The Student Assessment Unit

Norman Webb’s Depth of Knowledge (DOK)

A Cognitive Demand (Thinking) Scale for Assessments
Over view 1

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Subject Specific DOK Level Descriptors

• Language Arts
  * Reading 13
  * Writing 15
• Social Studies 17
• Science 19
• Mathematics 23

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As the Student Assessment Unit continues its 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.
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:

**DOK 1**
Recall & Reproduction
- Who?
- What?
- Where?
- When?
- How?
- Why?

**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?

**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?

**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?
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

<table>
<thead>
<tr>
<th>Quiz</th>
<th>Vocabulary</th>
<th>Podcast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definition</td>
<td>Quiz</td>
<td>Categorizing/Tagging</td>
</tr>
<tr>
<td>Facts</td>
<td>Recitation</td>
<td>Commenting</td>
</tr>
<tr>
<td>Worksheet</td>
<td>Example</td>
<td>Bulletting</td>
</tr>
<tr>
<td>Test</td>
<td>Explanation</td>
<td>Highlighting</td>
</tr>
<tr>
<td>Label</td>
<td>Show and Tell</td>
<td>Social networking</td>
</tr>
<tr>
<td>List</td>
<td>Outline</td>
<td>Social bookmarking</td>
</tr>
<tr>
<td>Workbook</td>
<td>Blog</td>
<td>Searching</td>
</tr>
<tr>
<td>Reproduction</td>
<td>Wiki</td>
<td>Googling</td>
</tr>
</tbody>
</table>

### Roles

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Directs</td>
<td>Responds</td>
</tr>
<tr>
<td>Shows</td>
<td>Remembers</td>
</tr>
<tr>
<td>Questions</td>
<td>Memorizes</td>
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<tr>
<td>Demonstrates</td>
<td>Explains</td>
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<tr>
<td>Compares</td>
<td>Restates</td>
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<td></td>
<td>Interprets</td>
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<td></td>
<td>Absorbs</td>
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<td></td>
<td>Recognizes</td>
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<td></td>
<td>Describes</td>
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<td></td>
<td>Demonstrates</td>
</tr>
</tbody>
</table>
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
- 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**
- Shows
- Observes
- Organizes
- Facilitates
- Evaluates

**Student**
- Solves problems
- Calculates
- Completes
- Constructs
- Demonstrates use of knowledge
- Compiles
- Illustrates
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

<table>
<thead>
<tr>
<th>Graph</th>
<th>Database</th>
<th>Report</th>
<th>Animation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spreadsheet</td>
<td>Mobile</td>
<td>Evaluating</td>
<td>Video cast</td>
</tr>
<tr>
<td>Checklist</td>
<td>Abstract</td>
<td>Investigation</td>
<td>Podcast</td>
</tr>
<tr>
<td>Chart</td>
<td>Report</td>
<td>Conclusion</td>
<td>Publishing</td>
</tr>
<tr>
<td>Outline</td>
<td>Debate</td>
<td>Program</td>
<td>Wiki-ing</td>
</tr>
<tr>
<td>Survey</td>
<td>Panel</td>
<td>Film</td>
<td></td>
</tr>
</tbody>
</table>

Roles

**Teacher**
- Probes
- Observes
- Acts as a resource
- Organizes
- Clarifies
- Guides

**Student**
- Evaluates
- Questions
- Dissects
- Accepts

**Teacher**
- Discusses
- Debates
- Examines
- Judges
- Assesses
- Justifies
- Uncovers
- Thinks deeply

**Student**
- Disputes
- Decides
- Argues
- Tests
- Calculates
- Compares
- Selects
- 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

<table>
<thead>
<tr>
<th>Film</th>
<th>Song</th>
</tr>
</thead>
<tbody>
<tr>
<td>Story</td>
<td>Newspaper</td>
</tr>
<tr>
<td>Project</td>
<td>Media Product</td>
</tr>
<tr>
<td>Plan</td>
<td></td>
</tr>
<tr>
<td>New Game</td>
<td></td>
</tr>
</tbody>
</table>

