Principles of Assessment and Methods of Assessing Knowledge

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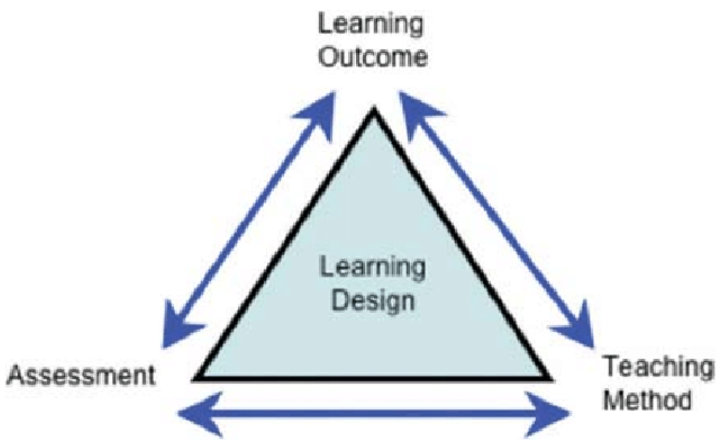
The etymological origin of 'Assessment' is from the Latin is "assidere" which means "to sit with." Assessment is the process of defining, selecting, designing, collecting, analyzing, interpreting and using information to increase student's learning and development. (Erwin 1991). It's a formal action to measure the competence or performance of the students. It's a common practice to use 'Assessment' and 'Evaluation' interchangeably but there is a difference. Evaluation is the process of systematic data collection, analysis, and interpretation to show the value of a particular activity. Assessment is used mainly in the context of students whereas Evaluation is primarily used in the context of the Program.

- **'Functions' of assessment:**

1. **Diagnosis:** diagnose areas that have not been properly learnt and require remedial measures.
2. **Prediction:** Most of the aptitude tests
3. **Selection:** Entrance tests to MBBS /Post Graduation/and other professional courses (NEET,NET)
4. **Grading:** Rank order the students of any given class for prizes, scholarships, etc.
5. **Curriculum evaluation:** modify a curriculum to make it more useful and cost-effective.

The main purpose of an assessment is to align with the outcomes of the specific learning objectives. By harmonizing course objectives with assessment content, educators ensure a unified curriculum. This concept gets cleared more with the idea of Golden Triangle.



Adapted from Mikroyannidis and associates article FORGE: An eLearning Framework for Remote Laboratory Experimentation on FIRE Testbed Infrastructure.

Broadly classified, the learning objectives are categorized under three domains: **Cognitive** (knowledge), **Psychomotor** (skills), and **affective** (attitudes). The current metamorphosis in Medical education of India to Competency Based Medical Education (CBME), assessment needs to be more integrated, mostly formative and criterion-referenced.

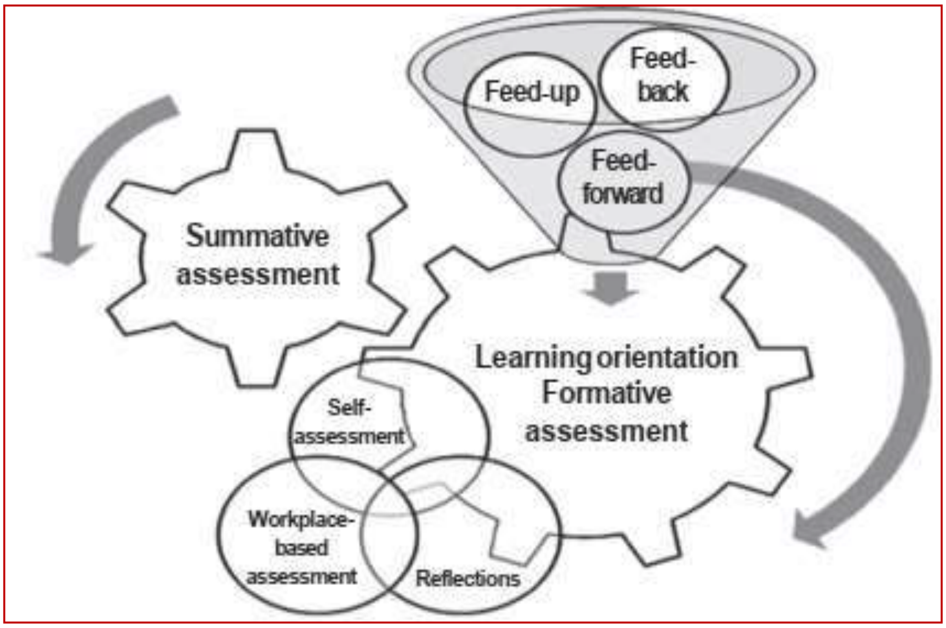
- **Assessment tool and it's features:** It is crucial to consider the attributes desirable for an effective assessment tool. This consideration requires an understanding of the fundamental concepts of validity and reliability.

