MINISTRY OF EDUCATION
YOUTH & INFORMATION

The Student Assessment Unit

Norman Webb's Depth of Knowledge (DOK)

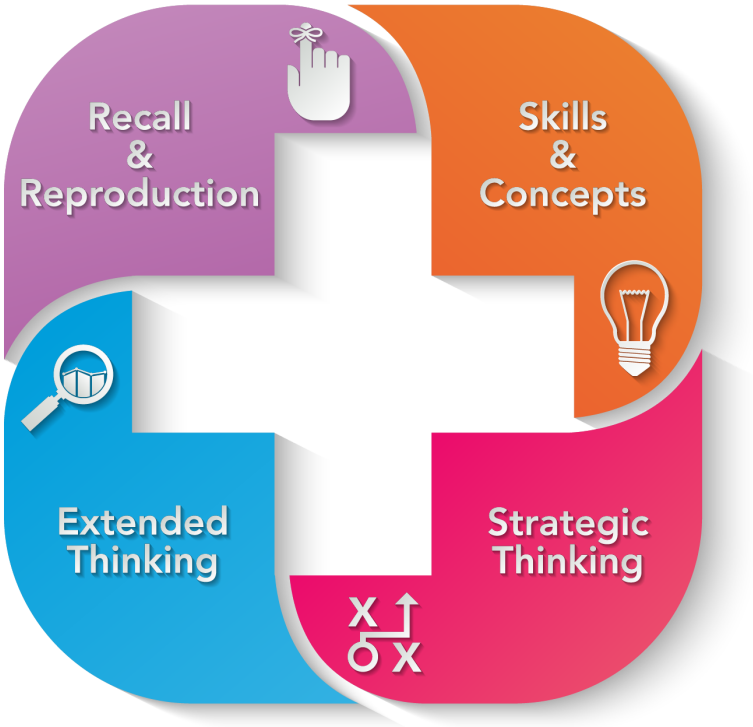
A Cognitive Demand (Thinking) Scale for Assessments

Contents

Overview

As the Student Assessment Unit continues it efforts to support the system in improving its assessment practices, you are being engaged in the second of a series of training to help you acquire the skills necessary to carry out your functions.

This publication focuses on **Norman Webb's Depth of Knowledge** and will serve as a resource in the development of assessment plans and tasks.



Webb's Depth of Knowledge

Norman Webb developed a process and criteria for analysing the alignment between objectives and assessments. The model places tasks in categories that reflect the different levels of cognitive expectations (thinking) required to complete the task. There are four categories/levels:

What is the knowledge?

DOK 1

Recall & Reproduction

Who?

What?

Where?

When?

How?

Why?

How can the knowledge be used?

DOK 2

Basic Application of Skills and Concepts

How does/ did it happen?

How does/did it work?

How is/ was it used?

What is the answer/outcome/ result?

Why can the knowledge be used?

DOK 3

Strategic Thinking

Why did it happen?

How/why can you use it?

What is the cause/effect?

What distinguishes/ indicates?

What is the reason?

What is the relationship?

What else can be done with the knowledge?

DOK 4

Extended Thinking

What is the impact?

What is the influence?

What could/ would happen?

What do you believe/ feel/ think?

What can you create/ design/ develop?

Level 1: Recall and Reproduction

Assessments that fall into this category involve basic tasks that require students to recall or reproduce knowledge and/or skills. The subject content at this particular level usually involves working with facts, terms and/or properties of objects. It may also involve use of simple procedures and/or formulas. There is little transformation or extended processing of the target knowledge required by the tasks that fall into this category. Key words that often denote this particular level include: list, identify and define. A student answering a Level 1 item either knows the answer or does not; that is, the answer does not need to be "figured out" or "solved."

Possible Products

Quiz	Vocabulary	Podcast
Definition	Quiz	Categorizing/Tagging
Facts	Recitation	Commenting
Worksheet	Example	Bulleting
Test	Explanation	Highlighting
Label	Show and Tell	Social networking
List	Outline	Social bookmarking
Workbook	Blog	Searching
Reproduction	Wiki	Googling

Roles

Teacher		**Student**	
Directs	Examines	Responds	Interprets
Shows	Tells	Remembers	Absorbs
Questions	Evaluates	Memorizes	Recognizes
Demonstrates	Listens	Explains	Describes
Compares	Contrasts	Restates	Demonstrates

Level 1: Recall and Reproduction

Potential Activities

- Develop a concept map showing a process or describing a topic.
- Make a timeline
- Write a list of keywords you know about…
- Make a chart showing…
- Recite a fact related to…
- Write in your own words…
- Cut out, or draw a picture that illustrates an event, process, or story.
- Report or present to the class.
- Make a cartoon strip showing the sequence of an event, process, or story.
- Write and perform…
- Write a brief outline and explain the event, process, or story.
- Write a summary report of the event
- Prepare a flow chart that illustrates the sequence of events.
- Paraphrase a chapter in the book
- Retell in your own words
- Outline the main points 8
- Recall, restate, remember, or recognize a fact, term, or property (Recognizing, listing, describing, identifying, retrieving, naming, locating, finding)
- Using basic calculation tasks involving only one step (i.e. addition, subtraction, etc), complete the following…
- Locate or retrieve information in verbatim form. □
- Straight-forward recognition tasks related to identifying features, objects and/or steps that don't vary greatly in form (i.e. recognizing features of basic tools). □
- Writing tasks that involve applying a standard set of conventions and or criteria that should eventually be automated (i.e. using punctuation, spelling, etc)
- Basic measurement tasks that involve one step (i.e. using a ruler to measure length)
- Use this simple formula where at least one of the unknowns are provided to…
- Locating information in maps, charts, tables, graphs, and drawings

Level 2: Skills and Concepts

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response. This level generally requires students to contrast or compare people, places, events and concepts; convert information from one form to another; classify or sort items into meaningful categories ; describe or explain issues and problems, patterns , cause and effect, significance or impact, relationships, points of view or processes. A Level 2 "describe or explain" would require students to go beyond a description or explanation of recalled information to describe or explain a result or "how" or "why." The learner should make use of information in a context different from the one in which it was learned. Elements found in a curriculum that fall in this category involve working with or applying skills and/or concepts to tasks related to the field of study in a laboratory setting. The subject matter content at this particular level usually involves working with a set of principles, categories, heuristics, and protocols. At this level students are asked to transform/process target knowledge before responding. Example mental processes that often denote this particular level include: summarize, estimate, organize, classify, and infer.

