Storyboard for Elearning Lesson Comparing Two Measures of Cognitive Rigor: Comparing Bloom's Taxonomy with Webb's Depth of Knowledge

By Laura Lohman

Audio Narration	Visuals
How can you be sure that your instruction is meeting standards and pushing students to higher and deeper levels of cognitive effort? Measures of cognitive rigor like Bloom's taxonomy and Webb's Depth of Knowledge are important tools to help guide you in designing instruction, learning activities, and assessments.	Comparing Bloom's Taxonomy with Webb's Depth of Knowledge

Functional Instructions/Instructions for Interactivity
- Play narration on screen open while image and title remain visible.
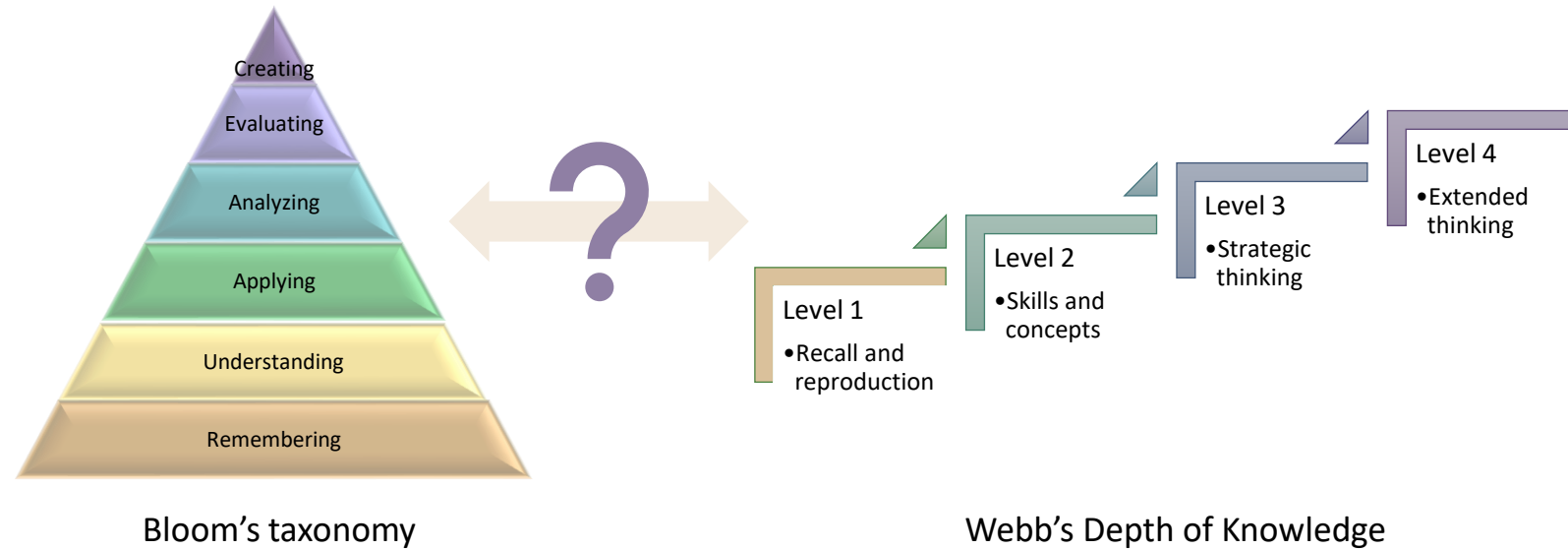
Audio Narration	Visuals
In a previous module, we learned about the six levels of Blooms' taxonomy of the cognitive domain. This taxonomy is often used to classify learning objectives according to lower and higher order thinking. Another common tool that defines different levels of cognitive rigor is Webb's Depth of Knowledge. This is often used to classify assessments of learning by level of cognitive rigor. In this module we'll look at Webb's Depth of Knowledge and focus on the most important similarities and differences between it and Bloom's taxonomy.	**Purpose of This Module**

Purpose of This Module

Bloom's taxonomy

- Creating
- Evaluating
- Analyzing
- Applying
- Understanding
- Remembering

?

