

## Alignment of Taxonomies

Bloom's Taxonomy of Cognitive Domain	Bloom's Taxonomy Cognitive Domain Revised	Cognitive Demand Mathematics	Cognitive Demand English Language Arts	Webb's Depth of Knowledge
Knowledge	Remembering	<b>Level One</b> Memorize Facts, Definitions & Formulas	<b>Level One</b> Memorize, Recall	<b>Level One</b> Recall and Reproduction
Comprehension	Understanding	<b>Level Two</b> Perform Procedures	<b>Level Two</b> Perform Procedures, Explain	<b>Level Two</b> Skills and Concepts
Application	Applying	<b>Level Three</b> Demonstrate Understanding of Mathematics	<b>Level Three</b> Generate, Create, Demonstrate	
Analysis	Analyzing	<b>Level Four</b> Conjecture, Analyze, Generalize, Prove	<b>Level Four</b> Analyze, Investigate	<b>Level Three</b> Strategic Thinking
Synthesis	Evaluating	<b>Level Five</b> Solve Non-Routine Problems, Make Connections	<b>Level Five</b> Evaluate, Integrate	<b>Level Four</b> Extended Thinking
Evaluation	Creating			

# Bloom's Critical Thinking Cue Questions

## Description

Cue questions related to the six thinking skills in Bloom's Taxonomy are purposely constructed to ensure students are stimulated to respond at all levels of the cognitive domain, especially the higher levels. Students may be asked to respond through quick writes, learning logs, tests, creative writing that answers the six levels of prompts, role-audience-format-topic (RAFT) activities, or other writing or speaking activities.

## Purpose

Use *before, during, and after* reading to:

- Establish a purpose for reading
- Help students develop their thinking skills at all levels of cognition
- Ensure learning assignments respond to all levels of cognition
- Deepen student comprehension of text, especially at the higher levels
- Stimulate original thinking through the use of open-ended questions
- Provide an array of questions to support differentiation in students' products to demonstrate what they have learned

## Directions

1. Assess the cognitive demands of the reading assignment to determine which of the six levels of thinking are required for students to understand what they are reading.
2. Explicitly teach the students about Bloom's Taxonomy of Critical Thinking and share a copy of the cue questions with them.
3. Use the cue questions to develop discussion or writing prompts in advance about the text and give the prompts to students before they read, to provide a purpose for engaging with the text.
4. Model how to respond to Bloom's thinking levels through think-alouds, whole group discussions, small group discussions, paired answers, and other methods so students learn how to answer cue questions at the six levels.
5. Once students are comfortable with the six levels of thinking skills, assign independent after-reading tasks using cue questions from the chart.

## Extensions

- Provide choice for student responses by offering several cue questions from which they select one to answer for each of the six levels.
- Have students use the cue questions chart when previewing text before they read to set their own purposes for reading.
- Ask students to construct questions and answers about what they have read, using the cue questions on the chart.

## Bloom's Critical Thinking Cue Questions

### *Cross Content Sample*

<p><b>English Language Arts</b></p> <p><i>During and after</i> reading a classical novel with complex plot, characterization, and theme</p> <p>During reading, provide Bloom's cue questions for students to respond at all cognitive levels: knowledge, comprehension, application, analysis, evaluation, synthesis.</p> <p>After reading, provide the chart of cue questions for each of Bloom's six thinking levels and have students select and answer at least one question for each thinking level to communicate their learning.</p>	<p><b>Mathematics</b></p> <p><i>Before and after</i> reading a text chapter on measurements</p> <p>Before reading, have students activate prior knowledge and predict what will be learned "up" the six levels of Bloom's Critical Thinking Taxonomy by answering six one-minute Quick Write prompts created by the teacher from the cue question chart that relate to precision, accuracy, and units of measurement.</p> <p>After reading, have students review and revise the predictive responses to the Bloom's cue questions to check their understanding of how precision, accuracy, and measurement units affect mathematical predictions and estimates.</p>
<p><b>Science</b></p> <p><i>During</i> reading a text chapter, reviewing graphic depictions, and viewing a video on plate tectonics</p> <p>Structure a two-column note taking chart with prompts derived from Bloom's cue questions chart that require students to analyze, evaluate, and synthesize the information on plate tectonics and correlate it to geological features in today's world.</p>	<p><b>Social Studies</b></p> <p><i>Before, during, and after</i> reading editorials about the economic systems in several countries</p> <p>Have the students refer to Bloom's cue questions for the analysis, evaluation, and synthesis levels when writing a persuasive essay about the country with the most effective economic system. Show them how to justify their response by analytical comparisons, evaluative judgments about quality, and a synthesizing description about the ways other countries would benefit from adopting the selected economic system.</p>