Possible Products

Photograph	Presentation	Reverse-Engineering	Blog Commenting
Illustration	Interview	Cracking Codes	Blog Reflecting
Simulation	Performance	Linking	Moderating
Sculpture	Dairy	Mashing	Testing (Alpha/Beta)
Demonstration	Journal	Relationship Mind Maps	Validating

Roles

Teacher		**Student**	
Shows	Facilitates	Solves problems	Demonstrates use of knowledge
Observes	Evaluates	Calculates	Complies
Organizes	Questions	Completes	Illustrates
Facilitates		Constructs	
Evaluates			

Level 2: Skills and Concepts

Potential Activities

- Classify a series of steps
- Construct a model to demonstrate how it looks or works
- Practices a play and perform in class
- Make a diorama to illustrate an event
- Write a diary/blog entry
- Make a scrapbook about the area of study
- Make a topographic map
- Make up puzzle or game about the topic
- Write an explanation about this topic for others
- Make a model…
- Routine application tasks (i.e. applying a simple set of rules or protocols to a laboratory situation the same way each time)
- Explaining the meaning of a concept and/or explaining how to perform a particular task
- Stating relationships among a number of concepts and or principles
- More complex recognition tasks that involve recognizing concepts and processes that may vary in how they "appear"
- More complex calculation tasks (i.e. multi-step calculations such as converting cm^3 to litres)
- Research projects and writing activities that involve locating, collecting, organizing and displaying information (i.e. writing a report with the purpose to inform; meeting all steps of the writing process)
- Measurement tasks that occur over a period of time and involve aggregating/organizing the data collected into basic presentation forms such as a simple table or graph

Level 3: Strategic Thinking

Items falling into this category demand a short-term use of higher order thinking processes, such as analysis and evaluation, to solve real-world problems with predictable outcomes. Stating one's reasoning is a key marker of tasks that fall into this particular category. The expectation established for tasks at this level tends to require coordination of knowledge and skill from multiple subject-matter areas to carry out processes and reach a solution in a project-based setting. Key processes that often denote this particular level include: analyse, explain and support with evidence, generalize, and create.

Possible Products

Graph	Database	Report	Animation
Spreadsheet	Mobile	Evaluating	Video cast
Checklist	Abstract	Investigation	Podcast
Chart	Report	Conclusion	Publishing
Outline	Debate	Program	Wiki-ing
Survey	Panel	Film	

Roles

Teacher		**Student**	
Probes	Evaluates	Discusses	Disputes
Observes	Questions	Debates	Decides
Acts as a resource	Dissects	Examines	Argues
Organizes	Accepts	Judges	Tests
Clarifies		Assesses	Calculates
Guides		Justifies	Compares
		Uncovers	Selects
		Thinks deeply	Questions

Level 3: Strategic Thinking

Potential Activities

- Use a Venn Diagram that shows how two topics are the same and different
- Design a questionnaire to gather information
- Survey classmates/industry members to find out what they think about a particular topics
- Make a flow chart to show the critical stages in a process
- Classify the actions of the characters in book
- Prepare a report about an area of study
- Conduct an investigation to produce information to support a view
- Write a letter to the editor after evaluation product
- Prepare and conduct a debate
- Prepare a list of criteria to judge
- Write a persuasive speech arguing for/against…
- Make a booklet about five rules you see as important. Convince others.
- Form a panel to discuss viewpoints on…
- Write a letter to… advertising on changes needed.
- Prepare a case to present your view about ….
- Short-term tasks and projects placing a strong emphasis on transferring knowledge to solve predictable problems
- Explaining and/or working with abstract terms and concepts
- Recognition tasks when the environment observed is real-world and often contains extraneous information which must be sorted through
- Complex calculation problems presented that draw upon multiple processes
- Writing and or explaining tasks that require altering a message to "fit" an audience
- Creating graphs, tables and charts where students must reason through and organize the information with instructor prompts
- Identifying a research question and/or designing investigations to answer a question
- Tasks that involve proposing solutions or making predictions

Level 4: Extended Thinking

Assessments assigned to this level demand extended use of higher order thinking processes such as synthesis, reflection, making judgements and adjustment of plans over time. Students are engaged in conducting investigations to solve real-world problems with unpredictable outcomes. Employing and sustaining strategic thinking processes over a longer period of time to solve the problem is a key feature of assessments that are assigned to this level. Key strategic thinking processes that denote this particular level include: synthesize, reflect, conduct, and manage.

Possible Products

Film

Story

Project

Plan

New Game

Song

Newspaper

Media Product

Roles

Teacher

Facilitates

Reflects

Evaluataes

Extends

Analyses

Student

Designs

Takes risks

Proposes

Formulates

Modifies

Plans

Creates

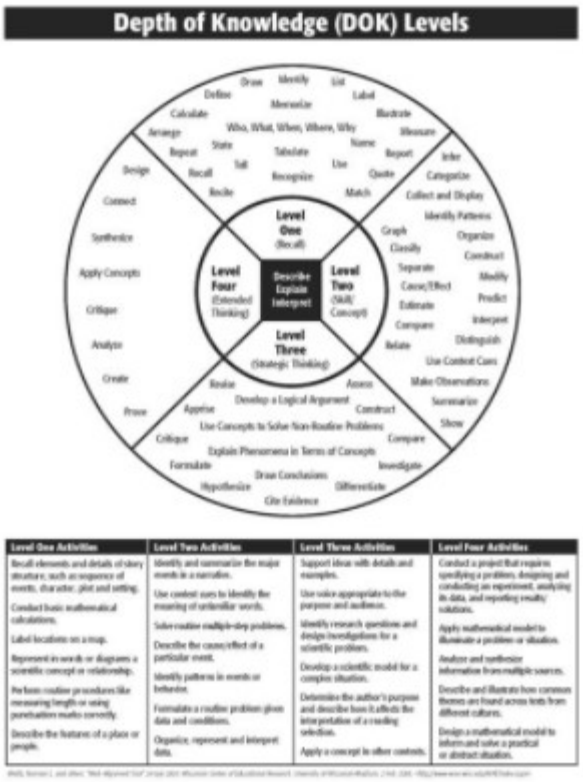
Level 4: Extended Thinking

Potential Activities

- Applying information to solve ill-defined problems in novel situations
- Tasks that require a number of cognitive and physical skills in order to complete
- Writing and/or research tasks that involve formulating and testing hypotheses over time
- Tasks that require students to make multiple strategic and procedural decisions as they are presented with new information throughout the course of the event
- Tasks that require perspective taking and collaboration with a group of individuals
- Creating graphs, tables, and charts where students must reason through and organize the information without instructor prompts
- Writing tasks that have a strong emphasis on persuasion
- Devise a way to…
- Develop a menu for a new restaurant using a variety of healthy foods
- Sell an idea
- Write a jingle to advertise a new product
- Conduct an internship in industry where students are faced with real-world, unpredictable problems

