APPLYING WEBB'S DEPTH OF KNOWLEDGE LEVELS MATHEMATICS

(Adapted from Karin Hess, Center for Assessment/NCIEA by the Kentucky Department of Education, 2005)

DoK Level 1: Recall and Reproduction	**DoK Level 2: Skills and Concepts/ Basic Reasoning**	**DoK Level 3: Strategic Thinking/ Complex Reasoning**	**DoK Level 4: Extended Thinking/ Reasoning**
• Recall of a fact, information or procedure • Recall or recognize fact • Recall or recognize definition • Recall or recognize term • Recall and use a simple procedure • Perform a simple algorithm. • Follow a set procedure • Apply a formula • A one-step, well-defined and straight algorithm procedure. • Perform a clearly defined series of steps • Identify • Recognize • Use appropriate tools • Measure • Habitual response: Can be described; Can be explained • Answer item automatically • Use a routine method • Recognize patterns • Retrieve information from a graph • Includes one step word problems • Do basic computations	• Students make some decisions as to how to approach the problem • Skill/Concept • Basic Application of a skill or concept • Classify • Organize • Estimate • Make observations • Collect and display data • Compare data • Imply more than one step • Visualization Skills • Probability Skills • Explain purpose and use of experimental procedures. • Carry out experimental procedures • Make observations and collect data • Beyond habitual response • Classify, organize and compare data. • Explain, describe or interpret • Organize and display data in tables, charts and graphs. • Use of information • Two or more steps, procedures • Demonstrate conceptual knowledge through models and explanations. • Extend a pattern. • Explain concepts, relationships, and non-examples.	• Requires reasoning, planning using evidence and a higher level of thinking • Strategic Thinking • Freedom to make choices • Explain your thinking • Make conjectures • Cognitive demands are complex and abstract • Conjecture, plan, abstract, explain • Justify • Draw conclusions from observations • Cite evidence and develop logical arguments for concepts • Explain phenomena in terms of concepts • Use concepts to solve problems • Make and test conjectures • Some complexity • Provide math justification when more than one possible answer • Non-routine problems • Interpret information from a complex graph • Analyze, synthesize • Weigh multiple things.	• Performance tasks • Authentic writing • Project-based assessment • Complex, reasoning, planning, developing and thinking • Cognitive demands of the tasks are high • Work is very complex • Students make connections within the content area or among content areas • Select one approach among alternatives • Design and conduct experiments • Relate findings to concepts and phenomena • Combine and synthesize ideas into new concepts • Critique experimental designs

APPLYING WEBB'S DEPTH OF KNOWLEDGE LEVELS
SCIENCE

(Karin Hess, Center for Assessment, based on Webb, update 2005)

DoK Level 1: **Recall and Reproduction**	**DoK Level 2:** **Skills and Concepts/** **Basic Reasoning**	**DoK Level 3:** **Strategic Thinking/** **Complex Reasoning**	**DoK Level 4:** **Extended Thinking/** **Reasoning**
a. Recall or recognize a fact, term, definition, simple procedure (such as one step), or property b. Demonstrate a rote response c. Use a well-known formula d. Represent in words or diagrams a scientific concept or relationship e. Provide or recognize a standard scientific representation for simple phenomenon f. Perform a routine procedure, such as measuring length g. Perform a **simple** science process or a set procedure (like a recipe) h. Perform a clearly defined set of steps i. Identify, calculate, or measure **NOTE: If the knowledge necessary to answer an item automatically provides the answer, it is a Level 1.**	a. Specify and explain the relationship between facts, terms, properties, or variables b. Describe and explain examples and non-examples of science concepts c. Select a procedure according to specified criteria and perform it d. Formulate a routine problem given data and conditions e. Organize, represent, and compare data f. Make a decision as to how to approach the problem g. Classify, organize, or estimate h. Compare data i. Make observations j. Interpret information from a simple graph k. Collect and display data **NOTE: If the knowledge necessary to answer an item <u>does not</u> automatically provide the answer, then the item is at least a Level 2. Most actions imply more than one step.** **NOTE: Level 3 is complex and abstract. If more than one response is possible, it is at least a Level 3 and calls for use of reasoning, justification, evidence, as support for the response.**	a. Interpret information from a complex graph (such as determining features of the graph or aggregating data in the graph) b. Use reasoning, planning, and evidence c. Explain thinking (beyond a simple explanation or using only a word or two to respond) d. Justify a response e. Identify research questions and design investigations for a scientific problem f. Use concepts to solve non-routine problems/more than one possible answer g. Develop a scientific model for a complex situation h. Form conclusions from experimental or observational data i. Complete a multi-step problem that involves planning and reasoning j. Provide an explanation of a principle k. Justify a response when more than one answer is possible l. Cite evidence and develop a logical argument for concepts m. Conduct a designed investigation n. Research and explain a scientific concept o. Explain phenomena in terms of concepts	a. Select or devise approach among many alternatives to solve problem b. Based on provided data from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables. c. Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analyzing its data and forming conclusions d. Relate ideas *within* the content area or *among* content areas e. Develop generalizations of the results obtained and the strategies used and apply them to new problem situations **NOTE: Level 4 activities often require an extended period of time for carrying out multiple steps; however, time alone is not a distinguishing factor if skills and concepts are simply repetitive over time.**

