Webinar 3 - Assessment for Competency-based Education

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# Table of Content

Introduction...........................................................................................................................................3  
Competency-Based Assessment at the Glance .......................................................................................3  
Concept of constructive alignment for competency-based learning......................................................3  
Different Types of Assessment .............................................................................................................4  
  Formative Assessment – Definition ...................................................................................................5  
  Diagnostic Assessment .......................................................................................................................5  
  Self-Assessment ..................................................................................................................................5  
  Summative Assessment ......................................................................................................................5  
  Formative Assessment to Reinforce Competency-Based Education ..................................................5  
The Essentials of Competency Based Learning Rubric ..........................................................................6  
Alternative assessments, also Known as Authentic Assessments ..........................................................7  
Planning authentic assignments ...........................................................................................................8  
Rubrics ..................................................................................................................................................10  
Creating a rubric ....................................................................................................................................10  
Mastery learning approach through formative assessment and differentiated teaching methodology ....10  
The Mastery Learning Instructional Process .........................................................................................12  
Method of assessing the quality of Assessment in a Competency-Based Learning Using the Cognitive and Knowledge Dimension Matrix .........................................................................................13
Introduction

Competency based assessment is a rigorous, ongoing process, which aims in testing and building the knowledge, skills and abilities of the learner. It is a continuous process, by which student’s knowledge and skills are constantly developed. It progresses an individual from being a novice to an expert, well enough to stay ahead of the curve in a competitive world. In competency based assessment, students get additional support even during the process of building knowledge and skills.

As we are now aware, competency based education holds promise for mixing high quality teaching and learning for the growth of all students. It provides numerous opportunities to learners for master of the topics at hand and to benefit from the differentiated and remedial teaching during the process of mastery learning.

However, competency based education cannot fulfil its goals unless accompanied by high quality assessments and assessment systems.

Competency-Based Assessment at the Glance

Competency based assessment is a process where a teacher works with a learner to collect evidence of competence, using the benchmarks provided by the learning outcomes as articulated in the competence statement in the curriculum. At the essence, it is not about passing or failing a candidate since the collected evidence is represents more than just setting a test. During a school term, a learner may be required to undertake a series of tasks for assessment purposes such as assignments, projects, tests, exams or labs. It is the sum of all these assessments that deems a learner to be competent (or not).

The assessment process should be considered to be part of the learning process identifying gaps as learning opportunities to develop skills, not failures. It is a collaborative process to be negotiated with the trainee and not a one-off event that is imposed. Therefore, the learner is given many opportunities to demonstrate skill using the mastery learning approach and the assessment process should allow the capturing and recording of these demonstrations.

In the webinar 2 resource park, we spoke about the constructive alignment of all components involved in the implementation of the competency-based learning process. As you are aware, the competency based education starts by identifying the learning outcomes for a given course before commencing the course. The next step is to develop assessment activities for the outcomes (objectives).

Concept of constructive alignment for competency-based learning

Constructive alignment is based on two principles:

- Constructivist psychology suggests that students construct their knowledge through appropriate learning activities; and
- Curriculum theory suggests that maximum learning is achieved when teaching and assessment methods are aligned to the learning outcomes.

Therefore, learners are encouraged to engage in learning activities that are relevant in achieving learning outcomes. In this case, we say the tool assessing learners should be authentic; it means it should reflect the real life in which the learner lives to address the relevant aspect of the assessment. Teaching is not topic based but
focuses on what students are intended to do after they have learned the curriculum topics. The outcome statement that specifies the intended outcome activities is addressed in the teaching and assessment processes.

The learning outcomes, teaching activities and assessments are properly aligned. The focus is on what and how students learn; especially what they can do with the knowledge they have acquired. As the learners create meaning of the newly acquired information, the teacher provides a conducive learning environment that supports learning to achieve the desired learning outcome. Then choose assessment tasks that will tell how well students have attained the learning outcomes.

The alignment for competency based tries to answer the following questions

1. What learning outcome is guiding the teaching and assessment?
2. How will students know that they have demonstrated proficiency or mastery of a competency?
3. What experiences best prepare a student to demonstrate competence?

