Cognitive Complexity: Math and ELA

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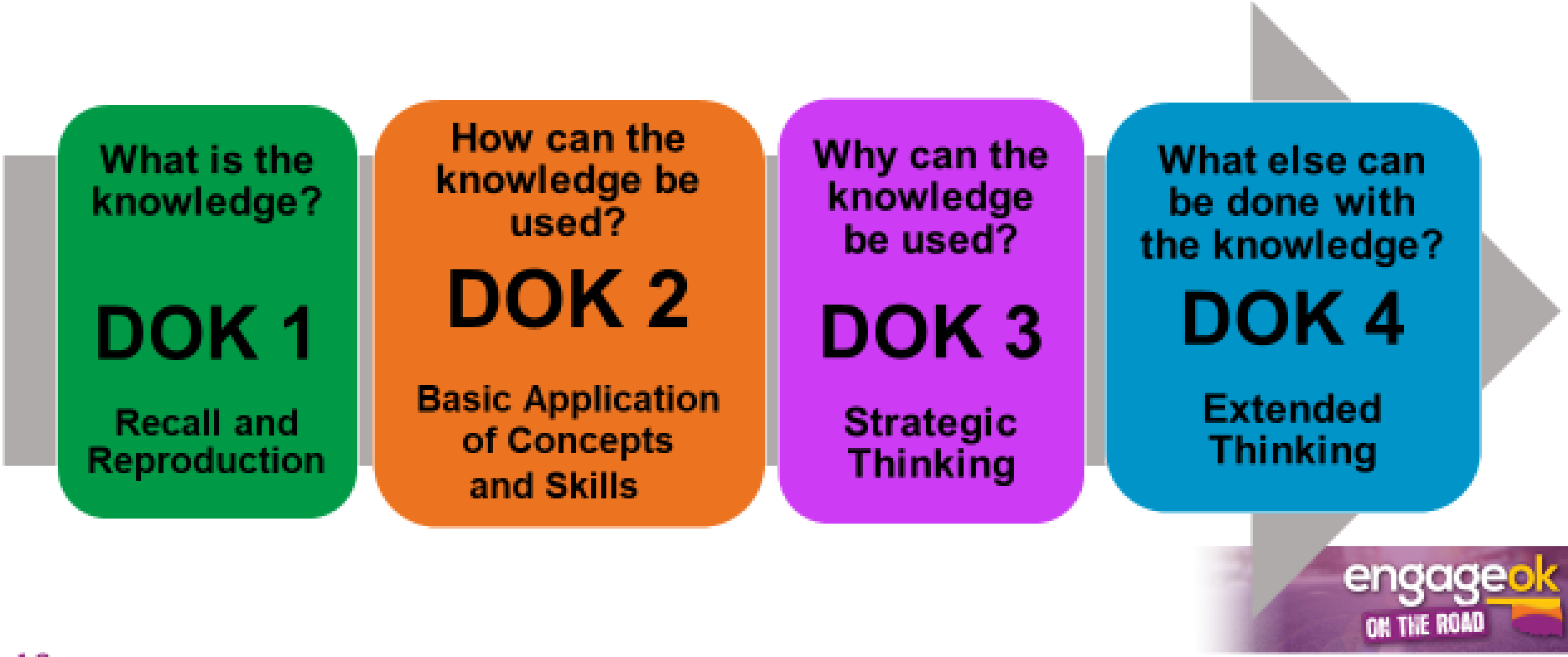
What is Cognitive Complexity?

- Cognitive Complexity refers to the kind of thinking required to complete a task.
- It's NOT about the verbs in the question, but about the level of thinking required to complete the task.
- Cognitive Complexity is measured by Depth of Knowledge (DOK) levels.

Depth of Knowledge (DOK) is a way to measure Cognitive Complexity



Why is Cognitive Complexity important?

- The Oklahoma Academic Standards are written to different DOK levels.
- In order to fully address all OAS, students must be able to perform a range of tasks at different complexity levels.

TOOL 2

HESS COGNITIVE RIGOR MATRIX (MA

Applying Webb's Depth-of-Knowledge Levels to Bloom'

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	o Recall, observe, & recognize facts, principles, properties o Recall/ identify conversions among representations or numbers (e.g., customary and metric measures)	Use these Hess CRM or scie	
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion), predict, compare/contrast, match like ideas, explain, construct models	o Evaluate an expression o Locate points on a grid or number on number line o Solve a one-step problem o Represent math relationships in words, pictures, or symbols o Read, write, compare decimals in scientific notation	o Specify and explain relationships (e.g., non-examples/examples; cause-effect) o Make and record observations o Explain steps followed o Summarize results or concepts o Make basic inferences or logical predictions from data/observations o Use models /diagrams to represent or explain mathematical concepts o Make and explain estimates	o o o o
Apply	o Follow simple procedures	o Select a procedure according to criteria	o