Table 1: Sample Depth-of-Knowledge Level Descriptors for Social Studies (Based on Webb, Karin Hess, 2005, National Center for Assessment www.nciea.org)

Level 1 Recall of Information	Level 2 Basic Reasoning	Level 3 Complex Reasoning	Level 4 Extended Reasoning
a. Recall or recognition of: fact, term, concept, trend, generalization, event, or document b. Identify or describe features of places or people c. Identify key figures in a particular context meaning of words d. Describe or explain: who, what, where, when e. Identify specific information contained in maps, charts, tables, graphs, or drawings	a. Describe cause-effect of particular events b. Describe or explain: how (relationships or results), why, points of view, processes, significance, or impact c. Identify patterns in events or behavior d. Categorize events or figures in history into meaningful groups e. Identify and summarize the major events, problem, solution, conflicts f. Distinguish between fact and opinion g. Organize information to show relationships h. Compare and contrast people, events, places, concepts i. Give examples and non-examples to illustrate an idea/concept	a. Explain, generalize, or connect ideas, using supporting evidence from a text/source b. Apply a concept in other contexts c. Make and support inferences about implied causes and effects d. Draw conclusion or form alternative conclusions e. Analyze how changes have affected people or places f. Use concepts to solve problems g. Analyze similarities and differences in issues or problems h. Propose and evaluate solutions i. Recognize and explain misconceptions related to concepts	a. Analyze and explain multiple perspectives or issues within or across time periods, events, or cultures b. Gather, analyze, organize, and synthesize information from multiple (print and non print) sources c. Make predictions with evidence as support d. Plan and develop solutions to problems e. Given a situation/problem, research, define, and describe the situation/problem and provide alternative solutions f. Describe, define, and illustrate common social, historical, economic, or geographical themes and how they interrelate

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Table 1: Sample Depth-of-Knowledge Level Descriptors for Reading (Based on Webb and Wixson, K. Hess, Center for Assessment/NCIEA, 2004)

Level 1 Recall of Information	Level 2 Basic Reasoning	Level 3 Complex Reasoning	Level 4 Extended Reasoning
a. Read words orally in isolation b. Read words orally in connected text c. Read multi-syllabic words d. Locate or recall facts or details explicitly presented in text e. Identify or describe characters, setting, sequence of events f. Use language structure (pre/suffix) or word relationships (synonym/antonym) to determine meaning of words g. Select appropriate words to use in context (e.g., content-specific words, shades of meaning) when intended meaning is clearly evident	a. Use context cues or resources to identify the meaning of unfamiliar words b. Predict a logical outcome based on information in a reading selection c. Make basic inferences or draw basic conclusions about information presented in text (e.g., According to this report, what caused ___?) d. Recognizing appropriate generalizations about text (e.g., possible titles, main ideas) e. Identify and summarize the major events, problem, solution, conflicts in a literary text f. Determine whether a text is fact or fiction g. Distinguish between fact and opinion h. Describe the characteristics or features of various types of text i. Obtain information using text features of informational text (e.g., Table of Contents, sidebar, chart) j. Organize information presented in informational text using mapping, charting, or summarizing k. Locate information to answer questions related to explicit or implicit central ideas in informational texts l. Identify use of literary devices (e.g., imagery, idioms, exaggeration, alliteration, etc.)	a. Explain, generalize, or connect ideas, using supporting evidence from the text or from other sources b. Draw inferences about author's purpose, author's message or theme (explicit or implied) c. Make and support inferences about implied causes and effects d. Describe how word choice, point of view, or bias affects the interpretation of a reading selection e. Summarize or compare information within and across text passages f. Analyze interrelationships among elements of the text (plot, subplots, characters, setting) g. Analyze or interpret use of author's craft (literary devices) to analyze or critique a literary text	a. Compare or analyze multiple works by the same author, including author's craft b. Compare or analyze multiple works from the same time period or from the same genre c. Gather, analyze, organize, and interpret information from multiple (print and non print) sources for the purpose of drafting a reasoned report d. Evaluate the relevancy and accuracy of information from multiple (print and non print) sources (e.g., verifying factual information or assertions with other sources; researching the source of information)

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Table 1 – Detailed Descriptions of Depth of Knowledge Levels for Writing
(Adapted by Karin Hess, Center for Assessment/NCIEA, 2005, Based on Webb)