Webb's Depth of Knowledge

Level 1
- Recall and reproduction

Level 2
- Skills and concepts

Level 3
- Strategic thinking

Level 4
- Extended thinking

By the end of this module, you'll be able to:
- Identify similarities between Bloom's taxonomy and Webb's Depth of Knowledge
- Explain differences between Bloom's taxonomy and Webb's Depth of Knowledge

Functional Instructions/Instructions for Interactivity
- Play narration on screen open while "Bloom's taxonomy" is already visible.
- Fade in "Webb's Depth of Knowledge" graphic and label when second sentence of narration begins.
- Zoom in arrow and question mark when third sentence of narration begins.
- Grow textbox containing learning objectives out of the question mark to cover other graphics.

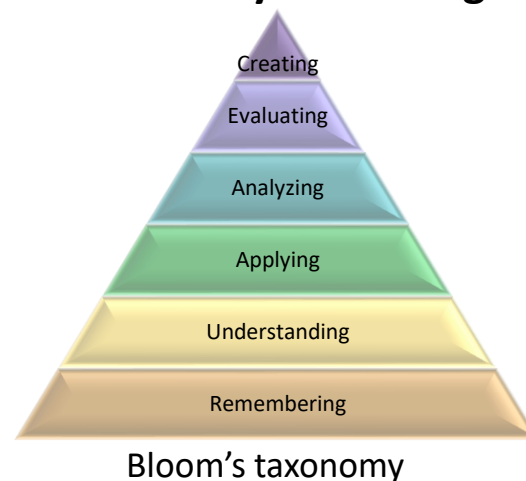| Audio Narration	Visuals
Let's first review the 6 levels of Bloom's taxonomy of the cognitive domain. Remembering involves recalling facts and basic concepts. Learning objectives at this cognitive level often begin with verbs like "recall" and "list." Understanding involves explaining ideas or concepts. Learning objectives at this level often begin with "explain," "describe," or "discuss." Applying requires learners to use information in new situations. At this level, learning objectives may begin with verbs like "use" and "interpret." Analyzing requires learners to distinguish between different parts of a whole or determine relationships between things. Learning objectives at this level can begin with "distinguish," "compare," or "contrast." Evaluating requires that learners justify a position or decision. Learning objectives at this cognitive level might begin with "argue" or "appraise." Creating involves producing new work. Objectives at this level often begin with "design" or "construct."	**Bloom's Taxonomy of the Cognitive Domain**

Bloom's Taxonomy of the Cognitive Domain

Pyramid levels (top to bottom): Creating, Evaluating, Analyzing, Applying, Understanding, Remembering

Text boxes:
- Design a poster promoting recycling on campus.
- Defend a position to vote for or against the sales tax increase.
- Distinguish Beethoven's late style from his early style.
- Use the Pareto principle to determine which customer complaints to focus on.
- Explain the concept oxymoron.
- List the five senses.

Bloom's taxonomy

Functional Instructions/Instructions for Interactivity
- Play narration on screen open.
- Throughout narration paragraph about "Remembering," show the text box to the right of Remembering level.
- When narration paragraph about "Understanding" begins fade out text box to the right of Remembering level. Note: similar fade out is omitted from subsequent bullets due to space limitations. Only one text box should be visible at any one time.
- Throughout narration paragraph about "Understanding," show the text box to the right of Understanding level.
- Throughout narration paragraph about "Applying," show the text box to the right of Applying level.
- Throughout narration paragraph about "Analyzing," show the text box to the right Analyzing level.
- Throughout narration paragraph about "Evaluating," show the text box to the right of Evaluating level.
- Throughout narration paragraph about "Creating," show the text box to the right of Creating level.