Points to note……

- The DOK level assigned should reflect the level of work students are most commonly required to perform in order for the response to be deemed acceptable.
- The DOK level should reflect the complexity of the cognitive processes demanded by the task outlined by the objective, rather than its difficulty. Ultimately the DOK level describes the kind of thinking required by a task, not whether or not the task is "difficult".
- If there is a question regarding which of two levels a statement addresses, such as Level 1 or Level 2, or Level 2 or Level 3, it is appropriate to select the higher of the two levels.
- The DOK level should be assigned based upon the cognitive demands required by the central performance described in the objective.
- **The objective's central verb(s) alone is/are not sufficient information to assign a DOK level. Developers must also consider the complexity of the task and/or information, conventional levels of prior knowledge for students at the grade level, and the mental processes used to satisfy the requirements set forth in the objective.**
- A popular resource for assigning DOK is the DOK Wheel. Note that this wheel was not developed nor endorsed by Norman Webb. Since the verb alone is insufficient for assigning a DOK level, this graphic (if used) should be used with caution.



Difficulty vs Complexity

Difficulty	Complexity
How much work/effort is needed to answer a question, address a problem, or accomplish a task?	What kind of thinking, action, or knowledge must be demonstrated and communicated to answer a question, address a problem, or accomplish a task?
How many people can answer a question, address a problem, or accomplish a task correctly or successfully?	How many different ways can a question be answered, a problem be addressed, or a task be accomplished?
Easy or Hard	Simple or Complex

DOK Descriptors for English Language Arts

Reading (based on Wixson 1999)

Level 1

Level 1 requires students to receive or recite facts or to use simple skills or abilities. Oral reading that does not include analysis of the text as well as basic comprehension of a text is included. Items require only a shallow understanding of text presented and often consist of verbatim recall from text or simple understanding of a single word or phrase.

Some examples that represent but do not constitute all of Level 1 performance are:

- Support ideas by reference to details in the text.
- Use a dictionary to find the meaning of words.
- Identify figurative language in a reading passage.

Level 2

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response; it requires both comprehension and subsequent processing of text or portions of text. Inter-sentence analysis of inference is required. Some important concepts are covered but not in a complex way. Standards and items at this level may include words such as summarize, interpret, infer, classify, organize, collect, display, compare, and determine whether fact or opinion. Literal main ideas are stressed. A Level 2 assessment item may require students to apply some of the skills and concepts that are covered in Level 1. Some examples that represent but do not constitute all of Level 2

performance are:

- Use context cues to identify the meaning of unfamiliar words.
- Predict a logical outcome based on information in a reading selection.
- Identify and summarize the major events in a narrative.

DOK Descriptors for English Language Arts

Reading (based on Wixson 1999)

Level 3

Deep knowledge becomes more of a focus at Level 3. Students are encouraged to go beyond the text; however, they are still required to show understanding of the ideas in the text. Students may be encouraged to explain, generalize, or connect ideas. Standards and items at Level 3 involve reasoning and planning. Students must be able to support their thinking. Items may involve abstract theme identification, inference across an entire passage, or students' application of prior knowledge. Items may also involve more superficial connections between texts. Some examples that represent but do not constitute all of Level 3 performance are:

- Determine the author's purpose and describe how it affects the interpretation of a reading selection.
- Summarize information from multiple sources to address a specific topic.
- Analyse and describe the characteristics of various types of literature.

Level 4

Higher order thinking is central and knowledge is deep at Level 4. The standard or assessment item at this level will probably be an extended activity, with extended time provided. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. Students take information from at least one passage and are asked to apply this information to a new task. They may also be asked to develop hypotheses and perform complex analyses of the connections among texts. Some examples that represent but do not constitute all of Level 4 performance are:

- Analyse and synthesize information from multiple sources.
- Examine and explain alternative perspectives across a variety of sources.
- Describe and illustrate how common themes are found across texts from different cultures

TOOL 1

HESS COGNITIVE RIGOR MATRIX (READING CRM):

Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	o Recall, recognize, or locate basic facts, terms, details, events, or ideas explicit in texts o Read words orally in connected text with fluency & accuracy	Use these Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.		
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 Identify or describe literary elements (characters, setting, sequence, etc.) o Select appropriate words when intended meaning/definition is clearly evident o Describe/explain who, what, where, when, or how o Define/describe facts, details, terms, principles o Write simple sentences	o Specify, explain, show relationships; explain why (e.g., cause-effect) o Give non-examples/examples o Summarize results, concepts, ideas o Make basic inferences or logical predictions from data or texts o Identify main ideas or accurate generalizations of texts o Locate information to support explicit-implicit central ideas	o Explain, generalize, or connect ideas using supporting evidence (quote, example, text reference) o Identify/ make inferences about explicit or implicit themes o Describe how word choice, point of view, or bias may affect the readers' interpretation of a text o Write multi-paragraph composition for specific purpose, focus, voice, tone, & audience	o Explain how concepts or ideas specifically relate to other content domains (e.g., social, political, historical) or concepts o Develop generalizations of the results obtained or strategies used and apply them to new problem-based situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	o Use language structure (pre/suffix) or word relationships (synonym/ antonym) to determine meaning of words o Apply rules or resources to edit spelling, grammar, punctuation, conventions, word use o Apply basic formats for documenting sources	o Use context to identify the meaning of words/phrases o Obtain and interpret information using text features o Develop a text that may be limited to one paragraph o Apply simple organizational structures (paragraph, sentence types) in writing	o Apply a concept in a new context o Revise final draft for meaning or progression of ideas o Apply internal consistency of text organization and structure to composing a full composition o Apply word choice, point of view, style to impact readers' /viewers' interpretation of a text	o Illustrate how multiple themes (historical, geographic, social, artistic, literary) may be interrelated o Select or devise an approach among many alternatives to research a novel problem
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias or point of view)	o Identify whether specific information is contained in graphic representations (e.g., map, chart, table, graph, T-chart, diagram) or text features (e.g., headings, subheadings, captions) o Decide which text structure is appropriate to audience and purpose	o Categorize/compare literary elements, terms, facts/details, events o Identify use of literary devices o Analyze format, organization, & internal text structure (signal words, transitions, semantic cues) of different texts o Distinguish: relevant-irrelevant information; fact/opinion o Identify characteristic text features; distinguish between texts, genres	o Analyze information within data sets or texts o Analyze interrelationships among concepts, issues, problems o Analyze or interpret author's craft (literary devices, viewpoint, or potential bias) to create or critique a text o Use reasoning, planning, and evidence to support inferences	o Analyze multiple sources of evidence, or multiple works by the same author, or across genres, time periods, themes o Analyze complex/abstract themes, perspectives, concepts o Gather, analyze, and organize multiple information sources o Analyze discourse styles
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique	"UG" – unsubstantiated generalizations = stating an opinion without providing any support for it!		o Cite evidence and develop a logical argument for conjectures o Describe, compare, and contrast solution methods o Verify reasonableness of results o Justify or critique conclusions drawn	o Evaluate relevancy, accuracy, & completeness of information from multiple sources o Apply understanding in a novel way, provide argument or justification for the application
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce	o Brainstorm ideas, concepts, problems, or perspectives related to a topic , principle, or concept	o Generate conjectures or hypotheses based on observations or prior knowledge and experience	o Synthesize information within one source or text o Develop a complex model for a given situation o Develop an alternative solution	o Synthesize information across multiple sources or texts o Articulate a new voice, alternate theme, new knowledge or perspective

