

**Developing Higher Order Thinking Questions  
Based on Webb's DOK and  
FCAT Content Complexity**

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# Fascinating Brain Facts

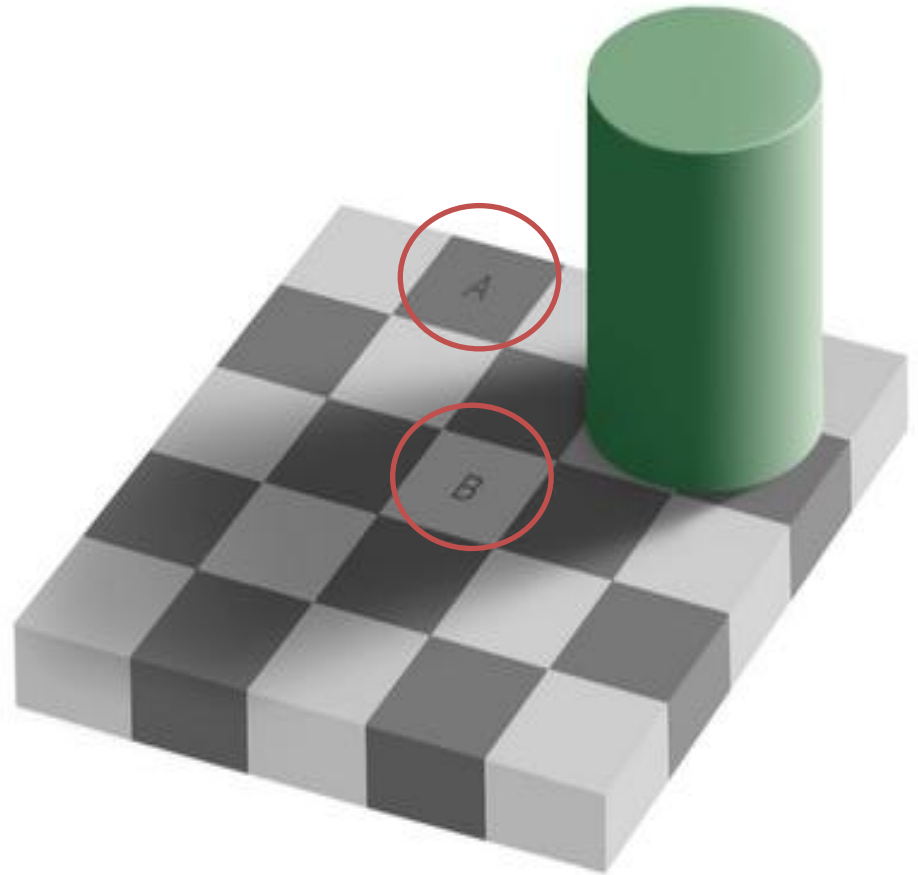
- Learning two languages before the age of five alters the brain structure.
- While awake, your brain generates between 10 and 23 watts of power—or enough energy to power a light bulb.
- A study of one million students in New York showed that students who ate lunches that did not include artificial flavors, preservatives, and dyes did 14% better on IQ tests than students who ate lunches with these additives.

# Fascinating Brain Facts

- Every time you recall a memory or have a new thought, you are creating a new connection in your brain.
- The average number of thoughts that humans are believed to experience each day is 70,000.
- A living brain is so soft you could cut it with a table knife.
- There are about 100,000 miles of blood vessels in the brain.

# Fascinating Brain Facts

- Our brain often fools us. It often perceives things differently from the reality. Look at the picture on the right. Squares A and B are actually the same shade of gray



# What is Depth of Knowledge (DOK)?

- A scale of cognitive demand (**thinking**) to align standards with assessments
- Based on the research of **Norman Webb**, University of Wisconsin Center for Education Research and the National Institute for Science Education
- Defines the “**ceiling**” or **highest DOK level** for each Core Content standard for the state assessment
- Guides **item development** for state assessments

## BLOOM'S TAXONOMY

### KNOWLEDGE / REMEMBERING

"The recall of specifics and universals, involving little more than bringing to mind the appropriate material"

### COMPREHENSION / UNDERSTANDING

"Ability to process knowledge on a low level such that the knowledge can be reproduced or communicated without a verbatim repetition."

### APPLICATION / APPLYING

"Using information in another familiar situation."

### ANALYSIS / ANALYSING

"Breaking information into parts to explore understandings and relationships."

### SYNTHESIS and EVALUATION / EVALUATING and CREATING

"Putting together elements & parts to form a whole, then making value judgments about the method."

## WEBB'S DOK

### RECALL

Recall of a fact, information, or procedure (e.g., What are 3 critical skill cues for the overhand throw?)

### SKILL/CONCEPT

Use of information, conceptual knowledge, procedures, two or more steps, etc.

### STRATEGIC THINKING

Requires reasoning, developing a plan or sequence of steps; has some complexity; more than one possible answer

### EXTENDED THINKING

Requires an investigation; time to think and process multiple conditions of the problem or task.

# Webb's Depth of Knowledge

## Level 1

- Recall of a fact, information, or procedure.