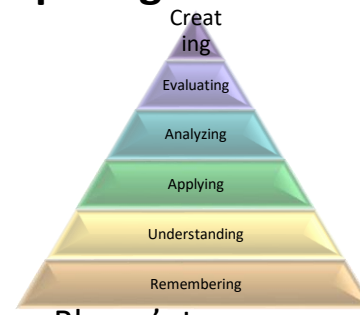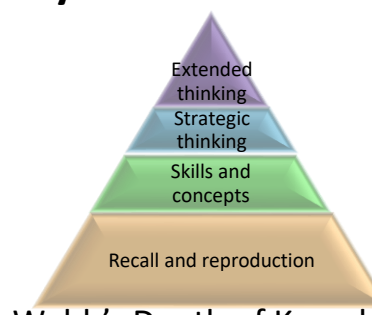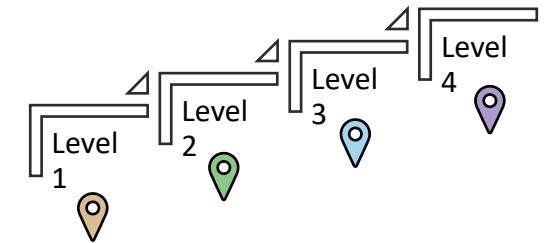| Audio Narration	Visuals
Now let's consider Webb's Depth of Knowledge and compare it with Bloom's taxonomy. Norman Webb defined 4 levels of cognitive demands that are made on students by assessments of learning. Click the marker for each of the 4 levels to learn how they relate to Bloom's taxonomy. Level 1 involves recall and reproduction. In such an assessment, students are processing information on a low level, like remembering a fact or procedure. This resembles the remembering and understanding levels of Bloom's taxonomy. Level 2 involves using skills and concepts to complete a task or solve a routine problem. This most closely resembles the applying level of Bloom's taxonomy. Level 3 strategic thinking involves more demanding reasoning and planning to solve a problem. This often resembles the analyzing level of Bloom's taxonomy. Level 4 extended thinking requires someone to think more deeply about several conditions within a problem to determine what to do. This most closely resembles the evaluating and creating levels of Bloom's taxonomy. So the middle two levels of Webb's Depth of Knowledge relate to the middle two levels of Bloom's taxonomy. The bottom and top level of Webb's Depth of Knowledge each relate to the **two** bottom levels and **two** top levels of Bloom's taxonomy.	**Comparing Bloom's Taxonomy and Webb's Depth of Knowledge** Bloom's taxonomy: Creating, Evaluating, Analyzing, Applying, Understanding, Remembering Webb's Depth of Knowledge: Extended thinking, Strategic thinking, Skills and concepts, Recall and reproduction — compared with Bloom's taxonomy Webb's Depth of Knowledge: Level 1, Level 2, Level 3, Level 4

Functional Instructions/Instructions for Interactivity

- Play first paragraph of narration on screen open.
- When user rolls over tan marker, Level 1 bracket and label transform into the tan bottom level of the pyramid that contains the text "Recall and reproduction."
- When user rolls over tan marker, play Level 1 paragraph of narration.
- When user rolls over green marker, Level 2 bracket and label transform into the green layer of the pyramid that contains the text "Skills and concepts."
- When user rolls over green marker, play Level 2 paragraph of narration.
- When user rolls over blue marker, Level 3 bracket and label transform into the blue layer of the pyramid that contains the text "Strategic thinking."
- When user rolls over blue marker, play Level 3 paragraph of narration.
- When user rolls over lavender marker, Level 4 bracket and label transform into the lavender layer of the pyramid that contains the text "Extended thinking."
- When user rolls over lavender marker, play remainder of narration.
- When user rolls over lavender marker, fade out label "Webb's Depth of Knowledge"
- When final paragraph of narration begins, fade in label "Webb's Depth of Knowledge compared with Bloom's taxonomy."

Audio Narration	Visuals
Now let's pause to check your understanding of how Bloom's taxonomy and Webb's Depth of Knowledge relate to each other. Match each level of Webb's Depth of Knowledge to the most similar portion of Bloom's taxonomy.	**Check Your Understanding**

Visuals:

Skills and concepts

Recall and reproduction

Strategic thinking

Extended thinking

Creating and Evaluating

Analyzing

Applying

Remembering and Understanding

Webb's Depth of Knowledge   Bloom's taxonomy

Correct! You've identified important similarities between these two models.