DOK Descriptors for English Language Arts

Writing

Level 1

Level 1 requires the student to write or recite simple facts. This writing or recitation does not include complex synthesis or analysis but basic ideas. The students are engaged in listing ideas or words as in a brainstorming activity prior to written composition, are engaged in a simple spelling or vocabulary assessment or are asked to write simple sentences. Students are expected to write and speak using Standard English conventions. This includes using appropriate grammar, punctuation, capitalization and spelling.

Some examples that represent but do not constitute all of Level 1 performance are:

- Use punctuation marks correctly.
- Identify Standard Jamaican English grammatical structures and refer to resources for correction.

Level 2

Level 2 requires some mental processing. At this level students are engaged in first draft writing or brief extemporaneous speaking for a limited number of purposes and audiences. Students are beginning to connect ideas using a simple organizational structure. For example, students may be engaged in note-taking, outlining or simple summaries. Text may be limited to one paragraph. Students demonstrate a basic understanding and appropriate use of such reference materials as a dictionary, thesaurus, or web site.

Some examples that represent but do not constitute all of Level 2 performance are:

- Construct compound sentences.
- Use simple organizational strategies to structure written work.
- Write summaries that contain the main idea of the reading selection and pertinent details.

DOK Descriptors for English Language Arts

Writing

Level 3

Level 3 requires some higher level mental processing. Students are engaged in developing compositions that include multiple paragraphs. These compositions may include complex sentence structure and may demonstrate some synthesis and analysis. Students show awareness of their audience and purpose through focus, organization and the use of appropriate compositional elements. The use of appropriate compositional elements includes such things as addressing chronological order in a narrative or including supporting facts and details in an informational report. At this stage students are engaged in editing and revising to improve the quality of the composition.

Some examples that represent but do not constitute all of Level 3 performance are:

- Support ideas with details and examples.
- Use voice appropriate to the purpose and audience.
- Edit writing to produce a logical progression of ideas.

Level 4

Higher-level thinking is central to Level 4. The standard at this level is a multi-paragraph composition that demonstrates synthesis and analysis of complex ideas or themes. There is evidence of a deep awareness of purpose and audience. For example, informational papers include hypotheses and supporting evidence. Students are expected to create compositions that demonstrate a distinct voice and that stimulate the reader or listener to consider new perspectives on the addressed ideas and themes.

An example that represents but does not constitute all of Level 4 performance is:

- Write an analysis of two selections, identifying the common theme and generating a purpose that is appropriate for both.

TOOL 3

HESS COGNITIVE RIGOR MATRIX (WRITING/SPEAKING CRM):

Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	o Complete short answer questions with facts, details, terms, principles, etc. (e.g., label parts of diagram)	Use these Hess CRM curricular examples with most writing and oral communication assignments or assessments in any content area.		
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 Describe or define facts, details, terms, principles, etc. o Select appropriate word/phrase to use when intended meaning/definition is clearly evident o Write simple complete sentences o Add an appropriate caption to a photo or illustration o Write "fact statements" on a topic (e.g., spiders build webs)	o Specify, explain, show relationships; explain why, cause-effect o Provide and explain non-examples and examples o Take notes; organize ideas/data (e.g., relevance, trends, perspectives) o Summarize results, key concepts, ideas o Explain central ideas or accurate generalizations of texts or topics o Describe steps in a process (e.g., science procedure, how to and why control variables)	o Write a multi-paragraph composition for specific purpose, focus, voice, tone, & audience o Develop and explain opposing perspectives or connect ideas, principles, or concepts using supporting evidence (quote, example, text reference, etc.) o Develop arguments of fact (e.g., Are these criticisms supported by the historical facts? Is this claim or equation true?)	o Use multiple sources to elaborate on how concepts or ideas specifically draw from other content domains or differing concepts (e.g., research paper, arguments of policy – should this law be passed? What will be the impact of this change?) o Develop generalizations about the results obtained or strategies used and apply them to a new problem or contextual scenario
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	o Apply rules or use resources to edit specific spelling, grammar, punctuation, conventions, or word use o Apply basic formats for documenting sources	o Use context to identify/infer the intended meaning of words/phrases o Obtain, interpret, & explain information using text features (table, diagram, etc.) o Develop a (brief) text that may be limited to one paragraph, précis o Apply basic organizational structures (paragraph, sentence types, topic sentence, introduction, etc.) in writing	o Revise final draft for meaning, progression of ideas, or logic chain o Apply internal consistency of text organization and structure to a full composition or oral communication o Apply a concept in a new context o Apply word choice, point of view, style, rhetorical devices to impact readers' interpretation of a text	o Select or devise an approach among many alternatives to research and present a novel problem or issue o Illustrate how multiple themes (historical, geographic, social) may be interrelated within a text or topic
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias or point of view)	o Decide which text structure is appropriate to audience and purpose (e.g., compare-contrast, proposition-support) o Determine appropriate, relevant key words for conducting an Internet search or researching a topic	o Compare/contrast perspectives, events, characters, etc. o Analyze/revise format, organization, & internal text structure (signal words, transitions, semantic cues) of different print and non-print texts o Distinguish: relevant-irrelevant information; fact/opinion (e.g., What are the characteristics of a hero's journey?) o Locate evidence that supports a perspective/differing perspectives	o Analyze interrelationships among concepts/ issues/problems in a text o Analyze impact or use of author's craft (literary devices, viewpoint, dialogue) in a single text o Use reasoning and evidence to generate criteria for making and supporting an argument of judgment (Was FDR a great president? Who was the greatest ball player?) o Support conclusions with evidence	o Analyze multiple sources of evidence, or multiple works by the same author, or across genres, or time periods o Analyze complex/abstract themes, perspectives, concepts o Gather, analyze, and organize multiple information sources o Compare and contrast conflicting judgments or policies (e.g., Supreme Court decisions)
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique	"UG" – unsubstantiated generalizations = stating an opinion without providing any support for it!		o Evaluate validity and relevance of evidence used to develop an argument or support a perspective o Describe, compare, and contrast solution methods o Verify or critique the accuracy, logic, and reasonableness of stated conclusions or assumptions	o Evaluate relevancy, accuracy, & completeness of information across multiple sources o Apply understanding in a novel way, provide argument or justification for the application o Critique the historical impact (policy, writings, discoveries, etc.)
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce	o Brainstorm facts, ideas, concepts, problems, or perspectives related to a topic, text, idea, issue, or concept	o Generate conjectures, hypotheses , or predictions based on facts, observations, evidence/observations, or prior knowledge and experience o Generate believable "grounds" (reasons) for an opinion-argument	o Develop a complex model for a given situation or problem o Develop an alternative solution or perspective to one proposed (e.g., debate)	o Synthesize information across multiple sources or texts in order to articulate a new voice, alternate theme, new knowledge or nuanced perspective