Level 1	Level 2	Level 3	Level 4
Some examples that represent, but do not constitute all Level 1 writing performances: a. Listing/generating ideas or words prior to developing written composition (e.g., brainstorming, webbing) b. Selecting or recalling appropriate vocabulary (words, phrases, idioms) to achieve intended meaning in writing c. Writing simple sentences d. Using punctuation marks and capitalization correctly in writing and editing e. Using Standard English conventions in writing and editing to correct errors f. Identifying misspelled words in a written passage g. Applying conventional spelling patterns/rules to new situations in writing h. Using resources (dictionary, thesaurus) to correct spelling in written passages i. Using resources to identify Standard English grammatical structures for correction j. Using resources to apply basic formats for documentation	**Some examples that represent, but do not constitute all Level 2 writing performances:** a. Note-taking or outlining as a means of organizing ideas for writing b. Developing text which may be limited to one paragraph c. Using simple organizational strategies to structure written work (e.g., basic paragraph form: indenting, main idea, supporting details; simple transitions) d. Constructing a variety of sentence types (e.g., simple and compound, sentences with embedded phrases) e. Writing summaries that contain the main idea of a reading selection and pertinent details or quotations f. Demonstrating basic understanding and appropriate use of such reference materials as a dictionary, thesaurus, or web site g. Editing final drafts of compositions for mechanics and conventions, including grammar, punctuation, and capitalization	**Some examples that represent, but do not constitute all Level 3 writing performances:** a. Developing compositions that include multiple paragraphs b. Using complex or varied sentence structures in written compositions c. Demonstrating some synthesis and analysis in writing (making inferences; determining relationships; generalizing, or connecting ideas) d. Showing awareness of audience and purpose through focus, organization, voice/tone e. Using appropriate organizational text structures (e.g., description; chronology; proposition/support; compare/contrast; cause/effect) f. Editing and revising to improve the quality and meaning of the composition g. Supporting ideas with details, examples, quotations, text references, and/or citations h. Revising final drafts to improve organization and precision of language to produce a logical progression of ideas i. Summarizing information from multiple sources to address a specific topic	**Some examples that represent, but do not constitute all Level 4 writing performances:** a. Developing multi-paragraph compositions that demonstrate synthesis and analysis of complex ideas or themes b. Analyzing author's craft (e.g., style, bias, literary techniques, point of view) c. Demonstrating evidence of a deep awareness of purpose and intended audience. (e.g., in informational reports including hypotheses and supporting evidence) d. Creating compositions that demonstrate a distinct voice and that stimulate the reader or listener to consider new perspectives on the addressed ideas or themes e. Writing an analysis of two selections, identifying the common theme and generating a purpose that is appropriate for both f. Gathering, analyzing, and evaluating written information for the purpose of drafting a reasoned report that supports and appropriately illustrates inferences and conclusions drawn

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DOK Question Stems

DOK 1

- Can you recall_____?
- When did ____ happen?
- Who was ____?
- How can you recognize____?
- What is____?
- How can you find the meaning of____?
- Can you recall____?
- Can you select____?
- How would you write___?
- What might you include on a list about___?
- Who discovered___?
- What is the formula for___?
- Can you identify___?
- How would you describe___?

DOK 2

- Can you explain how ____ affected ____?
- How would you apply what you learned to develop ____?
- How would you compare ____? Contrast_____?
- How would you classify____?
- How are____alike? Different?
- How would you classify the type of____?
- What can you say about____?
- How would you summarize____?
- How would you summarize___?
- What steps are needed to edit___?
- When would you use an outline to ___?
- How would you estimate___?
- How could you organize___?
- What would you use to classify___?
- What do you notice about___?

DOK 3

- How is ____ related to ____?
- What conclusions can you draw _____?
- How would you adapt____to create a different____?
- How would you test____?
- Can you predict the outcome if____?
- What is the best answer? Why?
- What conclusion can be drawn from these three texts?
- What is your interpretation of this text? Support your rationale.
- How would you describe the sequence of____?
- What facts would you select to support____?
- Can you elaborate on the reason____?
- What would happen if___?
- Can you formulate a theory for___?
- How would you test___?
- Can you elaborate on the reason___?

DOK 4

- Write a thesis, drawing conclusions from multiple sources.
- Design and conduct an experiment. Gather information to develop alternative explanations for the results of an experiment.
- Write a research paper on a topic.
- Apply information from one text to another text to develop a persuasive argument.
- What information can you gather to support your idea about___?
- DOK 4 would most likely be the writing of a research paper or applying information from one text to another text to develop a persuasive argument.
- DOK 4 requires time for extended thinking.

From Depth of Knowledge – Descriptors, Examples and Question Stems for Increasing Depth of Knowledge in the Classroom Developed by Dr. Norman Webb and Flip Chart developed by Myra Collins