The concept of constructive alignment for competency based learning starts with a self-assessment. The teacher provides an environment that can allow all students to assess themselves by asking leading questions, followed by the teacher review of the outcomes of this self-assessment. It is at this point that the learners’ development needs are identified with which a development plan is created. The competency level assessment is incomplete without the pre-assessment. This helps to assess the prior learning of any learner and align it with the competency requirements. The learner gets assessed in terms of competences, which allows personalizing teaching approaches for individual learner profiles.

According to Eliot Levine and Susan Patrick (2019), the concept of competency-based education is permitting the following:

- Empowers students daily to make important decisions about their learning experiences, how they will create and apply knowledge, and how they will demonstrate their learning
- This concept makes assessment meaningful, positive and empowering learning experiences for students to yield timely, relevant and actionable evidence
- Students receive timely, differentiated support based on their individual learning needs
- Students progress based on evidence of mastery, not seat time
- Students learn actively using different pathways and varied pacing
- Strategies to ensure equality for all students are embedded in the culture, structure and pedagogy of schools and education systems
- Rigourous common expectations for learning i.e. knowledge, skills and dispositions are explicit, transparent, measurable and transferable.

Learning gets purposeful when learners understand what their goals are. Therefore, the first step in designing the assessment of the learning cycle is to define the outcomes (Knowledge, skills, abilities), which is the level of learning required.

**Different Types of Assessment**

Rather than categorising assessment as ‘as learning’, ‘for learning’, or ‘of learning’, we need to focus on what assessment tells us about the progress that students (individually or in groups) have achieved in their learning at the time of assessment. We can start to see all assessment in schools as formative if we focus on the question “what is the purpose of the assessment?”

In this section, we discuss four different types of assessment, including (1) Formative assessment, (2) Diagnostic assessment, (3) Self-assessment and (4) Summative assessment
**Formative Assessment – Definition**

Formative assessment is a method used by teachers to conduct tailored made evaluations to support learners to engage effectively in learning. It is a continuous feedback that allows a teacher to evaluate the impact and a student to move their learning forward. According to Masters (2015), If we understand assessment as the process of establishing where students are at then, in fact, all assessment is formative. Incorporated into a teaching and learning cycle, formative assessment is at the heart of improving student learning outcomes. As we mentioned in the resource pack of webinar 2, formative assessment is used to assist a learner to move from knowledge acquisition to knowledge deepening.

**Diagnostic Assessment**

Diagnostic assessment is an evaluation method usually interpreting the learners’ strengths and weaknesses in their learning so that appropriate interventions can be carried out to support the learners involved. While it can be implemented at any stage of the study, in an ideal situation this kind of evaluation is most generally related to the beginning of the learning process of a new module, unit, even a course.

**Self-Assessment**

A self-assessment is the learner review of own performance that is executed to detect aspects that require improvement or those aspects that can be used to achieve certain identified goals. In addition, it is an evaluation tool for learners to assess the quality of their work using the performance measurements, such as learning objectives/outcomes. The tool allows learners to identify their strengths and sustain them and also identify their weaknesses for possible improvement. This type of assessment motivates learners to take ownership and control of their own learning with a great sense of accountability, academic freedom, and as a result, great learning achievement. With the practice of self-evaluation, learners aim at learning quality than only passing tests and exams for promotion to the next class.

**Summative Assessment**

Summative assessment is a course evaluation provided to learners with the aim to make a judgment about their accomplishment and it is implemented towards the end of a specific period of learning. This type of assessment is to establish if the learner has to get promoted or obtain a certificate. Similarly to formative assessment, the summative approach is also a method used assess learners to demonstrate the understanding and mastery of multiple skills identified in different modules or units.

**Formative Assessment to Reinforce Competency-Based Education**

The formative assessments are used by teachers to help determine the ideal learning path for their students, helping them to personalize and adjust curriculum, assignments and content to what a given student needs. Formative assessment along with the effective feedback is the competence education strong point. It helps students to improve and gives specific feedback, while also telling the teacher where students require the most guidance. In competency based assessment, students are supported to learn, progress and advance, all at an exact pace. Competency based assessment focuses on assessment for learning. The assessments are embedded and aligned to outcomes. The embedded assessment ensures that students become free to practice and revise at their own pace. This is achieved by using a set of competency assessment tools and formative assessments to give prompt feedback to students which eventually helps students to master their objectives. Students are
assessed as individuals at a given time. Each and every step of the learner’s achievement is documented. At every stage of grading students are empowered, engaged, and communicated about their progress upon multiple sources of evidence.