DEPTH OF KNOWLEDGE IN ENGLISH/LANGUAGE ARTS

DOK 1

USING SIMPLE SKILLS

Reciting facts.
Using simple skills.

Reading doesn't require analysis. Focus is on basic comprehension.

Understanding words and phrases.

Key Concepts:

- Recall from text
- Reference details
- Find word meanings

DOK 2

MENTAL PROCESSING

Engaging beyond recall.

Requiring both comprehension and processing.

Requiring students to:

- summarize
- interpret
- infer
- classify
- organize
- collect
- compare

Key Concepts:

- Use context clues
- Predict outcomes
- Summarize events

DOK 3

BEYOND THE TEXT

Requiring students to go beyond the text.

Explain, generalize, and connect ideas.

Students must be able to support their thinking.

Identify abstract themes.
Infer across an entire passage.
Apply prior knowledge.

Key Concepts:

- Determine author's purpose
- Summarize from multiple sources
- Analyze /describe characteristics

DOK 4

HIGHER ORDER THINKING

Higher order thinking is essential. Knowledge is deep.

Extended activity.
Extended periods of time.

Taking information from one source and applying it in a different task.

Developing hypotheses.

Key Concepts:

- Analyze information
- Examine perspectives
- Illustrate common themes

DOK Descriptors for Social Studies

Level 1

Level 1 asks students to recall facts, terms, concepts, trends, generalizations and theories or to recognize or identify specific information contained in graphics. This level generally requires students to identify, list, or define. The items at this level usually ask the student to recall who, what, when and where. Items that require students to "describe" and "explain" could be classified at Level 1 or 2 depending on what is to be described and explained. A Level 1 "describe or explain" would recall, recite or reproduce information. Items that require students to recognize or identify specific information contained in maps, charts, tables, graphs or drawings are generally level 1.

Some examples that represent but do not constitute all of Level 1 performance are:

- Define independence
- Identify two examples of political conflict among individuals and/or groups in Jamaica during the period
- Identify how scarcity forces people and societies to make choices
- List three physical characteristics of a region in Jamaica

Level 2

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response. This level generally requires students to contrast or compare people, places, events and concepts; convert information from one form to another; give an example; classify or sort items into meaningful categories; describe, interpret or explain issues and problems, patterns, reasons, cause and effect, significance or impact, relationships, points of view or processes. A Level 2 "describe or explain" would require students to go beyond a description or explanation of recalled information to describe or explain a result or "how" or "why."

Some examples that represent but do not constitute all of Level 2 performance are:

- Explain the cause and effects of the Morant Bay Rebellion
- Describe how groups and individuals in Westmoreland make economic decisions based on their limited productive resources.
- Explain how interaction between Caribbean territories led to regional cooperation .

DOK Descriptors for Social Studies

Level 3

Level 3 requires reasoning, using evidence, and a higher level of thinking than the previous two levels. Students would go beyond explaining or describing "how and why" to justifying the "how and why" through application and evidence. The cognitive demands at Level 3 are more complex and more abstract than Levels 1 or 2. Items at Level 3 include drawing conclusions; citing evidence; applying concepts to new situations; using concepts to solve problems; analysing similarities and differences in issues and problems; proposing and evaluating solutions to problems; recognizing and explaining misconceptions or making connections across time and place to explain a concept or big idea.

Some examples that represent, but do not constitute all of Level 3 performance are:

- Propose and evaluate solutions for an economic problem
- Citing evidence, evaluate democracies and dictatorships in terms of their effectiveness in establishing order, providing security and accomplishing common goals,
- Recognize and explain misconceptions related to the discovery of Jamaica

Level 4

Level 4 requires the complex reasoning of Level 3 with the addition of planning, investigating, or developing that will most likely require an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. At this level the cognitive demands should be high and the work should be very complex. Students should be required to connect and relate ideas and concepts within the content area or among content areas in order to be at this highest level. The distinguishing factor for Level 4 would be evidence through a task or product that the cognitive demands have been met. A Level 4 performance will require students to analyse and synthesize information from multiple sources, examine and explain alternative perspectives across a variety of primary/secondary sources, and/or describe and illustrate how common themes and concepts are found across time and place. In some Level 4 performance students will make predictions with evidence as support, develop a logical argument, or plan and develop solutions to problems. Some examples that represent, but do not constitute all of Level 4 performance are:

- Plan and develop a solution to a problem/ issue in your community
- Research, apply and adapt information to solve a geographic problem

DEPTH OF KNOWLEDGE IN SOCIAL STUDIES

DOK 1

RECALLING INFORMATION

Recalling facts, terms, and concepts.

Asking students to know who, what, and when.

Recognizing and identifying specific information found in:

- maps
- charts
- graphs
- tables
- drawings

Key Concepts:

Identify List Define

DOK 2

BASIC REASONING

Engaging beyond recalling or reproducing.

Asking students to know how and why.

Comparing and contrasting people, places, and events.

Key Concepts:

Explain issues

Classify into categories

Understand relationships

DOK 3

COMPLEX REASONING

Requiring evidence, reasoning, and higher order thinking.

Justify how and why with application and evidence.

Propose solutions.
Make connections.
Recognize misconceptions.

Key Concepts:

Cite evidence

Draw conclusions

Apply concepts

DOK 4

EXTENDED REASONING

Plan, investigate, and develop over an extended period of time.

Apply conceptual understanding and higher level thinking.

Analyze and synthesize information from multiple sources.