## Level 2

- Skill/Concept: Use information or conceptual knowledge, two or more steps, etc.

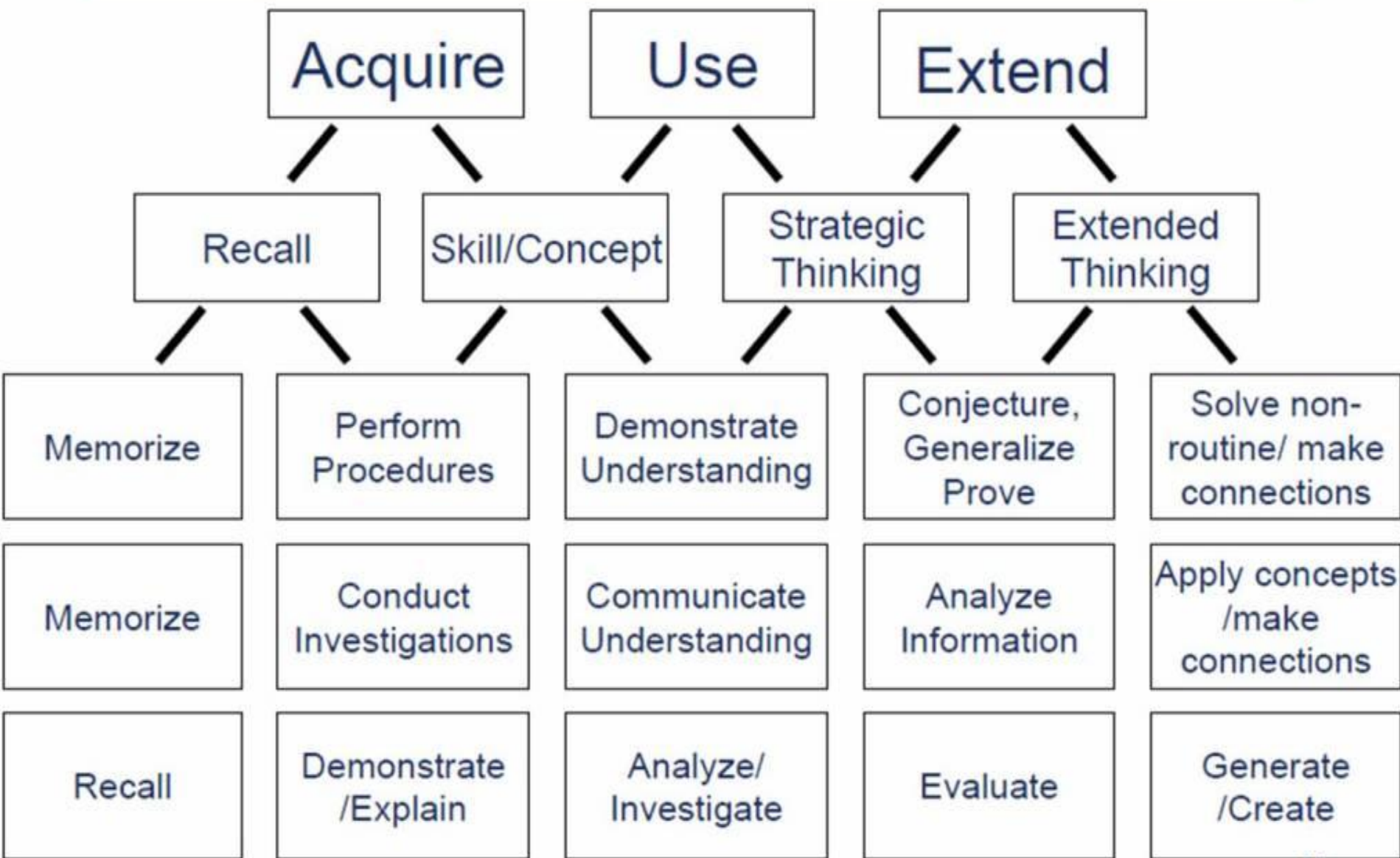
## Level 3

- Strategic Thinking: Requires reasoning, developing plan or a sequence of steps, some complexity, more than one possible answer.

## Level 4

- Extended Thinking: Requires an investigation, time to think and process multiple conditions of the problem

# Expectations for Student Performance





# Applying Webb's DOK Levels in Reading

## Level 1:

- requires students to use simple skills or abilities to recall or locate facts from the text
- focus on basic initial comprehension, not on analysis or interpretation
- Items require shallow/literal understanding of text presented and often consist of verbatim recall from text or simple understanding of a single word or phrase

# Applying Webb's DOK Levels in Reading

## Level 2

- Requires both initial comprehension and subsequent processing of text or portion of text
- Important concepts are covered but not in a complex way
- Items at this level may include words such as “paraphrase, summarize, interpret, infer, classify, organize, collect, display, and compare”
- Items may require students to apply skills and concepts that are covered in level 1

# Applying Webb's DOK Levels in Reading

## Level 3

- Requires deep knowledge
- Students encouraged to go beyond text
- Students asked to explain, generalize, or connect ideas
- Students must be able to support their thinking, citing references from the text or other sources
- Items may involve abstract theme identification, inferences between or across passages, application of prior knowledge, or text support for analytical judgment about a text

# Applying Webb's DOK Levels in Reading

## Level 4

- Requires complex reasoning, planning, developing, and thinking most likely over an extended period of time, such as multiple works by the same author or from the same time period
- 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:
  - Analyze 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.