Turnbull detailed an ideal assessment tool would possess the following features like accountability, flexibility, comprehensiveness, feasibility, timeliness and relevance to both the examiner and examinee (Table 1).

Table 1. Qualities of an ideal assessment tool

Quality	Brief explanation
Validity	The degree to which an assessment measures what it purports to
Reliability	The reproducibility of an assessments results
Accountability	To relevant stakeholders (students, staff, institution, community)
Flexibility	The versatility of the assessment tool
Comprehensiveness	The overall scope of the assessment
Feasibility	The practicality of using the assessment
Timeliness	The elapsed time between the target behavior and assessment
Relevance	The perceived significance of the assessment
Adapted from: *'Teaching the Surgical Craft: From selection to Certification'*[4]	

- **Types of Assessment:**
  1. **Formative:** Formative Assessment is a *process* used by *teachers and students* as *part of instruction* that provides **feedback** to adjust ongoing teaching and learning to improve students' achievement of core content (intended instructional outcomes).
  2. **Summative:** Summative assessment is generally used for making pass/fail decisions in most set-ups. It is also known as *assessment of learning*. There is no scope of feedback.
  3. **Continuous Internal Assessment (CIA)**: CIA is the type of assessment that involves regular assessment of day-to-day activities of the students including the way they learn/follow instructions with the scope of providing structured feedback.



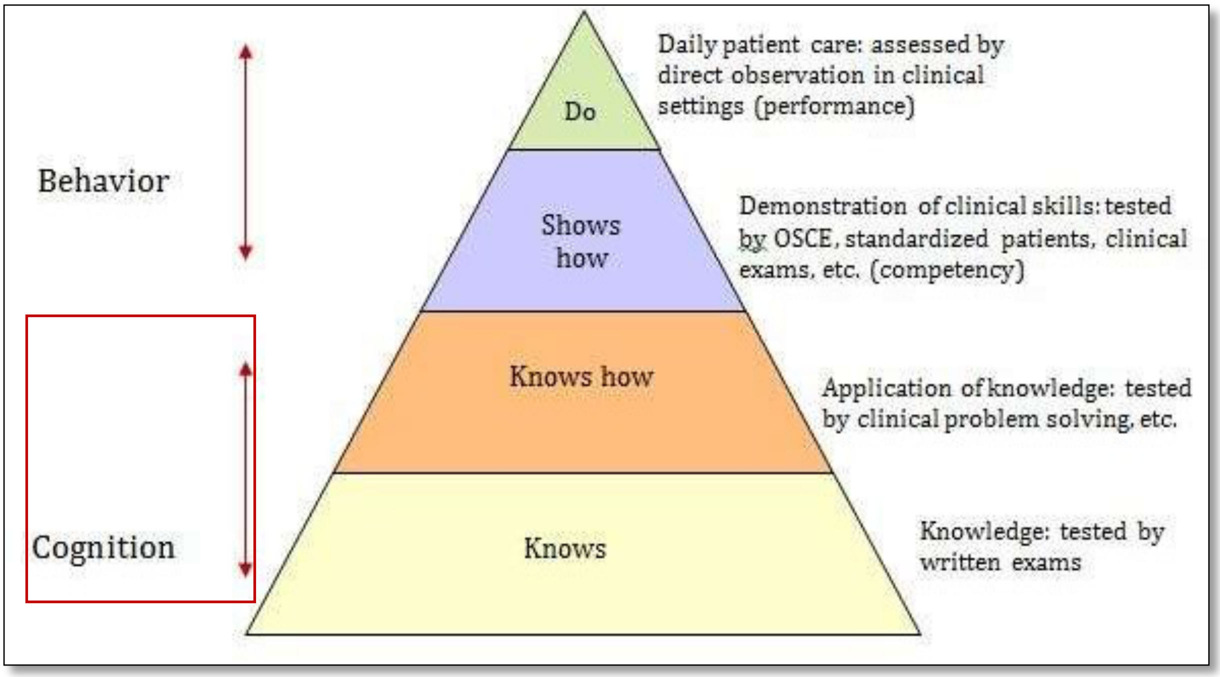
- **Principles of Planning an assessment:** The following factors should be considered while planning an assessment:
    - **Whom to assess?**
    - **Which domain to assess?**
    - **Which level of Miller's Pyramid?**
    - **Which tool is to be used?**