Key Concepts:

Develop arguments

Make predictions

Plan solutions to problems

TOOL 4

HESS COGNITIVE RIGOR MATRIX (SOCIAL STUDIES/HUMANITIES CRM):

Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/Reasoning	Webb's DOK Level 4 Extended Thinking
Remember Retrieve knowledge from long-term memory, recognize, recall, locate, identify	o Recall or locate key facts, dates, terms, details, events, or ideas explicit in texts	Use these Hess CRM curricular examples with most assignments, assessments, or inquiry activities in social studies, history, civics, geography, economics, or humanities.		
Understand Construct meaning, clarify, paraphrase, represent, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion), predict, observe, compare/ contrast, match like ideas, explain, construct models	o Select appropriate words/terms when intended meaning is clearly evident o Describe/explain who, what, where, when, or how o Define facts, details, terms, principles o Locate/identify symbols that represent... o Raise related questions for possible investigation	o Specify, explain, illustrate relationships; explain why (e.g., cause-effect) o Provide and explain non-examples / examples o Summarize results, concepts, main ideas, generalizations o Make basic inferences or logical predictions (using data / text) o Locate relevant information to support explicit-implicit central ideas	o Explain, generalize, or connect ideas using supporting evidence (quote, example, text reference, data) o Support inferences about explicit or implicit themes o Describe how word choice, point of view, or bias may affect the reader/ viewer interpretation o Write multi-paragraph composition/essay for specific purpose, focus, voice, tone, & audience	o Explain how concepts or ideas specifically relate to other content domains or concepts (social, political, historical, cultural) o Apply generalizations to new problem-based situations o Use multiple sources to elaborate on how concepts or ideas specifically draw from other content domains or differing concepts (e.g., research paper, arguments of policy: should this law be passed? What will be the impact of this change?)
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (transfer) to an unfamiliar or non-routine task	o Apply basic formats for documenting sources o Apply use of reference materials and tools for gathering information (e.g., key word searches)	o Use context to identify the meaning of words/phrases o Interpret information using text features (diagrams, data tables, captions, etc.) o Apply simple organizational structures (paragraph outline)	o Investigate to determine how an historical/cultural/political context may be the source of an underlying theme, central idea, or unresolved issue or crisis	o Integrate or juxtapose multiple (historical, cultural) contexts drawn from source materials (e.g., literature, music, historical events, media) with intent to develop a complex or multimedia product and personal viewpoint
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias, point of view, approach/strategy used)	o Identify causes or effects o Describe processes or tools used to research ideas, artifacts, or images reflecting history, culture, tradition, etc. o Identify ways symbols and metaphors are used to represent universal ideas o Identify specific information given in graphics (e.g., map, T-chart, diagram) or text features (e.g., heading, subheading, captions)	o Compare similarities/ differences in processes, methods, styles due to influences of time period/politics/culture o Distinguish relevant-irrelevant information, fact/opinion; primary from a secondary source o Draw inferences about social, historical, cultural contexts portrayed in (literature, arts, film, political cartoons, primary sources) o Explain/categorize events/ideas in the evolution of _____ across time periods	o Analyze information within data sets or a text (e.g., interrelationships among concepts, issues, problems) o Analyze an author's viewpoint or potential bias (e.g., political cartoon) o Use reasoning, planning, and evidence to support or refute inferences in policy or speech o Use reasoning and evidence to generate criteria for making and supporting an 'argument of judgment' (e.g., Was FDR a great president? Is this a fair law?)	o Analyze multiple sources of evidence across time periods, themes, issues o Analyze diverse/complex/ abstract perspectives o Gather, analyze, and organize information from multiple sources o Analyze discourse styles/bias in speeches, legal briefs, etc. across time or authors o Compare and contrast conflicting judgments or policies (e.g., Supreme Court decisions)
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique	"UG" – unsubstantiated generalizations = stating an opinion without providing any support for it!		o Develop a logical argument for conjectures, citing evidence o Verify reasonableness of results of others o Critique conclusions drawn/evidence used/credibility of sources	o Evaluate relevancy, accuracy, & completeness of information using multiple sources o Apply understanding in a novel way, provide argument/ justification for the application o Critique the historical impact on policy, writings, advances
Create Reorganize elements into new patterns/structures/ or schemas, generate, hypothesize, design, plan, producee	o Brainstorm ideas, concepts, problems, or perspectives related to a topic , principle, or concept	o Generate testable conjectures or hypotheses based on observations, prior knowledge, and/or artifacts	o Synthesize information within one source or text o Develop a complex model or symbol for given issue o Develop & support an alternative solution	o Synthesize information across multiple sources or texts o Articulate a new voice, alternate theme, new knowledge or new perspective o Create historical fiction drawing on sources

DOK Descriptors for Science

Level 1

Level 1 requires the recall of information, such as a fact, definition, term, or a simple procedure, as well as performance of a simple science process or procedure. Level 1 only requires students to demonstrate a rote response, use a well-known formula, follow a set procedure (like a recipe), or perform a clearly defined series of steps. A "simple" procedure is well defined and typically involves only one step. Verbs such as "identify," "recall," "recognize," "use," "calculate," and "measure" generally represent cognitive work at the recall and reproduction level. Simple word problems that can be directly translated into and solved by a formula are considered Level 1. Verbs such as "describe" and "explain" could be classified at different DOK levels, depending on the complexity of what is to be described and explained. A student answering a Level 1 item either knows the answer or does not: that is, the item does not need to be "figured out" or "solved." In other words, if the knowledge necessary to answer an item automatically provides the answer to it, then the item is at Level 1. If the knowledge needed to answer the item is not automatically provided in the stem, the item is at least at Level 2.

Some examples that represent, but do not constitute all of, Level 1 performance are:

- Recall or recognize a fact, term, or property.
- Represent in words or diagrams a scientific concept or relationship.
- Provide or recognize a standard scientific representation for simple phenomenon.
- Perform a routine procedure, such as measuring length.

DOK Descriptors for Science

Level 2

Level 2 includes the engagement of some mental processing beyond recalling or reproducing a response. The content knowledge or process involved is more complex than in Level 1. Items require students to make some decisions as to how to approach the question or problem. Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data."

These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomena and then grouping or ordering the objects. Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts. Some action verbs, such as "explain," "describe," or "interpret," could be classified at different DOK levels, depending on the complexity of the action. For example, interpreting information from a simple graph, requiring reading information from the graph, is a Level 2. An item that requires interpretation from a complex graph, such as making decisions regarding features of the graph that need to be considered and how information from the graph can be aggregated, is at Level 3.

Some examples that represent, but do not constitute all of, Level 2 performance, are:

- Specify and explain the relationship between facts, terms, properties, or variables.
- Describe and explain examples and non-examples of science concepts.
- Select a procedure according to specified criteria and perform it.
- Formulate a routine problem, given data and conditions.
- Organize, represent, and interpret data.