Roles

**Teacher**
- Facilitates
- Reflects
- Evaluates

**Student**
- Extends
- Analyses
- Designs
- Takes risks
- Proposes
- Formulates
- Modifies
- Plans
- Creates
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

<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>How much work/effort is needed to answer a question, address a problem, or accomplish a task?</td>
<td>What kind of thinking, action, or knowledge must be demonstrated and communicated to answer a question, address a problem, or accomplish a task?</td>
</tr>
<tr>
<td>How many people can answer a question, address a problem, or accomplish a task correctly or successfully?</td>
<td>How many different ways can a question be answered, a problem be addressed, or a task be accomplished?</td>
</tr>
<tr>
<td>Easy or Hard</td>
<td>Simple or Complex</td>
</tr>
</tbody>
</table>
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.
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.
**HESS COGNITIVE RIGOR MATRIX (READING CRM): Applying Webb’s Depth-of-Knowledge Levels to Bloom’s Cognitive Process Dimensions**

<table>
<thead>
<tr>
<th>Revised Bloom’s Taxonomy</th>
<th>Webb’s DOK Level 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recall &amp; Reproduction</strong></td>
<td><strong>Skills &amp; Concepts</strong></td>
</tr>
<tr>
<td><strong>Remember</strong></td>
<td>Recall, recognize, or locate basic facts, terms, details, events, or ideas explicit in texts</td>
</tr>
<tr>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>Read words orally in connected text with fluency &amp; accuracy</td>
</tr>
<tr>
<td><strong>Understand</strong></td>
<td>Identify or describe literary elements (characters, setting, sequence, etc.)</td>
</tr>
<tr>
<td>Construct meaning, clarify, paraphrase, rephrase, translate, illustrate, give examples, classify, categorize, summarize, generalize, infer a logical conclusion, predict, compare/contrast, match like ideas, explain, construct models</td>
<td>Select appropriate words when intended meaning/definition is clearly evident</td>
</tr>
<tr>
<td><strong>Apply</strong></td>
<td>Describe/explain who, what, where, when, or how</td>
</tr>
<tr>
<td>Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</td>
<td>Define/describe facts, details, terms, principles</td>
</tr>
<tr>
<td><strong>Analyze</strong></td>
<td>Use language structure (pre/suffix) or word relationships (synonym/antonym) to determine meaning of words</td>
</tr>
<tr>
<td>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)</td>
<td>Apply rules or resources to edit spelling, grammar, punctuation, conventions, word use</td>
</tr>
<tr>
<td><strong>Evaluate</strong></td>
<td>Apply basic formats for documenting sources</td>
</tr>
<tr>
<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>Apply simple organizational structures (paragraph, sentence types) in writing</td>
</tr>
<tr>
<td>“UG” – unsubstantiated generalizations = stating an opinion without providing any support for it</td>
<td>Apply word choice, point of view, style, for specific purpose, focus, voice, tone, &amp; audience</td>
</tr>
<tr>
<td><strong>Create</strong></td>
<td>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)</td>
</tr>
<tr>
<td>Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce</td>
<td>Decide which text structure is appropriate to audience and purpose</td>
</tr>
<tr>
<td><strong>Revised Bloom’s Taxonomy</strong></td>
<td>Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.</td>
</tr>
<tr>
<td><strong>Webb’s DOK Level 1</strong></td>
<td>Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.</td>
</tr>
<tr>
<td><strong>Webb’s DOK Level 2</strong></td>
<td>Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.</td>
</tr>
<tr>
<td><strong>Webb’s DOK Level 3</strong></td>
<td>Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.</td>
</tr>
<tr>
<td><strong>Webb’s DOK Level 4</strong></td>
<td>Hess CRM curricular examples with most close reading or listening assignments or assessments in any content area.</td>
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</tbody>
</table>

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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.
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.
# Hess Cognitive Rigor Matrix (Writing/Speaking CRM)