Competency based education requires the use of formative assessment with lots of activities that help students to demonstrate their mastery level irrespective of the time, place, and pace of learning. By giving instant feedback on time, there are chances for reduced risks of inequalities and students get to plan the next step of their learning path. On achieving this with confidence, they then continue by the summative assessment. By taking both formative and summative assessments the student becomes a master. Committing mistakes is acceptable as students are given relevant feedback and guidance until the students demonstrate their proficiency.

Formative assessments become a critical component of CBA where intermittent checks are taken of student progress to inform if the skills they are learning are developing to a level where students can utilize them independently and in authentic ways. Teachers will collaborate with students after a formative CBA to engage the student in the discourse around where they found success and what challenges remain. Assessment for learning is commonly recognised as an effective approach to include learners in understanding what they have learned and what they need to do to make further progress.

Another critical element of competency-based assessment is engaging students in the design of what mastery will look like. Having students grapple with what a learning outcome will look like, identifying criteria and then reflecting on their learning with that self-designed criteria, are all meaningful steps in CBA that can be applied across any content area.

With the underpinning principles of empowering and learning-to-learn at the heart of CBC it is vital that learners should be actively engaged in assessment of their own learning.

Establish the transition from knowledge acquisition to knowledge deepening and from knowledge deepening to knowledge creation through the usage of authentic assessment.

The authentic assessment/evidence based assessments should be in line with real life experiences. Choosing the type of assessment is very crucial in achieving the learning outcome. The rubric is almost similar to a working guide for both teachers and students, which is usually handed out before the commencement of assessment in order to let the students know the criteria on which their work will be judged. In competency based learning the rubric helps to evaluate a student's performance based on the total range of the criteria rather than a numerical score.

The Essentials of Competency Based Learning Rubric

- Rubrics should have clearly articulated competences and learning outcomes as their base
- They are intended to give clarity to students about what and why they are learning
- A well written rubric should essentially be a tool for teachers to understand the quality performance of the students work collaboratively
- Rubrics should ultimately measure performance, reflect on learning and plan the next steps.
- Competency based assessment measures deeper learning targets including application to new context.
- Determine mastery of knowledge based on sufficient assessment evidence.
- Provide timely, differentiated support along a pathway to competence
- Supports variable pathways and demonstrates document learning.
**Alternative assessments, also Known as Authentic Assessments**

The traditional type of assessment through mid-term or final exams often fails to assess deeper forms of learning. CBC requires carefully designed assessments to motivate students in their approach to learning, helping them to develop thinking and problem solving skills and allowing them to assess their own understanding of the course content.

Carefully designed assessments, on the other hand, not only evaluate what students have learned, but can motivate students in their approach to learning, helping them develop thinking and problem-solving skills, and allowing them to assess their own understanding of the course content.

Authentic or alternative assessments means an alternative to standard tests or exams that provide a true evaluation of what the student has learned going beyond acquired knowledge to focus on what the student has actually learned by looking at their application of Knowledge. (Indian University).

Authentic forms of assessment can allow you to see what the student can or cannot do. They tend to evaluate applied proficiency rather than measuring knowledge. They allow the use of problem solving and reflection other than providing mere facts as answers to specific questions. (Indian University).

With Authentic or alternative assessment the student make a judgment about what information and skills they will need to solve a given problem. These assessments are characterized as real –world situations with accompanying real world controls. They involve written and performance measures so that students can develop meaningful and applicable skills and advance their knowledge of the how over the best practices in Authentic assessment. They are also meant to help develop disciplinary behaviours in students, making new connections between existing skills.