DOK Descriptors for Science

Level 3

Level 3 requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. The cognitive demands at Level 3 are complex and abstract. The complexity does not result only from the fact that there could be multiple answers, a possibility for both Levels 1 and 2, but because the multi-step task requires more demanding reasoning.

In most instances, requiring students to explain their thinking is at Level 3; requiring a very simple explanation or a word or two should be at Level 2. An activity that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Experimental designs in Level 3 typically involve more than one dependent variable.

Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve non-routine problems.

Some examples that represent, but do not constitute all of Level 3 performance, are:

- Identify research questions and design investigations for a scientific problem.
- Solve non-routine problems.
- Develop a scientific model for a complex situation.
- Form conclusions from experimental data.

DOK Descriptors for Science

Level 4

Level 4 involves high cognitive demands and complexity. Students are required to make several connections—relate ideas within the content area or among content areas—and have to select or devise one approach among many alternatives to solve the problem. Many on-demand assessment instruments will not include any assessment activities that could be classified as Level 4.

However, standards, benchmarks, attainment targets, and objectives can be stated in such a way as to expect students to perform extended thinking. "Develop generalizations of the results obtained and the strategies used and apply them to new problem situations," is an example of an objective that is a Level 4. Many, but not all, performance assessments and open-ended assessment activities requiring significant thought will be Level 4.

Level 4 requires complex reasoning, experimental design and planning, and probably will require an extended period of time either for the science investigation required by an objective, or for carrying out the multiple steps of an assessment item. However, the extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take the water temperature from a river each day for a month and then construct a graph, this would be classified as a Level 2 activity. However, if the student conducts a river study that requires taking into consideration a number of variables, this would be a Level 4.

Some examples that represent, but do not constitute all of, a Level 4 performance are:

- Based on data provided from a complex experiment that is novel to the student, deduct the fundamental relationship between several controlled variables.
- Conduct an investigation, from specifying a problem to designing and carrying out an experiment, to analysing its data and forming conclusions.

DEPTH OF KNOWLEDGE IN SCIENCE

DOK 1

RECALLING INFORMATION

Recalling facts, terms, and properties.

Following procedures and/or a series of steps.

Student either knows the answer or not; there's nothing to be figured out or solved.

Key Concepts:
Identify
Recall
Recognize
Calculate
Measure

DOK 2

SKILLS AND CONCEPTS

Engaging beyond recall.

Students are making decisions about how to approach and solve problems.

Collecting, classifying, and organizing data in:
- tables - charts - graphs

Key Concepts:
Explain relationships
Describe examples
Select procedures

DOK 3

STRATEGIC THINKING

Requiring evidence, reasoning, and higher order thinking.

Multi-step tasks that require students to justify their responses and explain their thinking.

Citing evidence.
Developing logical arguments.
Drawing conclusions from data.

Key Concepts:
Developing models
Forming conclusions
Designing investigations

DOK 4

EXTENDED THINKING

Open-ended tasks requiring significant, complex thought.

Extended periods of time for scientific investigation.

Making connections and relating ideas.

Key Concepts:
Conducting experiments
Deducting relationships
Analyzing data

TOOL 2

HESS COGNITIVE RIGOR MATRIX (MATH-SCIENCE CRM):

Applying Webb's Depth-of-Knowledge Levels to Bloom's Cognitive Process Dimensions

Revised Bloom's Taxonomy	Webb's DOK Level 1 Recall & Reproduction	Webb's DOK Level 2 Skills & Concepts	Webb's DOK Level 3 Strategic Thinking/Reasoning	Webb's DOK Level 4 Extended Thinking
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 curricular examples with most mathematics or science assignments or assessments.		
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 Use concepts to solve non-routine problems o Explain, generalize, or connect ideas using supporting evidence o Make and justify conjectures o Explain thinking/reasoning when more than one solution or approach is possible o Explain phenomena in terms of concepts	o Relate mathematical or scientific concepts to other content areas, other domains, or other concepts o Develop generalizations of the results obtained and the strategies used (from investigation or readings) and apply them to new problem situations
Apply Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task	o Follow simple procedures (recipe-type directions) o Calculate, measure, apply a rule (e.g., rounding) o Apply algorithm or formula (e.g., area, perimeter) o Solve linear equations o Make conversions among representations or numbers, or within and between customary and metric measures	o Select a procedure according to criteria and perform it o Solve routine problem applying multiple concepts or decision points o Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps o Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table) o Construct models given criteria	o Design investigation for a specific purpose or research question o Conduct a designed investigation o Use concepts to solve non-routine problems o Use & show reasoning, planning, and evidence o Translate between problem & symbolic notation when not a direct translation	o Select or devise approach among many alternatives to solve a problem o Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
Analyze Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct	o Retrieve information from a table or graph to answer a question o Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram) o Identify a pattern/trend	o Categorize, classify materials, data, figures based on characteristics o Organize or order data o Compare/ contrast figures or data o Select appropriate graph and organize & display data o Interpret data from a simple graph o Extend a pattern	o Compare information within or across data sets or texts o Analyze and draw conclusions from data, citing evidence o Generalize a pattern o Interpret data from complex graph o Analyze similarities/differences between procedures or solutions	o Analyze multiple sources of evidence o Analyze complex/abstract themes o Gather, analyze, and evaluate information
Evaluate Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique	"UG" – unsubstantiated generalizations = stating an opinion without providing any support for it!		o Cite evidence and develop a logical argument for concepts or solutions o Describe, compare, and contrast solution methods o Verify reasonableness of results	o Gather, analyze, & evaluate information to draw conclusions o Apply understanding in a novel way, provide argument or justification for the application
Create Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce	o Brainstorm ideas, concepts, or perspectives related to a topic	o Generate conjectures or hypotheses based on observations or prior knowledge and experience	o Synthesize information within one data set, source, or text o Formulate an original problem given a situation o Develop a scientific/mathematical model for a complex situation	o Synthesize information across multiple sources or texts o Design a mathematical model to inform and solve a practical or abstract situation

DOK Descriptors for Mathematics

Level 1

Level 1 includes the recall of information such as fact, definition, term, or a simple procedure, as well as performing a simple algorithm or applying a formula. That is, in mathematics a one-step, well-defined, and straight algorithmic procedure should be included at this lowest level. Other key words that signify a Level 1 include "identify," "recall," "recognize," "use," and "measure." Verbs such as "describe" and "explain" could be classified at different levels depending on what is to be described and explained.