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

<table>
<thead>
<tr>
<th></th>
<th>Revised Bloom’s Taxonomy</th>
<th>Webb’s DOK Level 1</th>
<th>Webb’s DOK Level 2</th>
<th>Webb’s DOK Level 3</th>
<th>Webb’s DOK Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remember</strong></td>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>Complete short answer questions with facts, details, terms, principles, etc. (e.g., label parts of diagram)</td>
<td>Specify, explain, show relationships; explain why, cause-effect</td>
<td>Write a multi-paragraph composition for specific purpose, focus, voice, tone, &amp; audience</td>
<td>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?)</td>
</tr>
<tr>
<td><strong>Understand</strong></td>
<td>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</td>
<td>Describe or define facts, details, terms, principles, etc.</td>
<td>Provide and explain non-examples and examples</td>
<td>Develop and explain opposing perspectives or connect ideas, principles, or concepts using supporting evidence (quote, example, text reference, etc.)</td>
<td>Develop generalizations about the results obtained or strategies used and apply them to a new problem or contextual scenario</td>
</tr>
<tr>
<td><strong>Apply</strong></td>
<td>Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</td>
<td>Apply rules or use resources to edit specific spelling, grammar, punctuation, conventions, or word use</td>
<td>Use context to identify/infer the intended meaning of words/phrases</td>
<td>Revise final draft for meaning, progression of ideas, or logic chain</td>
<td>Select or devise an approach among many alternatives to research and present a novel problem or issue</td>
</tr>
<tr>
<td><strong>Analyze</strong></td>
<td>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)</td>
<td>Decide which text structure is appropriate to audience and purpose (e.g., compare-contrast, proposition-support)</td>
<td>Compare/contrast perspectives, events, characters, etc.</td>
<td>Analyze interrelationships among concepts/issues/problems in a text</td>
<td>Analyze multiple sources of evidence, or multiple works by the same author, or across genres, or time periods</td>
</tr>
<tr>
<td><strong>Evaluate</strong></td>
<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>“UG” – unsubstantiated generalizations – stating an opinion without providing any support for it!</td>
<td>Analyze/review format, organization, &amp; internal text structure (signal words, transitions, semantic cues) of different print and non-print texts</td>
<td>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?)</td>
<td>Analyze complex/abstract themes, perspectives, concepts</td>
</tr>
<tr>
<td><strong>Create</strong></td>
<td>Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce</td>
<td>Brainstorm facts, ideas, concepts, problems, or perspectives related to a topic, text, idea, issue, or concept</td>
<td>Generate conjectures, hypotheses, or predictions based on facts, observations, evidence/observations, or prior knowledge and experience</td>
<td>Develop an alternative solution or perspective to one proposed (e.g., debate)</td>
<td>Synthesize information across multiple sources or texts in order to articulate a new voice, alternate theme, new knowledge or nuanced perspective</td>
</tr>
</tbody>
</table>

**Use these Hess CRM curricular examples with most writing and oral communication assignments or assessments in any content area.**

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# Depth of Knowledge in English/Language Arts

<table>
<thead>
<tr>
<th>DOK 1</th>
<th>DOK 2</th>
<th>DOK 3</th>
<th>DOK 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Using Simple Skills</strong></td>
<td><strong>Mental Processing</strong></td>
<td><strong>Beyond the Text</strong></td>
<td><strong>Higher Order Thinking</strong></td>
</tr>
<tr>
<td>Reading doesn't require analysis. Focus is on basic comprehension.</td>
<td>Requiring both comprehension and processing.</td>
<td>Explain, generalize, and connect ideas.</td>
<td>Extended activity. Extended periods of time.</td>
</tr>
<tr>
<td>Understanding words and phrases.</td>
<td>Requiring students to: - summarize - interpret - infer - classify</td>
<td>Students must be able to support their thinking.</td>
<td>Taking information from one source and applying it in a different task.</td>
</tr>
<tr>
<td><strong>Key Concepts:</strong></td>
<td><strong>Key Concepts:</strong></td>
<td><strong>Key Concepts:</strong></td>
<td><strong>Key Concepts:</strong></td>
</tr>
<tr>
<td>Recall from text</td>
<td>Reference details</td>
<td>Summarize from multiple sources</td>
<td>Examine perspectives</td>
</tr>
<tr>
<td>Find word meanings</td>
<td>Use context clues</td>
<td>Analyze /describe characteristics</td>
<td>Illustrate common themes</td>
</tr>
<tr>
<td>Predict outcomes</td>
<td>Summarize events</td>
<td>Determine author's purpose</td>
<td></td>
</tr>
</tbody>
</table>
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.
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
  - drawings
  - graphs