The paradigm and desirable shift to Competency Based Assessment has the following Characteristics:

- Operates within the framework of competencies. Assessment tools should align with competencies/objectives.
- Help to acquire competencies/objectives (*assessment for learning) and their certification (assessment of learning)*
- Continuous and ongoing process with opportunities for providing developmental feedback
- Direct observation of students improves utility of CBA and feedback
- Multiple assessors, multiple tools and multiple assessments improve the validity and reliability of CBA

Let us have a look at the Miller's pyramid:

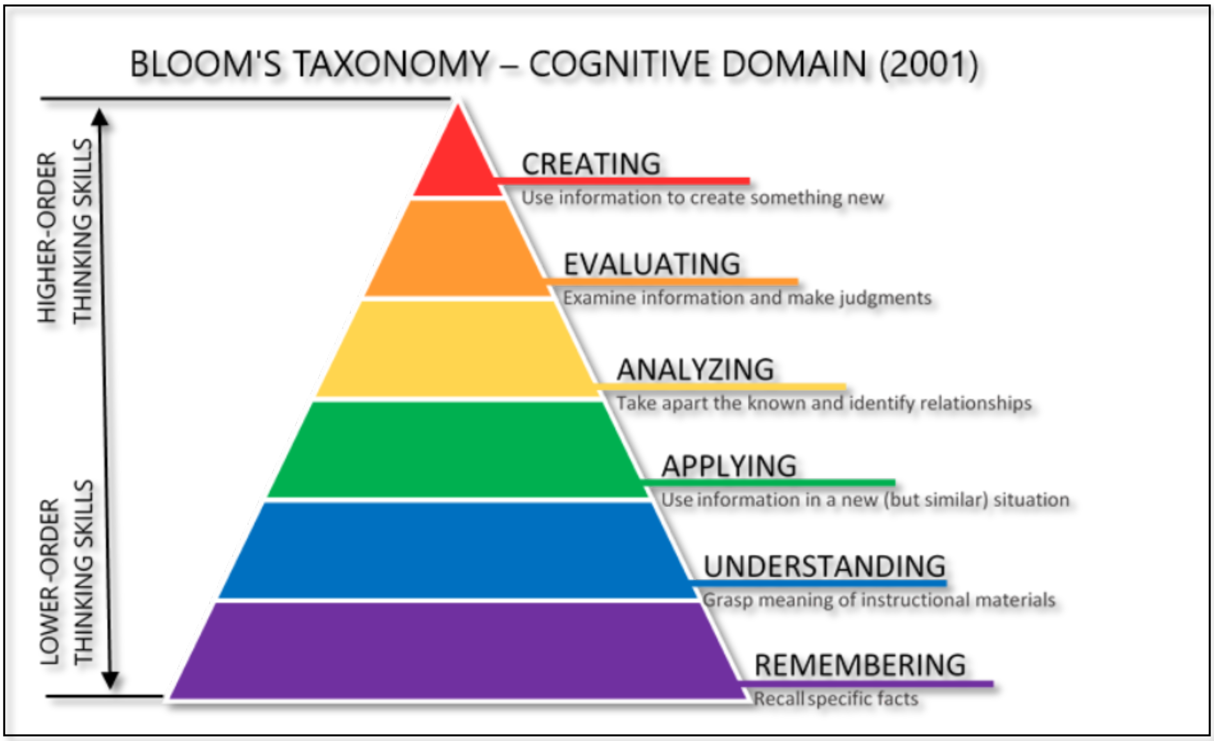
The Miller's Pyramid was devised by George Miller in 1990 to assess clinical competency. The lowest level of the pyramid is related to 'knowledge' and upper tiers with 'Skill and Behaviour.'