# Bloom's Critical Thinking Cue Questions

## Cue Questions Based on Blooms' Taxonomy of Critical Thinking

Lower-Order Thinking Skills	Higher-Order Thinking Skills
<p><b>1. REMEMBERING</b></p> <ul style="list-style-type: none"> <li>• What is ...?</li> <li>• How is ...?</li> <li>• Where is ...?</li> <li>• When did _____ happen?</li> <li>• How did _____ happen?</li> <li>• How would you explain ...?</li> <li>• How would you describe ...?</li> <li>• What do you recall ...?</li> <li>• How would you show ...?</li> <li>• Who (what) were the main ...?</li> <li>• What are three ...?</li> <li>• What is the definition of...?</li> </ul>	<p><b>4. ANALYZING</b></p> <ul style="list-style-type: none"> <li>• What are the parts or features of ...?</li> <li>• How is _____ related to ...?</li> <li>• Why do you think ...?</li> <li>• What is the theme ...?</li> <li>• What motive is there ...?</li> <li>• What conclusions can you draw ...?</li> <li>• How would you classify ...?</li> <li>• How can you identify the different parts ...?</li> <li>• What evidence can you find ...?</li> <li>• What is the relationship between ...?</li> <li>• How can you make a distinction between ...?</li> <li>• What is the function of ...?</li> <li>• What ideas justify ...?</li> </ul>
<p><b>2. UNDERSTANDING</b></p> <ul style="list-style-type: none"> <li>• How would you classify the type of ...?</li> <li>• How would you compare ...? contrast ...?</li> <li>• How would you rephrase the meaning ...?</li> <li>• What facts or ideas show ...?</li> <li>• What is the main idea of ...?</li> <li>• Which statements support ...?</li> <li>• How can you explain what is meant ...?</li> <li>• What can you say about ...?</li> <li>• Which is the best answer ...?</li> <li>• How would you summarize ...?</li> </ul>	<p><b>5. EVALUATING</b></p> <ul style="list-style-type: none"> <li>• Why do you agree with the actions? The outcomes?</li> <li>• What is your opinion of ...?</li> <li>• How would you prove ...? disprove ...?</li> <li>• How can you assess the value or importance of ...?</li> <li>• What would you recommend ...?</li> <li>• How would you rate or evaluate the ...?</li> <li>• What choice would you have made ...?</li> <li>• How would you prioritize ...?</li> <li>• What details would you use to support the view ...?</li> <li>• Why was it better than ...?</li> </ul>
<p><b>3. APPLYING</b></p> <ul style="list-style-type: none"> <li>• How would you use ...?</li> <li>• What examples can you find to ...?</li> <li>• How would you solve _____ using what you have learned ...?</li> <li>• How would you organize _____ to show ...?</li> <li>• How would you show your understanding of ...?</li> <li>• What approach would you use to ...?</li> <li>• How would you apply what you learned to develop ...?</li> <li>• What other way would you plan to ...?</li> <li>• What would result if ...?</li> <li>• How can you make use of the facts to ...?</li> <li>• What elements would you choose to change ...?</li> <li>• What facts would you select to show ...?</li> <li>• What questions would you ask in an interview with ...?</li> </ul>	<p><b>6. CREATING</b></p> <ul style="list-style-type: none"> <li>• What changes would you make to solve ...?</li> <li>• How would you improve ...?</li> <li>• What would happen if ...?</li> <li>• How can you elaborate on the reason ...?</li> <li>• What alternative can you propose ...?</li> <li>• How can you invent ...?</li> <li>• How would you adapt _____ to create a different ...?</li> <li>• How could you change (modify) the plot (plan) ...?</li> <li>• What could be done to minimize (maximize) ...?</li> <li>• What way would you design ...?</li> <li>• What could be combined to improve (change) ...?</li> <li>• How would you test or formulate a theory for ...?</li> <li>• What would you predict as the outcome of ...?</li> <li>• How can a model be constructed that would change ...?</li> <li>• What is an original way for the ...?</li> </ul>