**Traditional versus Authentic assessment**

<table>
<thead>
<tr>
<th>Traditional Assessment</th>
<th>Alternative Assessment</th>
<th>What Makes it Authentic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Requires right answer</td>
<td>Requires high-quality performance or product, along with justifications of decisions.</td>
<td>Students must be able to think through why they made decisions that resulted in final product.</td>
</tr>
<tr>
<td>Questions must be unknown to students in advance</td>
<td>Instructions/questions/purpose must be known to students in advance.</td>
<td>Tasks that are to be judged should be known ahead of time. Rubrics should be provided.</td>
</tr>
<tr>
<td>Disconnected from the real world.</td>
<td>Tied to real-world contexts and constraints. Requires student to solve a realistic problem.</td>
<td>Task is similar in nature as to what would be encountered by a real-life practitioner</td>
</tr>
<tr>
<td>Isolations of skills, focus on facts</td>
<td>A range of skills/knowledge need to be integrated in order to solve a problem.</td>
<td>Tasks are multi-step and multifaceted</td>
</tr>
<tr>
<td>Easily scored</td>
<td>Includes complex tasks for which there may not be a right answer.</td>
<td>Meaningful assessment and feedback is emphasized</td>
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<td>--------------------------------------------------</td>
</tr>
<tr>
<td>“One shot” approach</td>
<td>Iterative in nature.</td>
<td>Knowledge and skills are used in more than one way</td>
</tr>
<tr>
<td>Given a score</td>
<td>Opportunity to provide diagnostic feedback.</td>
<td>Designed to give practical experience and improve future performance</td>
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Adapted from Indiana University’s Tip Sheet

**Planning authentic assignments**

According to Brigham Young University the following set of guidelines are used to construct authentic assessments.

1. Define a concrete and unambiguous instructional outcomes/goal that you want to assess.
2. Make sure that you include both subject matter content and a set of skills/operations that a successful student would exhibit.
3. Define what can be assessed through performance measures and what can be assessed through objectives performance measures.
4. Create tasks/assignments that elicit this behaviour.
5. Decide what kind of guidance you can provide while still allowing students to learn independently.
6. Try the assessment out and make revisions as necessary.

**Some Useful Questions to Ask Yourself when you Decide on what Assessment to Choose.**

a) What do you want to test, acquisition of content knowledge or the ability to apply knowledge?
b) Do you want to test the product the student has produced or the process by which they produced it?
c) What kind of content knowledge should students be able to demonstrate?
d) Which assessment methods would allow you to understand how well students are achieving learning outcomes?
e) Did you include more than one assessment type in your course?

**Examples of Authentic or Alternative Assignments**

| Letter/Letter to the editor | • Asks student to write in first person singular perspective, which can be adapted so that they are writing from the perspective of a historical or imagined individual, or themselves.  
|                            | • Students are asked to develop a coherent written narrative or statement for the audience.  
|                            | • Requires research, disciplinary knowledge, communication skills, and creativity.  
<p>|                            | • Can be adapted by numerous disciplines. |</p>
<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
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</table>
| Memo              | Students prepare a one or two-page memorandum or briefing about a topic that is being covered in class. Memo headings can include: background, problem, solutions with pros and cons list, final recommendation.  
                      | This exercise allows students to practice being concise and direct.                                                                                                                                              |
| Presentations     | Considered the most readily approachable method of authentic assessment.  
                      | Applies positive peer pressure, as it is likely that students will be better prepared when they have to perform before others. Presentations are an opportunity for the development of professional skills. Students will need to prepare and rehearse, and develop an appropriate, polished use of visual aids.  
                      | Enhances professional verbal, visual, written communication skills.  
                      | Can be easily applied to many disciplines, including the sciences.                                                                                                                                                    |
| Poster presentations | The nature of the poster presentation can vary. It can consist of a summary of a work in progress, or a visual presentation that is equivalent to a term paper.  
                      | Headings to be included could be a literature review, description of topics, observations, claim/thesis, and conclusions.                                                                                       |
                      | Teaches professional skills for participation in academic conferences.                                                                                                                                               |
| Portfolio of work | Students develop portfolios in order to demonstrate the evolution of their work over the course of the semester.  
                      | Students are typically asked to compile their best/most representative work and write a critical introduction and brief introduction to each piece.                                                           |
| Proposals         | Asking students to write a proposal for a larger, more heavily weighted project allows students to try out their ideas and set their own goals for learning before actually carrying out their projects.  |
| Policy briefs, Reports | Policy briefs/reports ask students to address in a professional manner a research question, course of action, decision, or theory that is of interest and importance. This allows students to develop professional skills and become familiar with the specific vocabulary and style of writing in their fields. |
| Case studies, Simulations | Case studies present fictional scenarios that include a dilemma that requires problem solving. Students must apply higher order thinking skills in order to evaluate and apply knowledge, and to analyze the problem.  
                      | Simulations ask students to play and act out various roles within a case. This can include mock trials, mock city council or legislative meetings, and mock meetings of corporation stockholders or school boards. In simulations, students require background information that they then apply to the role. |
| Fishbowls         | The fishbowl is similar to a debate. A few students are selected to be in the “hot seat,” where they respond to questions, concerns, ideas, about the given topic. Other students ask questions and bring forth counter points.  
                      | This type of exercise advances student knowledge and comprehension, as well as improving skills in active listening, critical inquiry, professional communication, presentation, and group discussion. |
Authentic assessments are typically categorized as formative assessments, as they are in the process of evaluating student’s understanding, learning needs and academic progress. Tests and exams tend to be classified as summative assessment. These are used to assess student learning at the end of the instructional period.