Functional Instructions/Instructions for Interactivity

- Allow user to drag levels of Webb's Depth of Knowledge to the levels of Bloom's taxonomy.
- If the match is correct, show the level of Webb's Depth of Knowledge snap into place.
- If the match is incorrect, show the level of Webb's Depth of Knowledge returning to its original location.
- When all levels of Webb's Depth of Knowledge have been matched correctly, show Correct Answer feedback in textbox.
- Correct answers are as follows:
    - Skills and concepts: Applying
    - Recall and reproduction: Remembering and Understanding
    - Strategic thinking: Analyzing
    - Extended thinking: Creating and Evaluating
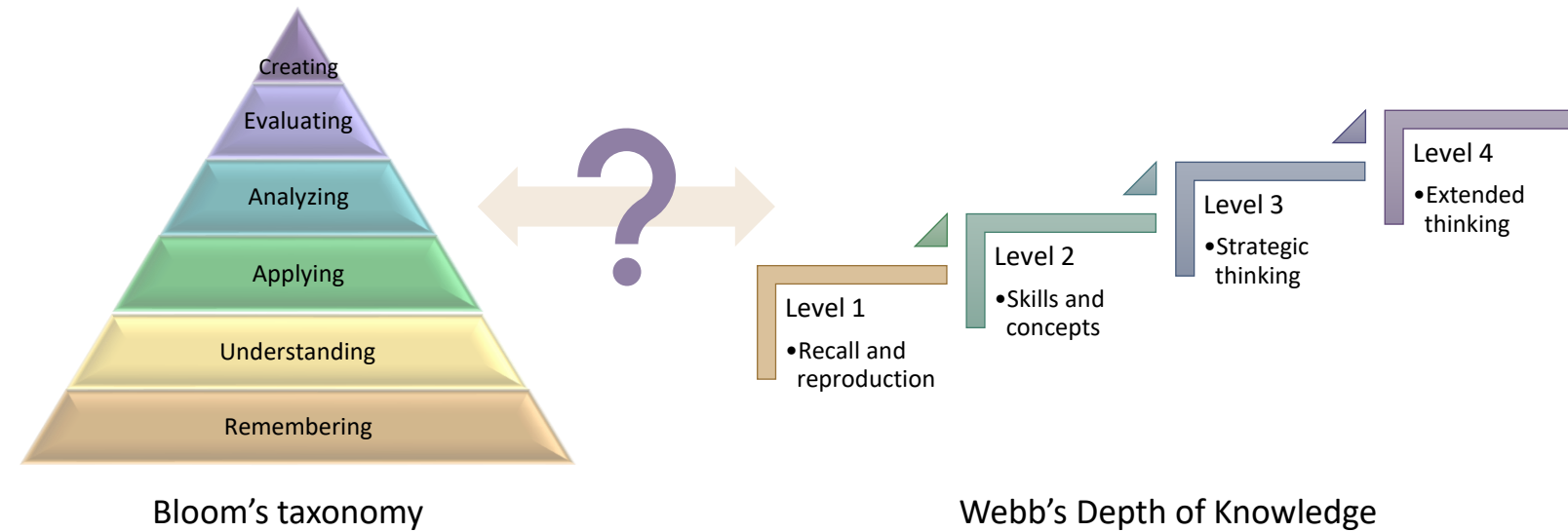
Audio Narration	Visuals
Now let's explore some of the differences between Bloom's taxonomy and Webb's Depth of Knowledge. The most obvious difference is the number of levels in each model. Webb defined four levels, while Bloom's taxonomy defines six. Some other differences are less obvious. We'll consider two of these.	**Differences between the Two Models**

Differences between the Two Models

Bloom's taxonomy (pyramid, bottom to top):
- Remembering
- Understanding
- Applying
- Analyzing
- Evaluating
- Creating

Bloom's taxonomy

Webb's Depth of Knowledge:
- Level 1 • Recall and reproduction
- Level 2 • Skills and concepts
- Level 3 • Strategic thinking
- Level 4 • Extended thinking

Webb's Depth of Knowledge

Functional Instructions/Instructions for Interactivity
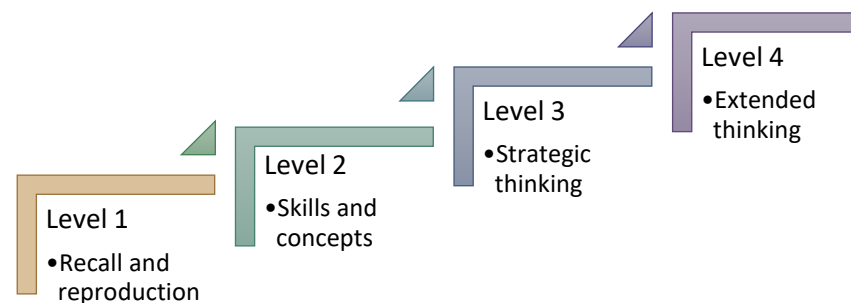- Play narration on screen open.