## Bloom's Critical Thinking Cue Questions

		<i><b>Actions</b></i>	<i><b>Products</b></i>
<b>Higher-order thinking</b>	<b><u>Creating</u></b>  (Putting together ideas or elements to develop an original idea or engage in creative thinking).	Designing Constructing Planning Producing Inventing Devising Making	Film Story Project Plan New game Song Media product Advertisement Painting
	<b><u>Evaluating</u></b>  (Judging the value of ideas, materials and methods by developing and applying standards and criteria).	Checking Hypothesising Critiquing Experimenting Judging Testing Detecting Monitoring	Debate Panel Report Evaluation Investigation Verdict Conclusion Persuasive speech
	<b><u>Analyzing</u></b>  (Breaking information down into its component elements).	Comparing Organising Deconstructing Attributing Outlining Structuring Integrating	Survey Database Mobile Abstract Report Graph Spreadsheet Checklist Chart Outline
<b>Lower-order thinking</b>	<b><u>Applying</u></b>  (Using strategies, concepts, principles and theories in new situations).	Implementing Carrying out Using Executing	Illustration Simulation Sculpture Demonstration Presentation Interview Performance Diary Journal
	<b><u>Understanding</u></b>  (Understanding of given information).	Interpreting Exemplifying Summarising Inferring Paraphrasing Classifying Comparing Explaining	Recitation Summary Collection Explanation Show and tell Example Quiz List Label Outline
	<b><u>Remembering</u></b>  (Recall or recognition of specific information).	Recognizing Listing Describing Identifying Retrieving Naming Locating Finding	Quiz Definition Fact Worksheet Test Label List Workbook Reproduction

## Exploring Cognitive Demand in Instruction and Assessment

### Karin K. Hess

Over the past decades, educators and psychologists have attempted to develop models for understanding cognitive complexity as it relates to designing instruction and assessments. In 1956, Benjamin Bloom headed a group of educational psychologists who developed a classification of levels of intellectual behavior important in learning. Bloom created this taxonomy for categorizing the levels of abstraction of questions that commonly occur in educational settings. Using these levels for analysis, Bloom found that over 95 % of the test questions students encounter at the college level require them to think only at the lowest possible level...the recall of information.

Bloom's committee identified three domains of educational activities: **Cognitive** - mental skills (*Knowledge*); **Affective** - growth in feelings or emotional areas (*Attitude*); and **Psychomotor** - manual or physical skills (*Skills*). The cognitive domain involves knowledge and the development of intellectual skills. Within the cognitive domain, Bloom identified six levels - from the simple recall or recognition of facts, as the lowest level, through increasingly more complex and abstract mental levels, to the highest order, classified as evaluation. Different sources list somewhat different verb examples to represent intellectual activity on each of Bloom's levels. Some of these verb examples are listed here. It is important to note that *sometimes the same verbs appear as examples in more than one cognitive level* (e.g., write, summarize, test, explain, etc.). While educators have found these cues useful in lesson planning, this overlap of verbs indicates that focusing only on verbs to determine level of cognitive demand is not fully adequate.

#### Bloom's Taxonomy Levels with "verb cues" for questioning

1. **Knowledge**: arrange, collect, define, describe, duplicate, examine, identify, label, list, memorize, name, order, quote, recognize, relate, recall, repeat, reproduce, show, state, tabulate, tell, who, when, where...
2. **Comprehension**: associate, classify, contrast, describe, discuss, distinguish, differentiate, estimate, **explain**, express, extend, identify, indicate, interpret, locate, predict, recognize, report, restate, review, select, **summarize**, translate...
3. **Application**: apply, calculate, choose, change, classify, complete, demonstrate, discover, dramatize, employ, examine, experiment, illustrate, interpret, modify, operate, practice, relate, schedule, show, sketch, solve, use, **write**...
4. **Analysis**: analyze, appraise, arrange, calculate, categorize, classify, compare, connect, contrast, criticize, differentiate, discriminate, distinguish, divide, examine, experiment, **explain**, infer, question, order, select, separate, **test** ...
5. **Synthesis**: arrange, assemble, collect, combine, compose, construct, create, design, develop, formulate, generalize, integrate, invent, manage, modify, organize, plan, prepare, propose, rearrange, rewrite, set up, substitute, what if?, **write**...