Rubrics

Rubrics are scoring tools that describe performance expectations for students as set out by the instructor. They can be used for all assignment types. They are usually comprised of four components:

1. A description of the assignment/assessment
2. Criteria that will be assessed
3. Descriptions of what is expected for each assignment component
4. Performance levels indicating mastering of various components.

A well-designed rubric will give a substantive description of the expected performance levels. There are two types of rubrics: holistic and analytic.

- Holistic rubrics provide a single score rating the overall perception of the student’s performance. This approach is especially useful when a single attribute is being examined. This type of rubric allows for quick scoring, but no detailed feedback.
- Analytic rubrics provide scores for various criteria, gives detailed feedback, and helps to ensure that feedback is consistently given across students.

Rubric is a key to successful assessment that gives students a clear understanding of what the expectations are for their work. Rubrics especially those given alongside an assessment description, are a great way of guiding students towards success. They strengthen the formative component of any assessment.

Creating a rubric

Effective creation of a rubric: A case of Yale University

1. Develop a clear definition of the purpose of assessment in order to create an effective rubric
2. Develop a clear definition of the purpose of the assessment task, and its goals.
3. Decide on whether you would like to use a holistic or analytic rubric, depending on the goals you want to achieve.
4. Define the assignment criteria. This can be based on the learning outcomes and goals as well. Consider what skills and knowledge is necessary for successful completion depending on the assessment design
5. Define the scale you will use in order to measure performance. Provide a description of each level.
6. Test the rubric and revise it as necessary.

Mastery learning approach through formative assessment and differentiated teaching methodology

Most applications of mastery learning stem from the work of Benjamin Bloom in 1984 who considered how teachers might adapt the most powerful aspects of tutoring and individualized instruction to improve student
learning in general education classrooms. He suggested that although students vary widely in their learning rates, if teachers could provide the necessary time and appropriate learning conditions nearly all students could reach a high level of achievement. The traditional way of checking on the progress of learners at the end of a topic or lesson Bloom says it would be more valuable if the assessment was used as part of the teaching and learning process to provide feedback on students’ individual learning difficulties and then provide specific remediation activities.

Bloom outlined a strategy to incorporate these feedback and corrective procedures which he called mastery learning.

Using this strategy, teachers organise the important concepts and skills they want students to acquire into learning units each requiring enough instructional time. Then teachers administer formative assessment that identifies precisely what students have learned well and where they still need additional work. This involves what students must do to correct their learning difficulties and to master the desired learning outcomes. The students take a second formative assessment of the same learning goals but including different problems to verify whether the correctives were successful in helping students meet their individual learning difficulties.

The determination of whether a student should move on or not may be a fairly consequential decision based on multiple measures of student learning. Students need multiple opportunities and ways to demonstrate their learning. Therefore, schools should integrate balanced systems of assessments into competency based learning systems in order to realize the goals of competency based education.