**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:**
- 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:**
- 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:**
- Make predictions
- Develop arguments
- Plan solutions to problems
### Revised Bloom’s Taxonomy

<table>
<thead>
<tr>
<th>Webb’s DOK Level 1</th>
<th>Webb’s DOK Level 2</th>
<th>Webb’s DOK Level 3</th>
<th>Webb’s DOK Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remember</strong></td>
<td>Recall &amp; Reproduction</td>
<td>Skills &amp; Concepts</td>
<td>Strategic Thinking/Reasoning</td>
</tr>
<tr>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>o Recall or locate key facts, dates, terms, details, events, or ideas explicit in texts</td>
<td>o Specify, explain, illustrate relationships; explain why (e.g., cause-effect)</td>
<td>o Explain, generalize, or connect ideas using supporting evidence (quote, example, text reference, data)</td>
</tr>
<tr>
<td>Understand</td>
<td>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</td>
<td>o Select appropriate words/terms when intended meaning is clearly evident</td>
<td>o Provide and explain non-examples / examples</td>
</tr>
<tr>
<td>Apply</td>
<td>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</td>
<td>o Apply basic formats for documenting sources</td>
<td>o Use context to identify the meaning of words/phrases</td>
</tr>
<tr>
<td>Analyze</td>
<td>Break into constituent parts, determine how parts relate, differentiate between relevant-relevant, distinguish, focus, select, organize, outline, find coherence, deconstruct (e.g., for bias, point of view, approach/strategy used)</td>
<td>o Identify causes or effects</td>
<td>o Compare similarities/differences in processes, methods, styles due to influences of time period/politics/culture</td>
</tr>
<tr>
<td>Evaluate</td>
<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>o Describe processes or tools used to research ideas, artifacts, or images reflecting history, culture, tradition, etc.</td>
<td>o Describe ways symbols and metaphors are used to represent universal ideas</td>
</tr>
<tr>
<td>Create</td>
<td>Reorganize elements into new patterns/structures/ or schemas, generate, hypothesize, design, plan, produce</td>
<td>o Identify ways symbols and metaphors are used to represent universal ideas</td>
<td>o Identify specific information given in graphics (e.g., map, 1-chart, diagram) or text features (e.g., heading, subheading, captions)</td>
</tr>
</tbody>
</table>

Use these Hess CRM curricular examples with most assignments, assessments, or inquiry activities in social studies, history, civics, geography, economics, or humanities.
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.
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.
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.
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.
<table>
<thead>
<tr>
<th><strong>DOK 1</strong></th>
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<th><strong>DOK 3</strong></th>
<th><strong>DOK 4</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RECALLING INFORMATION</strong></td>
<td><strong>SKILLS AND CONCEPTS</strong></td>
<td><strong>STRATEGIC THINKING</strong></td>
<td><strong>EXTENDED THINKING</strong></td>
</tr>
<tr>
<td>Recalling facts, terms, and properties.</td>
<td>Engaging beyond recall.</td>
<td>Requiring evidence, reasoning, and higher order thinking.</td>
<td>Open-ended tasks requiring significant, complex thought.</td>
</tr>
<tr>
<td>Following procedures and/or a series of steps.</td>
<td>Students are making decisions about how to approach and solve problems.</td>
<td>Multi-step tasks that require students to justify their responses and explain their thinking.</td>
<td>Extended periods of time for scientific investigation.</td>
</tr>
<tr>
<td>Student either knows the answer or not; there’s nothing to be figured out or solved.</td>
<td>Collecting, classifying, and organizing data in: - tables - charts - graphs</td>
<td>Citing evidence. Developing logical arguments. Drawing conclusions from data.</td>
<td>Making connections and relating ideas.</td>
</tr>
<tr>
<td><strong>Key Concepts:</strong> Identify Recall</td>
<td><strong>Key Concepts:</strong> Recognize Calculate Measure</td>
<td><strong>Key Concepts:</strong> Describe examples Select procedures</td>
<td><strong>Key Concepts:</strong> Forming conclusions Designing investigations</td>
</tr>
<tr>
<td></td>
<td><strong>Key Concepts:</strong> Explain relationships</td>
<td><strong>Key Concepts:</strong> Developing models</td>
<td><strong>Key Concepts:</strong> Conducting experiments Analyzing data</td>
</tr>
</tbody>
</table>
## HESS COGNITIVE RIGOR MATRIX (MATH-SCIENCE CRM):
Applying Webb’s Depth-of-Knowledge Levels to Bloom’s Cognitive Process Dimensions