6. **Evaluation**: appraise, argue, assess, attach, choose, compare, conclude, convince, decide, defend, estimate, judge, predict, rate, core, select, support, value, evaluate, rank, **test**, measure, recommend, **explain**, discriminate, support, **summarize...**

Since Bloom's early work, many others have used various schemas to describe cognitive demand in different learning and assessment contexts. A few are included here:

<b>National Assessment of Educational Progress (NAEP)</b>	
<b>Aspects of Reading (1990-2005)</b>	<b>Mathematical Abilities (1990-2005)</b>
<b>Forming a general understanding</b> Consider the text as a whole and provide a global understanding of it.	<b>Conceptual understanding</b> Recognize, label, and generate examples of concepts; use & interrelate models, diagrams, manipulatives, & varied representations of concepts; etc.
<b>Developing interpretation</b> Extend initial impressions to develop a more complete understanding of what was read.	<b>Procedural knowledge</b> Select and apply appropriate procedures correctly; verify or justify the correctness of a procedure using concrete models or symbolic methods; or extend or modify procedures to deal with factors inherent in problem settings.
<b>Making reader/text connections</b> Connect information in the text with knowledge & experience.	<b>Problem solving</b> Recognize and formulate problems; determine the consistency of data; use strategies, data, models; generate, extend, & modify procedures; use reasoning in new settings; & judge the reasonableness & correctness of solutions.
<b>Examining content and structure</b> Critically evaluating, comparing and contrasting, and understanding the effect of such features as irony, humor, & organization.	

## Mathematical Complexity of Items - NAEP 2005 Framework

The demand *on thinking* the items requires:

### Low Complexity

Relies heavily on the recall and recognition of previously learned concepts and principles.

### Moderate Complexity

Involves more flexibility of thinking and choice among alternatives than do those in the low-complexity category.

### High Complexity

Places heavy demands on students, who must engage in more abstract reasoning, planning, analysis, judgment, and creative thought.

<b>Andrew Porter's Survey of Enacted Curriculum</b>	
<b>English Language Arts Cognitive Levels</b>	<b>Mathematics Cognitive Levels</b>
<b>Recall</b> Provide facts, terms, definitions, conventions; describe; etc.	<b>Memorize</b> Recall basic mathematics facts; etc.
<b>Demonstrate/Explain</b> Follow instructions; give examples; etc.	<b>Perform procedures</b> Do computational procedures or algorithms; etc.
<b>Analyze/investigate</b> Categorize, schematize; distinguish fact from opinion; make inferences, draw conclusions; etc.	<b>Demonstrate understanding</b> Communicate mathematical ideas; use representations to model mathematical ideas; etc.
<b>Evaluate</b> Determine relevance, coherence, logical, internal consistency; test conclusions; etc.	<b>Conjecture, generalize, prove</b> Determine the truth of a mathematical pattern or proposition; write formal or informal proof; etc.
<b>Generate/create</b> Integrate, dramatize; predict probable consequences; etc.	<b>Solve non-routine problems, make connections</b> Apply and adapt a variety of appropriate strategies to solve problems; etc.