A student has to first '*know'* (factual knowledge) before he can 'knows how' (concept building and understanding).He then 'shows how' (competence to perform) and at the highest level 'does' (actually performs).

- **Method of Assessing Knowledge:** It ranges on a continuum from being able to recall factual events to integrating processes for problem solving. Thus the assessment of '*Cognitive domain'* is done by assessing the 'knows' and knows how' of Miller's pyramid. This is done by:
  - Theory examination:
    Knows: Assessed by Recall of Facts
    Knows how Assessed by reasoning, clinical problem-solving exercises and extended MCQs.
  - Conventional Viva Voce Examination.

The assessment of Cognitive domain was adopted from ***Bloom's Taxonomy***. Bloom's taxonomy was developed by Benjamin Bloom in 1956 to provide a common language for facilitators to discuss and exchange learning and assessment methods. Specific learning outcomes were derived from the taxonomy. In Bloom's Taxonomy from 1956, he outlined six main categories: *knowledge, comprehension, application, analysis, synthesis, and evaluation.* In 2001, a group of cognitive psychologists, curriculum theorists, instructional researchers, and testing specialists revised the category names of Bloom's Taxonomy from nouns to verbs. But in recent years, it is most commonly used to assess learning on a variety of cognitive levels.



- Commonly used action verbs to assess the 6 Categories of *'Blooms Taxonomy'*:-

- Knowledge -Define, Describe, Draw, Find, Enumerate, Cite, Name, Identify, List, label, Match, Sequence, Write, State

- Comprehension- Discuss, Conclude, Articulate, Associate, Estimate, Rearrange, Demonstrate, understanding, Explain, Generalise, Identify, Illustrate, Interpret, Review, Summarise

- Application -Apply, Choose, Compute, Modify, Solve, Prepare, Produce, Select, Show, Transfer, Use

- Analysis - Analyse, Characterise, Classify, Compare, Contrast, Debate, Diagram, Differentiate, Distinguish, Relate, Categorise

- Synthesis- Compose, Construct, Create, Verify, Determine, Design, Develop, Integrate, Organise, Plan, Produce, Propose, rewrite

- Evaluation- Appraise, Assess, Conclude, Critic, Decide, Evaluate, judge, Justify, Predict, Prioritise, Prove, Rank

Conclusion: Assessment in medical education is a multi-faceted and ongoing process. Sound or critical appraisal along with constructive feedback allows accurate, efficient and meaningful use of assessment tools. The assessment tool should align with the desired learning objective. While planning for an assessment of Cognitive domain, this should not only focus on factual recalling but incorporate higher order thinking skills too. Facilitators should plan trainee assessment, peer assessment, or self-assessment that should be meaning full and effective.

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