Math Example of DOK 1

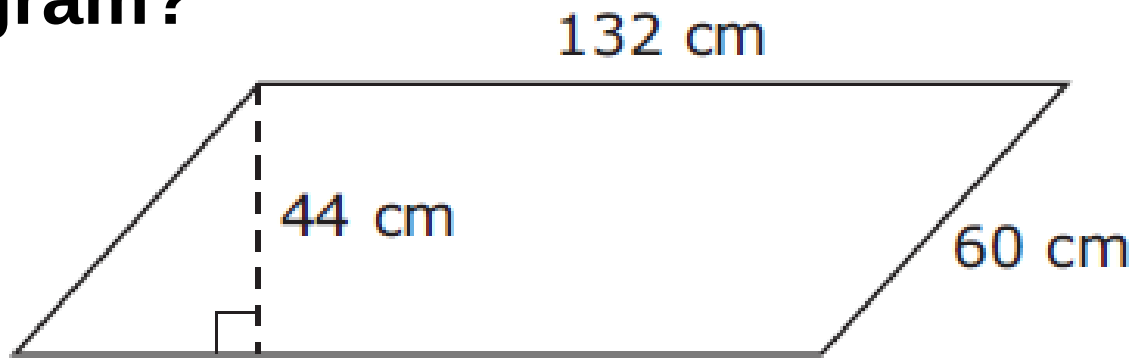
- 5.N.2.4 Recognize and generate equivalent decimals, fractions, mixed numbers, and fractions less than one in various contexts.

What decimal is equivalent to $\frac{12}{100}$?

Math Example of DOK 2

- 5.GM.2.3 Find the perimeter of polygons and create arguments for reasonable values for the perimeter of shapes that include curves.

What is the perimeter, in centimeters (cm), of this parallelogram?



Math Example of DOK 3

- 5.N.1.4 Solve real-world and mathematical problems requiring addition, subtraction, multiplication, and division of multi-digit whole numbers. Use various strategies, including the inverse relationships between operations, the use of technology, and the context of the problem to assess the reasonableness of results.

A student sorted 950 crayons into boxes that hold 36 crayons each. How many more crayons will the student need to completely fill the last box?

Math Example of DOK 4

- 5.GM.2 Understand how the volume of rectangular prisms and surface area of shapes with polygonal faces are determined by the dimensions of the object and that shapes with varying dimensions can have equivalent values of surface area and volume.

Create a 3 dimensional rendering of a kitchen including appliances and countertops. Students use their model to discuss volume, area and surface area.

ELA Examples of DOK

- Standard: **5.2.R.1** Students will create an objective summary, including main idea and supporting details, while maintaining meaning and a logical sequence of events.

ELA Examples of DOK

5.2.R.1 Students will create an objective summary, including main idea and supporting details, while maintaining meaning and a logical sequence of events.

- **DOK 1: Recall & Reproduction**

Describe/explain who, what, where, when, or how.

- **DOK 2: Skills & Concepts**

Summarize/identify the main idea of the text.

- **DOK 3: Strategic Thinking/Reasoning**

Explain, generalize, or connect ideas using supporting evidence.

- **DOK 4: Extended Thinking**

Explain how the main idea relates to other passages/stories.

How is Cognitive Complexity different from difficulty?

Math Example

- Using numbers requiring more complicated calculations, which increases difficulty, does not increase the DOK.

- Open ended questions could be easy but would be a higher DOK.

ELA Example

3.5.R.1 Students will recognize pronouns and possessive nouns.

Identify the **pronouns** in the following sentence:

By the beginning of July, I had recurring thoughts about how foolish I had been to let pettiness and jealousy seep into our friendship.

ELA Example

8.5.R.1 Students will recognize the use of verbals (e.g., gerunds, participles, infinitives) and clauses.

Identify the **verbals** in the following sentence:

By the beginning of July, I had recurring thoughts about how foolish I had been to let pettiness and jealousy seep into our friendship.

Where do I start?

- Examine your Standards
- Evaluate your resources
- Use a range of DOK

Oklahoma Academic Standards

- Know your standards!
- Oklahoma Academic Standards
- Standards Frameworks

Hess Cognitive Complexity Matrix

https://www.karin-hess.com/cognitive-rigor-and-dok

- Available for many content areas:
  - Close reading
  - Math-Science
  - Written and Oral Communication
  - Social Studies and Humanities
  - Fine arts
  - Health & Physical Science
  - World Languages
  - Career & Technical Education

Interim Assessment Alignment Study

- Voluntary participation
- Grades/Subjects
  - Grade 4 ELA & Math
  - Grade 7 ELA & Math
- Reviewers examined
  - OAS alignment
  - DOK alignment
- Interim Assessment Alignment Study

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