### **Norman Webb's Depth of Knowledge Levels (1997)**

1. **Recall** - Recall or recognition of a fact, information, concept, or procedure
2. **Basic Application of Skill/Concept** - Use of information, conceptual knowledge, follow or select appropriate procedures, two or more steps with decision points along the way, routine problems, organize/display data
3. **Strategic Thinking** - Requires reasoning, developing a plan or sequence of steps to approach problem; requires some decision making and justification; abstract and complex; often more than one possible answer
4. **Extended Thinking** - An investigation or application to real world; requires time to research, think, and process multiple conditions of the problem or task; non-routine manipulations, across disciplines/content areas/multiple sources

Webb's work has been applied to different content areas and used in test item development, as well as in alignment studies to determine the degree of alignment (match) between states' standards and the tests used by states for accountability purposes. Webb's Depth of Knowledge (DOK) Levels are also being used more and more by local schools and districts to develop curriculum materials and performance assessments to demonstrate learning.

3 Cognitive complexity: Applying Webb DOK Levels to Bloom's Taxonomy Karin K. Hess, National Center for Assessment, Dover, NH 2005 updated 2006 © Karin K. Hess permission to reproduce is given when authorship is fully cited [khess@nciea.org](mailto:khess@nciea.org)

Webb describes his DOK levels as “nominative” rather than as a taxonomy; DOK levels name 4 different ways students interact with content. Each level is dependent upon how *deeply* students understand the content in order to respond, not simply the “verb” used. *The Webb levels do not necessarily indicate degree of “difficulty” in that Level 1 can ask students to recall or restate a simple or a much more complex concept, the latter being much more difficult. Conversely, depth of understanding a concept is required to be able to explain how/why a concept works (Level 2), apply it to real-world phenomena with justification/supporting evidence (level 3), or to integrate one concept with other concepts or other perspectives (level 4).*

Applying Webb's DOK Levels to Bloom's Taxonomy of Educational Objectives (Karin Hess)

		Webb's Depth of Knowledge Levels		
Bloom's Taxonomy	Level 1 Recall & Reproduction	Level 2 Skills & Concepts	Level 3 Strategic Thinking/ Reasoning	Level 4 Extended Thinking
<b>Knowledge</b> Define, duplicate, label, list, memorize, name, order, recognize, relate, recall, reproduce, state	<ul style="list-style-type: none"> <li>List/generate ideas for writing or research</li> <li>Recall, recognize, or locate basic facts, ideas, principles, concepts</li> <li>Identify/describe key figures, places, or events in a particular context</li> </ul>			
<b>Comprehension</b> Classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate	<ul style="list-style-type: none"> <li>Write a simple sentence</li> <li>Select appropriate word(s) to use in context when meaning is evident</li> <li>Identify or describe characters, setting, plot, problem, solution</li> <li>Describe or explain: who, what, where, when</li> </ul>	<ul style="list-style-type: none"> <li>Determine or recognize main idea/generalizations</li> <li>Take and organize notes around common ideas/topics</li> <li>Summarize ideas/events</li> <li>Make basic inferences or logical predictions from text</li> <li>Explain relationships/cause-effect</li> </ul>	<ul style="list-style-type: none"> <li>Write full composition using varied sentence types &amp; structures to meet purposes</li> <li>Explain, generalize, or connect ideas using supporting evidence</li> <li>Make inferences about theme or author's purpose</li> </ul>	<ul style="list-style-type: none"> <li>Write full composition demonstrating synthesis &amp; analysis of complex ideas</li> <li>Compare multiple works by same author, across time periods, genres, etc.</li> </ul>
<b>Application</b> Apply, choose, demonstrate, dramatize, employ, illustrate, interpret, practice, schedule, sketch, solve, use, write	<ul style="list-style-type: none"> <li>Apply spelling, grammar, punctuation, conventions rules in writing</li> <li>Use structures (pre/suffix) or relationships (synonym) to determine word meaning</li> <li>Use resources to edit/revise</li> </ul>	<ul style="list-style-type: none"> <li>Write paragraph using a basic structure or template</li> <li>Edit final draft for mechanics and conventions</li> <li>Use context clues to determine meaning</li> <li>Use text features to find information</li> </ul>	<ul style="list-style-type: none"> <li>Edit final draft for meaning/progression of ideas</li> <li>Apply a concept in other/new contexts</li> <li>Support ideas with examples, citations, details, elaboration, quotations, text references</li> </ul>	<ul style="list-style-type: none"> <li>Define and illustrate common social, historical, economic, or geographical themes and how they interrelate</li> </ul>
<b>Analysis</b> Analyze, appraise, calculate, categorize, compare, criticize, discriminate, distinguish, examine, experiment	<ul style="list-style-type: none"> <li>Identify specific information contained in maps, charts, tables, graphs, or diagrams</li> </ul>	<ul style="list-style-type: none"> <li>Analyze a paragraph for simple organizational structure</li> <li>Determine fiction/ nonfiction; fact/opinion</li> <li>Describe purpose of text features</li> <li>Identify use of literary devices</li> </ul>	<ul style="list-style-type: none"> <li>Analyze an essay</li> <li>Compare information within or across text passages</li> <li>Analyze interrelationships among text elements, situations, events, or ideas</li> <li>Analyze use of literary devices</li> </ul>	<ul style="list-style-type: none"> <li>Analyze multiple works by the same author, across time periods, genres,</li> <li>Analyze complex/abstract themes</li> </ul>
<b>Synthesis</b> Rearrange, assemble, collect, compose, create design, develop, formulate, manage, organize, plan, propose, set up, write	<ul style="list-style-type: none"> <li>Brainstorm ideas, concepts, or perspectives related to a topic</li> </ul>		<ul style="list-style-type: none"> <li>Synthesize information within one source or text</li> <li>Develop a model for a complex situation</li> </ul>	<ul style="list-style-type: none"> <li>Synthesize information across multiple sources or texts</li> <li>Given a situation/problem, research, define, and describe the situation/problem and provide alternative solutions</li> </ul>
<b>Evaluation</b> Appraise, argue, assess, choose, compare, defend, estimate, judge, predict, rate, select, support, value			<ul style="list-style-type: none"> <li>Cite evidence and develop a logical argument for concepts</li> <li>Make &amp; support generalizations, using text evidence</li> </ul>	<ul style="list-style-type: none"> <li>Gather, analyze, &amp; evaluate information to draw conclusions</li> <li>Evaluate relevancy, accuracy, completeness of information from multiple sources</li> </ul>