Audio Narration

One difference is what each model represents. Bloom's taxonomy represents increasingly high levels of cognition. Webb's Depth of Knowledge **also** represents a bit about the context or situation in which the student engages in that cognition.

Does the situation involve a simple, routine problem or a non-routine problem? Solving a routine problem would likely be a Level 2 assessment, while solving a non-routine problem would likely be a Level 3 assessment.

Can the problem be solved in a modest series of steps or does it require an extended investigation? The time required by the assessment is part of the context that often distinguishes Level 3 strategic thinking assessments from Level 4 extended thinking assessments. Level 4 assessments often require more time to understand multiple conditions of the problem and weigh them in order to arrive at a workable solution.

Visuals

Only Cognition? Or Context Too?

Level 1
- Recall and reproduction

Level 2
- Skills and concepts

Level 3
- Strategic thinking

Level 4
- Extended thinking

Webb's Depth of Knowledge

Functional Instructions/Instructions for Interactivity
- Play narration on screen open.
- When second paragraph of narration begins, fade in photo of man.
- When third paragraph of narration begins, fade out photo of man.
- When third paragraph of narration begins, fade in photo of debris.

| Audio Narration	Visuals
Another important difference between Bloom's taxonomy and Webb's Depth of Knowledge is how much we can use the verb in a learning objective or an assessment to determine its level of cognitive rigor. With Bloom's taxonomy, we rely heavily on the verb in a learning objective to interpret its level of cognitive rigor. For example, learning objectives that begin with "create" are aligned with the highest level of Bloom's taxonomy. By contrast, to accurately associate an assessment of learning with one of the levels of Webb's Depth of Knowledge, we must consider more than the verb. Let's consider several examples that also begin with "create." If students are asked to create a timeline of events in the Vietnam War, that would entail reproducing facts from a text in a new format. This aligns with Level 1 recall and reproduction. If students are asked to create a model of cloud formation, they would be representing relationships between processes. This aligns with Level 2 skills and concepts. Creating a questionnaire to gather data about student health awareness would require short-term strategic thinking, as in Level 3. Creating a proposal for reducing a budget by 50% without laying off any employees would require an extended process of investigation, as in Level 4.	**Consider More Than the Verb** Pyramid (Bloom's taxonomy), top to bottom: Creating, Evaluating, Analyzing, Applying, Understanding, Remembering Bloom's taxonomy **Level 1** • Recall and reproduction — Create a timeline of key events in the Vietnam War. **Level 2** • Skills and concepts — Create a model of cloud formation. **Level 3** • Strategic thinking — Create a questionnaire to gather data about student health awareness. **Level 4** • Extended thinking — Create a proposal for reducing the budget by 50% without laying off any employees. Webb's Depth of Knowledge
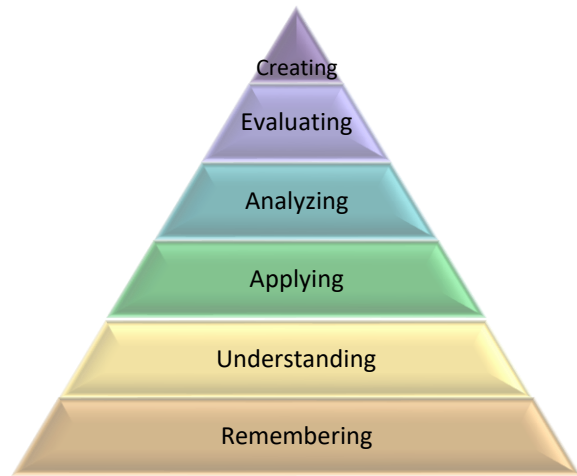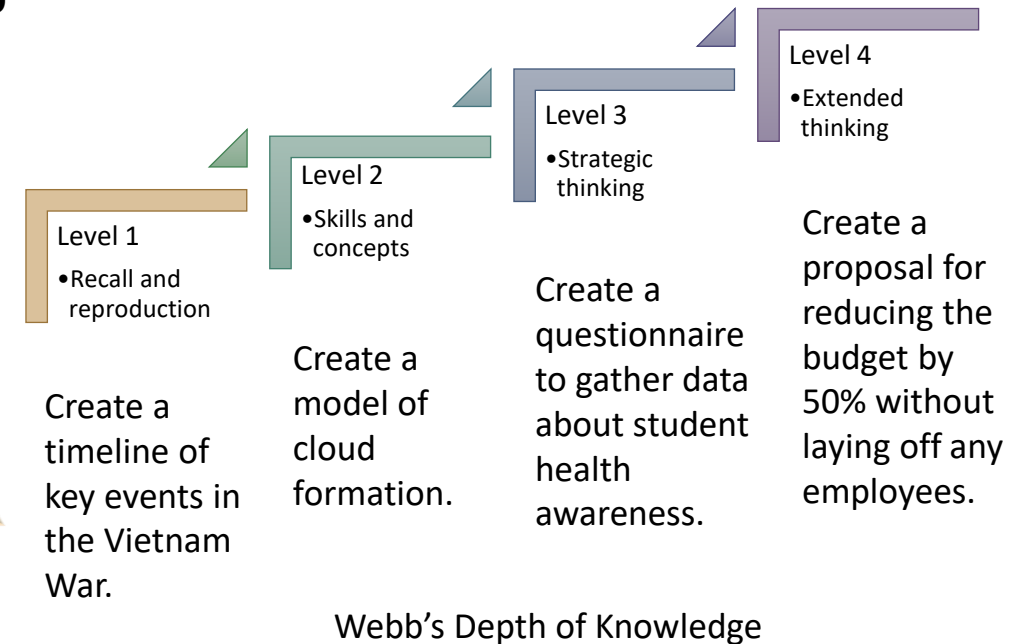
Functional Instructions/Instructions for Interactivity