<table>
<thead>
<tr>
<th>Revised Bloom’s Taxonomy</th>
<th>Webb’s DOK Level 1</th>
<th>Webb’s DOK Level 2</th>
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<th>Webb’s DOK Level 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Remember</strong></td>
<td>Recall &amp; Reproduction</td>
<td>Skills &amp; Concepts</td>
<td>Strategic Thinking/Reasoning</td>
<td>Extended Thinking</td>
</tr>
<tr>
<td>Retrieve knowledge from long-term memory, recognize, recall, locate, identify</td>
<td>o Recall, observe, &amp; recognize facts, principles, properties</td>
<td>o Specify and explain relationships (e.g., non-examples/examples, cause-effect)</td>
<td>o Use concepts to solve non-routine problems</td>
<td>o Relate mathematical or scientific concepts to other content areas, other domains, or other concepts</td>
</tr>
<tr>
<td>Understand</td>
<td>o Evaluate an expression</td>
<td>o Locate points on a grid or number on number line</td>
<td>o Select a procedure according to criteria and perform it</td>
<td>o Design investigation for a specific purpose or research question</td>
</tr>
<tr>
<td>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</td>
<td>o Solve a one-step problem</td>
<td>o Make and record observations</td>
<td>o Conduct a designed investigation</td>
<td></td>
</tr>
<tr>
<td>Remember</td>
<td>o Represent math relationships in words, pictures, or symbols</td>
<td>o Summarize results or concepts</td>
<td>o Use concepts to solve non-routine problems</td>
<td>o Use concepts to solve non-routine problems</td>
</tr>
<tr>
<td></td>
<td>o Read, write, compare decimals in scientific notation</td>
<td>o Make basic inferences or logical predications from data/observations</td>
<td></td>
<td>o Use &amp; show reasoning, planning, and evidence</td>
</tr>
<tr>
<td>Apply</td>
<td>o Follow simple procedures (recipe-type directions)</td>
<td>o Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table)</td>
<td>o Translate between problem &amp; symbolic notation when not a direct translation</td>
<td>o Select or devise approach among many alternatives to solve a problem</td>
</tr>
<tr>
<td>Carry out or use a procedure in a given situation; carry out (apply to a familiar task), or use (apply) to an unfamiliar task</td>
<td>o Calculate, measure, apply a rule (e.g., rounding)</td>
<td>o Construct models given criteria</td>
<td>o Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results</td>
<td></td>
</tr>
<tr>
<td>Analyze</td>
<td>o Apply algorithm or formula (e.g., area, perimeter)</td>
<td>o Use &amp; show reasoning, planning, and evidence</td>
<td>o Use &amp; draw reasoning, planning, and evidence</td>
<td>o Use &amp; show reasoning, planning, and evidence</td>
</tr>
<tr>
<td>Break into constituent parts, determine how parts relate, differentiate between relevant-irrelevant, distinguish, focus, select, organize, outline, find coherence, deconstruct</td>
<td>o Solve linear equations</td>
<td>o Analyze and draw conclusions from data, citing evidence</td>
<td>o Translate between problem &amp; symbolic notation when not a direct translation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Solve conversions among representations or numbers (e.g., customary and metric measures)</td>
<td>o Generalize a pattern</td>
<td>o Collect evidence from complex graph</td>
<td></td>
</tr>
<tr>
<td>Evaluate</td>
<td>o Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps</td>
<td>o Use concepts to solve non-routine problems</td>
<td>o Analyze similarities/differences between procedures or solutions</td>
<td>o Analyze multiple sources of evidence</td>
</tr>
<tr>
<td>Make judgments based on criteria, check, detect inconsistencies or fallacies, judge, critique</td>
<td>o Translate between tables, graphs, words, and symbolic notations (e.g., graph data from a table)</td>
<td>o Use concepts to solve non-routine problems</td>
<td>o Analyze complex/abstract themes</td>
<td></td>
</tr>
<tr>
<td>“UG” = unsubstantiated generalizations = stating an opinion without providing any support for it!</td>
<td>o Construct models given criteria</td>
<td>o Use &amp; show reasoning, planning, and evidence</td>
<td>o Gather, analyze, and evaluate information</td>
<td></td>
</tr>
<tr>
<td>Create</td>
<td>o Retrieve information from a table or graph to answer a question</td>
<td>o Compare information within or across data sets or texts</td>
<td>o Synthesize information across multiple sources or texts</td>
<td></td>
</tr>
<tr>
<td>Reorganize elements into new patterns/structures, generate, hypothesize, design, plan, produce</td>
<td>o Identify whether specific information is contained in graphic representations (e.g., table, graph, T-chart, diagram)</td>
<td>o Analyze and draw conclusions from data, citing evidence</td>
<td>o Design a mathematical model to inform and solve a practical or abstract situation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Identify a pattern/trend</td>
<td>o Generalize a pattern</td>
<td>o Cite evidence and develop a logical argument for concepts or solutions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Identify a pattern/trend</td>
<td>o Select appropriate graph and organize &amp; display data</td>
<td>o Describe, compare, and contrast solution methods</td>
<td>o Gather, analyze, &amp; evaluate information to draw conclusions</td>
</tr>
<tr>
<td></td>
<td>o Interpret data from a simple graph</td>
<td>o Construct a pattern</td>
<td>o Verify reasonableness of results</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Extend a pattern</td>
<td></td>
<td>o Synthesize information across multiple sources or texts</td>
<td></td>
</tr>
</tbody>
</table>