Webb's Depth of Knowledge Levels				
Math/Sci Examples	Level 1 Recall & Reproduction	Level 2 Skills & Concepts	Level 3 Strategic Thinking/ Reasoning	Level 4 Extended Thinking
<b>Knowledge</b> Define, duplicate, label, list, memorize, name, order, recognize, relate, recall, reproduce, state	<ul style="list-style-type: none"> <li>Recall, recognize, or locate basic facts, ideas, principles</li> <li>Recall or identify conversions between and among representations of numbers, or within and between customary and metric measures</li> </ul>	<ul style="list-style-type: none"> <li>Specify and explain relationships (cause-effect, why or how; non-examples/examples)</li> <li>Make and record observations</li> <li>Take notes to organize information/ideas</li> <li>Summarize results or concepts</li> <li>Make basic inferences or logical predictions from data/observations</li> </ul>	<ul style="list-style-type: none"> <li>Use concepts to solve non-routine problems</li> <li>Explain, generalize, or connect ideas using supporting evidence</li> <li>Make or justify conjectures</li> <li>Explain thinking when more than one response is possible</li> <li>Explain phenomena in terms of concepts</li> </ul>	<ul style="list-style-type: none"> <li>Relate mathematical or scientific concepts to other content areas or concepts</li> <li>Develop generalizations of the results obtained and the strategies used and apply them to new problem situations</li> </ul>
<b>Comprehension</b> Classify, describe, discuss, explain, express, identify, indicate, locate, recognize, report, restate, review, select, translate	<ul style="list-style-type: none"> <li>Make conversions between and among representations or numbers, or within and between customary and metric measures</li> <li>Evaluate an expression</li> <li>Locate points on a grid or number line</li> <li>Solve a one-step problem</li> </ul>	<ul style="list-style-type: none"> <li>Select a procedure according to criteria and perform it</li> <li>Solve routine problem applying multiple concepts or decision points</li> <li>Retrieve information from a table, graph, or figure and use it solve a problem requiring multiple steps</li> </ul>	<ul style="list-style-type: none"> <li>Design investigation for a specific purpose or research question</li> <li>Conduct a designed investigation</li> <li>Use concepts to solve non-routine problems</li> <li>Use reasoning, planning, and evidence</li> </ul>	<ul style="list-style-type: none"> <li>Select or devise approach among many alternatives to solve a problem</li> <li>Conduct a project that specifies a problem, identifies solution paths, solves the problem, and reports results</li> </ul>
<b>Application</b> Apply, choose, demonstrate, dramatize, employ, illustrate, interpret, practice, schedule, sketch, solve, use, write	<ul style="list-style-type: none"> <li>Follow simple procedures (recipe-type directions)</li> <li>Calculate, measure, apply a rule</li> <li>Apply an algorithm or formula (area, perimeter, etc.)</li> <li>Represent in words or diagrams a scientific concept or relationship</li> <li>Retrieve information from a table or graph</li> </ul>	<ul style="list-style-type: none"> <li>Categorize, classify materials based on characteristics</li> <li>Compare/ contrast figures or data</li> <li>Select appro graph and display data</li> <li>Interpret data from a simple graph</li> <li>Extend a pattern</li> <li>Use models to represent mathematical concepts</li> </ul>	<ul style="list-style-type: none"> <li>Compare information within or across data sets or texts</li> <li>Analyze and draw conclusions from data</li> <li>Generalize a pattern</li> <li>Interpret data from complex graph</li> <li>Synthesize information within one source or text</li> <li>Formulate an original problem, given a situation</li> <li>Develop a scientific/mathematical model for a complex situation</li> </ul>	<ul style="list-style-type: none"> <li>Analyze multiple sources of evidence</li> <li>analyze complex/abstract themes</li> <li>Gather, analyze, and evaluate information</li> <li>Synthesize information across multiple sources or texts</li> <li>Design a mathematical model to inform and solve a practical or abstract situation</li> </ul>
<b>Analysis</b> Analyze, appraise, calculate, categorize, compare, criticize, discriminate, distinguish, examine, experiment	<ul style="list-style-type: none"> <li>Brainstorm ideas, concepts, or perspectives related to a topic</li> </ul>			
<b>Synthesis</b> Rearrange, assemble, collect, compose, create, design, develop, formulate, manage, organize, plan, propose, set up, write				
<b>Evaluation</b> Appraise, argue, assess, attach, choose compare, defend estimate, judge, predict, rate, core, select, support, value, evaluate				