Most mastery learning models stress the importance of administering a quick and targeted pre-assessment to all students before beginning instruction to determine whether they have prerequisite knowledge and skills or misconceptions that may need correction.

Another mastery of learning approach is the use of progress monitoring through regular formative assessments to systematically monitor student progress and give students prescriptive feedback (Hattie & Timperley, 2007). These measure the most important learning goals from teaching and typically administered after two weeks or one week of instruction. They reinforce what students were expected to learn, identify what they learned well and describe what they need to learn better. They may be written assignments, oral presentations, skill demonstration/ performance or quiz depending on the subject.

Another mastery approach is the high quality corrective instruction, where teachers provide mastery of learning through high quality corrective instruction designed to remedy whatever learning difficulties the formative assessment identified. Note: this is not the same as re-teaching; instead teachers use corrective instruction approaches that accommodate differences in students' learning styles, learning modalities or types of intelligence. Some teachers engage students in peer tutoring, or cooperative learning groups. This emphasises the use of small group instruction with individualized assistance organised according to the needs and skill level of students involved. This assures that at this level must be qualitatively different from the initial instruction offering students an alternative approach and additional time to learn.

Another mastery of learning is second, parallel formative assessments, after corrective activities, mastery learning teachers give students a second parallel formative assessment that determines the effectiveness of the corrective instruction and offers students a second chance to demonstrate mastery and experience success. Mastery learning teachers make it a point to recognise those students who do well on the initial formative assessments. They also acknowledge that students who do well on the second formative assessment have learned just as much and deserve the same grades as those who performed well on the first attempt.
Another mastery of teaching approach is Enrichment or extension activities, teachers offer enrichment activities that provide valuable, challenging and rewarding learning experiences for learners who have mastered the materials and do not need corrective instruction. These help successful learners to explore in greater depth a range of related topics that keenly interest them but lie beyond the established curriculum. These activities must provide students with opportunities to pursue their interests, extend their understanding and broaden their learning experiences.

Bloom argued that to reduce variation in students’ achievement and to have all students learn well, we must increase variation in instructional approaches and learning time.

Bloom outlined a specific strategy for using formative classroom assessments to guide teachers in differentiating their instruction and labelled it “Mastery Learning”. A far better approach, according to Bloom, would be for teachers to use their classroom assessments as learning tools, and then to follow those assessments with feedback and corrective procedure. In other words, instead of using assessments only as evaluation devices that mark the end of each unit, Bloom recommended using them as part of the instructional process to diagnose individual learning difficulties (feedback) and to prescribe remediation procedures (correctives).

If the student makes an error, the tutor first points out the error (feedback), and then follows up with further explanation and clarification (correctives) to ensure the student’s understanding.

When students complete their corrective activities after a class period or two, Bloom recommended they take a second formative assessment. This second, “parallel” assessment covers the same concepts and skills as the first, but is composed of slightly different problems or questions, and serves two important purposes.

The teacher’s initial instruction was highly appropriate for these students and they have no need for corrective work. To ensure their continued learning progress, Bloom recommended these students be provided with special “enrichment” or “extension” activities to broaden their learning experiences. Such activities often are self-selected by students and might involve special projects or reports, academic games, or a variety of complex, problem-solving tasks.

**The Mastery Learning Instructional Process**

**Adapted from Blooms 1971**

Through this process of formative classroom assessment, combined with the systematic correction of individual learning difficulties, Bloom believed all students could be provided with a more appropriate quality of instruction. This, in turn, would drastically reduce the variation in students’ achievement levels, eliminate achievement gaps, and yield a distribution of achievement.

Teachers who use mastery learning provide students with frequent and specific feedback on their learning progress, typically through the use of regular, formative classroom assessments.

Feedback alone, however, does little to help students improve their learning. Significant improvement requires the feedback be paired with correctives: activities that offer guidance and direction to students on how to remedy their learning problems. Effective, correctives must be qualitatively different from the initial teaching. They must provide students who need it with an alternative approach and additional time to learn. The best correctives present concepts differently and involve students in learning differently than did the teacher’s initial instruction.
To help every student learn well, therefore, teachers must differentiate their instruction, both in their initial teaching and especially through corrective activities (Bloom, 1976). Teachers must increase variation in their teaching in order to decrease variation in results.