Use these Hess CRM curricular examples with most mathematics or science assignments or assessments.
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
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
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
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.
<table>
<thead>
<tr>
<th>DOK 1</th>
<th>DOK 2</th>
<th>DOK 3</th>
<th>DOK 4</th>
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</thead>
<tbody>
<tr>
<td><strong>RECALLING INFORMATION</strong></td>
<td><strong>SKILLS AND CONCEPTS</strong></td>
<td><strong>STRATEGIC THINKING</strong></td>
<td><strong>EXTENDED THINKING</strong></td>
</tr>
<tr>
<td>Recalling information. Facts. Definitions. Procedures.</td>
<td>Requiring students to make some decisions about how to approach a problem or activity.</td>
<td>Requiring reasoning, planning, and a higher level of thinking.</td>
<td>Requiring reasoning, planning, and thinking over an extended period of time.</td>
</tr>
<tr>
<td>Following a set of procedures. (like a recipe)</td>
<td>Working with problems that have more than one step.</td>
<td>Students have to explain their thinking and justify their responses.</td>
<td>Students have to deal with multiple elements and make connections between them.</td>
</tr>
<tr>
<td>Applying a formula.</td>
<td>Collecting, Classifying, Organizing, and Comparing data.</td>
<td>Complexity comes from a higher demand for reasoning, not harder problems.</td>
<td>Cognitive demand is high. Work is complex.</td>
</tr>
<tr>
<td>Performing a clearly defined series of steps.</td>
<td>Organizing and displaying data in charts, graphs, and tables.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Key Words:**
- Identify
- Recall
- Recognize
- Use
- Measure
- Classify
- Organize
- Make observations
- Collect and compare
- Draw conclusions
- Develop an argument
- Cite evidence
- Make connections
- Relate ideas
- Select approaches
References

- https://schools.graniteschools.org/mathesonjr/files/2015/03/descrip_social_studies.pdf
- http://static.pdesas.org/content/documents/DOK_Math_levels.pdf

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.