## References

- Anderson, D. and Krathwohl, D. editors (2005). *Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*
- Bloom B. S. (1956). *Taxonomy of Educational Objectives, Handbook I: The Cognitive Domain*. New York: David McKay Co Inc.
- Hess, K. (2004). "Applying Webb's Depth-of-Knowledge (DOK) Levels in Reading." [online] available: [www.nciea.org](http://www.nciea.org)
- Hess, K. (2005). "Applying Webb's Depth-of-Knowledge (DOK) Levels in Social Studies." [online] available: [www.nciea.org](http://www.nciea.org)
- Hess, K. (2005). "Applying Webb's Depth-of-Knowledge (DOK) Levels in Writing." [online] available: [www.nciea.org](http://www.nciea.org)
- Hess, K. (2006). "Applying Webb's Depth-of-Knowledge (DOK) Levels in Science." [online] available: [www.nciea.org](http://www.nciea.org)
- Krathwohl, D. R., Bloom, B. S., & Bertram, B. M. (1973). *Taxonomy of Educational Objectives, the Classification of Educational Goals. Handbook II: Affective Domain*. New York: David McKay Co., Inc.
- Petit, M. & Hess, K. (2006). "Applying Webb's Depth-of-Knowledge (DOK) and NAEP levels of Complexity in Mathematics." [online] available: [www.nciea.org](http://www.nciea.org)
- Webb, N. (March 28, 2002) "Depth-of-Knowledge Levels for Four Content Areas," unpublished paper.
- Webb, N. (August 1999). Research Monograph No. 18: "Alignment of Science and Mathematics Standards and Assessments In Four States." Washington, D.C.: CCSSO.
- Webb, N. (1997). Research Monograph Number 6: "Criteria for Alignment of Expectations and Assessments on Mathematics and Science Education. Washington, D.C.: CCSSO.