- Play narration on screen open with Bloom's taxonomy visible.
- When the third paragraph of narration begins, fade in Webb's Depth of Knowledge graphic and label.
- When the fourth paragraph of narration begins, fade in text box about the timeline.
- When the fifth paragraph of narration begins, fade in text box about the model.
- When the sixth paragraph of narration begins, fade in text box about the questionnaire.
- When the seventh paragraph of narration begins, fade in text box about the proposal.
- Note: All 4 text boxes should remain visible simultaneously to allow user comparison.

Audio Narration	Visuals
Let's pause and check your understanding of some of the differences between Bloom's taxonomy and Webb's Depth of Knowledge.	**Check Your Understanding** What are three differences between Bloom's taxonomy and Webb's Depth of Knowledge? Compare your answers: 1. They have different numbers of levels. 2. Bloom's taxonomy focuses on cognitive rigor, while Webb's Depth of Knowledge involves both cognition and the context. 3. A verb cannot be used on its own to align an assessment with Webb's Depth of Knowledge, but a verb can be used to align an objective with Bloom's taxonomy. **Check your answer** **Functional Instructions/Instructions for Interactivity** • Play narration on screen open. • When user clicks "Check your answer" button and answer box has been left blank, show a message "Please enter an answer." • When user clicks "Check your answer" button and answer box contains user text, show the "Compare your answers" text box.

Audio Narration	Visuals
Now that you understand the similarities and differences between Bloom's taxonomy and Webb's Depth of Knowledge, you have two tools that you can use to measure the cognitive rigor of your learning objectives, check that your instruction is meeting standards, and push students to higher and deeper levels of cognitive effort through learning activities and assessments.	**Comparing Bloom's Taxonomy with Webb's Depth of Knowledge**

Functional Instructions/Instructions for Interactivity

- Play narration on screen open while image and title remain visible.