In most applications of mastery learning, correctives are accompanied by enrichment or extension activities for students who master the unit concepts from the initial teaching. Feedback, corrective, and enrichment procedures are crucial to mastery learning, for it is through these procedures that mastery learning differentiated and individualized instruction.

Mastery learning adds the feedback and corrective component, allowing teachers to determine for whom their initial instruction was appropriate and for whom learning alternatives may be needed.

Method of assessing the quality of Assessment in a Competency-Based Learning Using the Cognitive and Knowledge Dimension Matrix

The quality of test or exam question paper paramount and it is assessed based on how it is aligned to the learning outcomes (objectives) and the distribution of the question across the taught curriculum. The quality assessment has always been a challenge where learners are assessed at the wrong level or the knowledge being assessed is not even known or clear. In this section, participants in this webinar will learn to assess a question paper using a cognitive and knowledge dimensions as it is articulated by the Bloom’s Taxonomy. This taxonomy assess assess if learners have achieved the learning objectives as stipulated in the competence statement.

- Accurate assessment of student learning is critical if the assessment is to assist both teaching and learners’ learning
- The revised Bloom’s Taxonomy is a two-dimensional tool made of cognitive and knowledge.
- The cognitive level (manifest from an action verb that represents the learner’s processes of learning) is placed on the horizontal axis and the kind of knowledge (manifest from the nouns that represent what the learner is to learn) is placed on the vertical.
- The six Bloom’s Taxonomy cognitive processes of the domain of learning are “remember, understand, apply, analyze, evaluate, and create” on the horizontal axis.
- The four knowledge dimensions in the revised taxonomy are “factual, conceptual, procedural, and metacognitive”, located on the vertical axis.

The Cognitive and knowledge dimension matrix is as follows:

<table>
<thead>
<tr>
<th>Cognitive/Knowledge</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual</td>
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<td>Conceptual</td>
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<tr>
<td>Procedural</td>
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<tr>
<td>Metacognitive</td>
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</table>

It is also very important to get a panoramic view of where the questions are drawn from. Let use an example of a subject having 5 chapters and every chapter has several topics and subtopics. It is important
to assess the balance aspect of the assessed curriculum by showing which chapter or topic each question is assessing. The content and cognitive processes balanced matrix is as follows:

<table>
<thead>
<tr>
<th>Content/Cognitive</th>
<th>Chapter1</th>
<th>Chapter2</th>
<th>Chapter3</th>
<th>Chapter4</th>
<th>Chapter5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tpc 1</td>
<td>Tpc 2</td>
<td>Tpc 3</td>
<td>Tpc 1</td>
<td>Tpc 2</td>
</tr>
<tr>
<td>remember</td>
<td>Q1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Understand</td>
<td></td>
<td>Q2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apply</td>
<td></td>
<td></td>
<td>Q3</td>
<td></td>
<td>Q5</td>
</tr>
<tr>
<td>Analyse</td>
<td></td>
<td></td>
<td></td>
<td>Q9</td>
<td></td>
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<tr>
<td>Evaluate</td>
<td></td>
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<td>Q10</td>
</tr>
<tr>
<td>Create</td>
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</tr>
</tbody>
</table>

In this case, we assumed that the test or exam paper has 10 questions, the matrix above is used to plot the questions to show which area of the curriculum the question is assessing. The cognitive and knowledge dimensions matrix should also show what kind of knowledge the questions are assessing:

<table>
<thead>
<tr>
<th>Cognitive/ Knowledge</th>
<th>Remember</th>
<th>Understand</th>
<th>Apply</th>
<th>Analyse</th>
<th>Evaluate</th>
<th>Create</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factual</td>
<td>Q1</td>
<td>Q2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conceptual</td>
<td></td>
<td></td>
<td>Q5</td>
<td>Q9</td>
<td>Q4</td>
<td></td>
</tr>
<tr>
<td>Procedural</td>
<td></td>
<td></td>
<td>Q3</td>
<td></td>
<td>Q10</td>
<td>Q8</td>
</tr>
<tr>
<td>Metacognitive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
References


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