Examples that represent, but do not constitute all Level 1 mathematics performances are:

- Recall or recognize a fact, definitions, or term
- Apply a well known algorithm
- Apply a formula
- Determine the area or perimeter of rectangles or triangles given a drawing and labels
- Identify a plane or three dimensional figure
- Retrieve information from a table or graph
- Recall, identify, or make conversions between and among representations or numbers (fractions, decimals, and percents), or within and between customary and metric measures
- Locate numbers on a number line, or points on a coordinate grid
- Represent math relationships in words, pictures, or symbols

DOK Descriptors for Mathematics

Level 2

Level 2 includes the engagement of some mental processing beyond a habitual response. A Level 2 assessment item requires students to make some decisions as to how to approach the problem or activity, whereas Level 1 requires students to demonstrate a rote response, perform a well-known algorithm, follow a set procedure (like a recipe), or perform a clearly defined series of steps.

Keywords that generally distinguish a Level 2 item include "classify," "organize," "estimate," "make observations," "collect and display data," and "compare data." These actions imply more than one step. For example, to compare data requires first identifying characteristics of the objects or phenomenon and then grouping or ordering the objects. Some action verbs, such as "explain," "describe," or "interpret" could be classified at different levels depending on the object of the action. For example, if an item required students to interpret information from a simple graph, requiring reading information from the graph, this is a Level 2. Interpreting information from a complex graph that requires some decisions on what features of the graph need to be considered and how information from the graph can be aggregated is a Level 3.

Caution is warranted in interpreting Level 2 as only skills because some reviewers will interpret skills very narrowly, as primarily numerical skills, and such interpretation excludes from this level other skills such as visualization skills and probability skills, which may be more complex simply because they are less common. Other Level 2 activities include making observations and collecting data; classifying, organizing, and comparing data; and organizing and displaying data in tables, graphs, and charts.

Examples that represent, but do not constitute all Level 2 mathematics performances are :

- Classify plane and three dimensional figures
- Interpret information from a simple graph
- Use models to represent mathematical concepts
- Solve a routine problem requiring multiple steps, or the application of multiple concepts
- Compare figures or statements
- Compare and contrast figures
- Provide justifications for steps in a solution process
- Extend a pattern
- Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps
- Translate between tables, graphs, words and symbolic notation
- Select a procedure according to criteria and perform it

DOK Descriptors for Mathematics

Level 3

Level 3 requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels. In most instances, requiring students to explain their thinking is a Level 3. Activities that require students to make conjectures are also at this level. The cognitive demands at Level 3 are complex and abstract. The complexity does not result from the fact that there are multiple answers, a possibility for both Levels 1 and 2, but because the task requires more demanding reasoning. An activity, however, that has more than one possible answer and requires students to justify the response they give would most likely be a Level 3. Other Level 3 activities include drawing conclusions from observations; citing evidence and developing a logical argument for concepts; explaining phenomena in terms of concepts; and using concepts to solve problems.

Examples that represent, but do not constitute all Level 3 mathematics performances are:

- Interpret information from a complex graph
- Explain thinking when more than one response is possible
- Make and/or justify conjectures
- Develop logical arguments for a concept
- Use concepts to solve problems
- Perform procedure with multiple steps and multiple decision points
- Generalize a pattern
- Describe, compare, and contrast solution methods
- Formulate a mathematical model for a complex situation
- Provide mathematical justifications
- Solve a multiple- step problem, supported with a mathematical explanation that justifies the answer
- Formulate an original problem, given a situation

DOK Descriptors for Mathematics

Level 4

Level 4 requires complex reasoning, planning, developing, and thinking most likely over an extended period of time. The extended time period is not a distinguishing factor if the required work is only repetitive and does not require applying significant conceptual understanding and higher-order thinking. For example, if a student has to take their temperature each day for a month and then construct a graph, this would be classified as a Level 2. However, if the student is to conduct a health and wellness study that requires taking into consideration a number of variables, this would be a Level 4. At Level 4, the cognitive demands of the task should be high and the work should be very complex. Students should be required to make several connections-relate ideas within the content area or among content areas-and have to select one approach among many alternatives on how the situation should be solved, in order to be at this highest level. Level 4 activities include making connections between a finding and related concepts and phenomena; combining and synthesizing ideas into new concepts; and critiquing statistical experimental designs.

Examples that represent, but do not constitute all Level 4 mathematics performances are:

- Relate mathematical concepts to other content areas
- Relate mathematical concepts to real-world applications in new situations
- Apply a mathematical model to illuminate a problem, situation
- Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results
- Design a mathematical model to inform and solve a practical or abstract situation

NOTE: Level 4 requires applying one approach among many to solve problems. Involves complex restructuring of data, establishing and evaluating criteria to solve problems.

DEPTH OF KNOWLEDGE IN MATHEMATICS

DOK 1

RECALLING INFORMATION

Recalling information. Facts. Definitions. Procedures.

Following a set of procedures. (like a recipe)

Applying a formula.

Performing a clearly defined series of steps.

Key Words:

Identify
Recall
Recognize
Use
Measure

DOK 2

SKILLS AND CONCEPTS

Requiring students to make some decisions about how to approach a problem or activity.

Working with problems that have more than one step.

Collecting
Classifying
Organizing
and Comparing data.

Organizing and displaying data in charts, graphs, and tables.

Key Words:

Classify
Organize
Make observations
Collect and compare

DOK 3

STRATEGIC THINKING

Requiring reasoning, planning, and a higher level of thinking.

Students have to explain their thinking and justify their responses.

Complexity comes from a higher demand for reasoning, not harder problems.

Key Words:

Draw conclusions
Cite evidence
Develop an argument

DOK 4

EXTENDED THINKING

Requiring reasoning, planning, and thinking over an extended period of time.

Students have to deal with multiple elements and make connections between them.

Cognitive demand is high. Work is complex.

Key Words:

Make connections
Relate ideas
Select approaches

References

- http://www.aps.edu/re/documents/resources/Webbs_DOK_Guide.pdf
- https://sjunkins.wordpress.com/2016/11/21/depth-of-knowledge-in-the-content-areas/
- https://schools.graniteschools.org/mathesonjr/files/2015/03/descrip_social_studies.pdf
- https://www.cde.state.co.us/sites/default/files/documents/assessment/documents/pld/sc_dok.pdf
- http://static.pdesas.org/content/documents/DOK_Math_levels.pdf
- http://educationdocbox.com/amp/69833831-Homework_and_Study_Tips/Language-arts-levels-of-depth-of-knowledge-nevada-reading-dok-level-descriptors.html

The SAU is committed to supporting you as you lead the development and implementation of assessment programs that cater to the needs of the 21st century learner within your school. Feel free to contact Ms. Venessa Powell at the SAU via email at venessa.powell@moey.gov.jm should you have any queries/concerns.