# Why Depth of Knowledge (DOK)?

Mechanism to ensure that the intent of the standard and the level of student demonstration required by that standard matches the assessment items

(required under NCLB)

To **ensure** that teachers are teaching to a level that will promote student achievement.



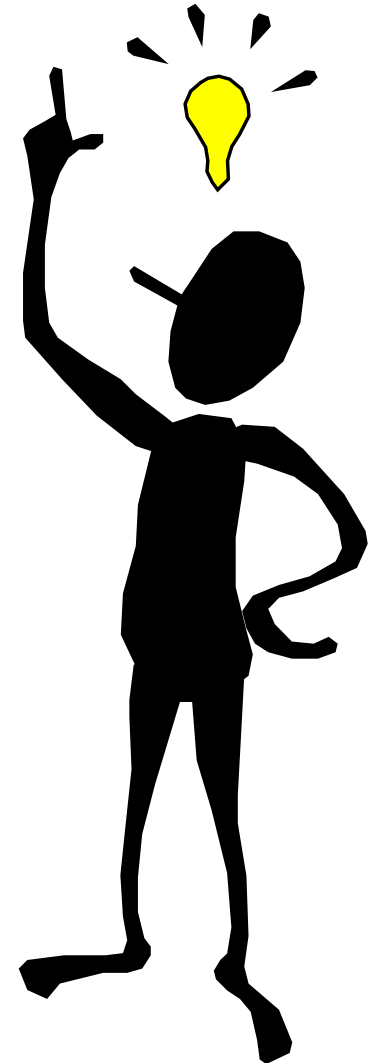
# DOK is **NOT**...

- a taxonomy (Bloom's)
- the same as difficulty
- about using “verbs”



# It's NOT about the verb...

The Depth of Knowledge is **NOT** determined by the verb (Bloom's Taxonomy), but by the context in which the verb is used and the depth of thinking required.



# Verbs are not always used appropriately...

Words like explain or analyze have to be considered in context.

- “Explain to me where you live” does not raise the DOK of a simple rote response.
- Even if the student has to use addresses or landmarks, the student is doing nothing more than recalling and reciting.



# Same Verb— Three Different DOK Levels

DOK 1- Describe three characteristics of metamorphic rocks. (Requires simple recall)

DOK 2- Describe the difference between metamorphic and igneous rocks. (Requires cognitive processing to determine the differences in the two rock types)

DOK 3- Describe a model that you might use to represent the relationships that exist within the rock cycle. (Requires deep understanding of rock cycle and a determination of how best to represent it)

# Cognitive Complexity vs Difficulty

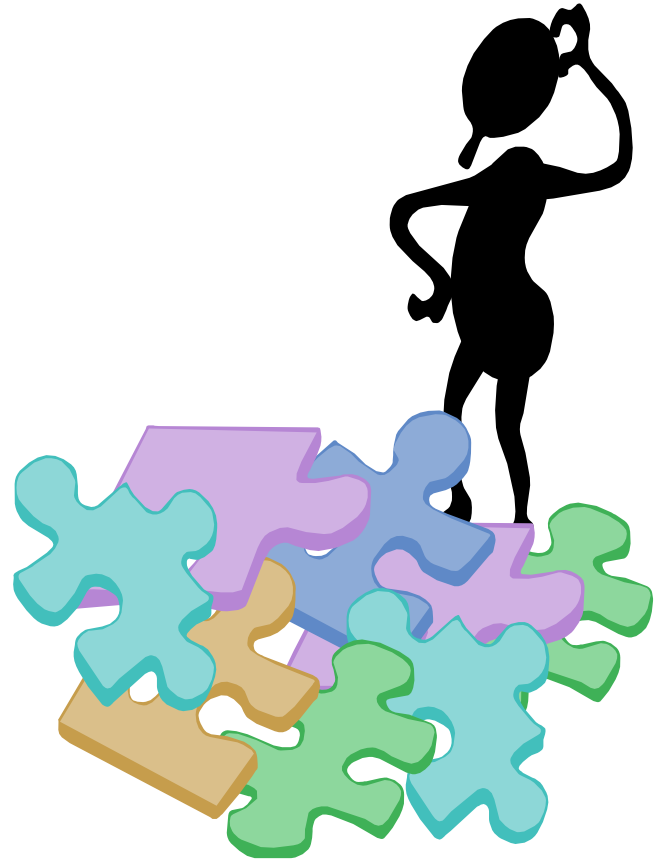
What is the difference between Cognitive Complexity and Difficulty Level?

- Difficulty refers to how many students answered the question correctly.
- High Order Thinking refers to how many steps it takes to answer the question.



# DOK is about complexity

- The intended student learning outcome determines the DOK level.
- Every objective in the NGSSS has been assigned a DOK level.
- Instruction and classroom assessments must reflect the DOK level of the objective or intended learning outcome.

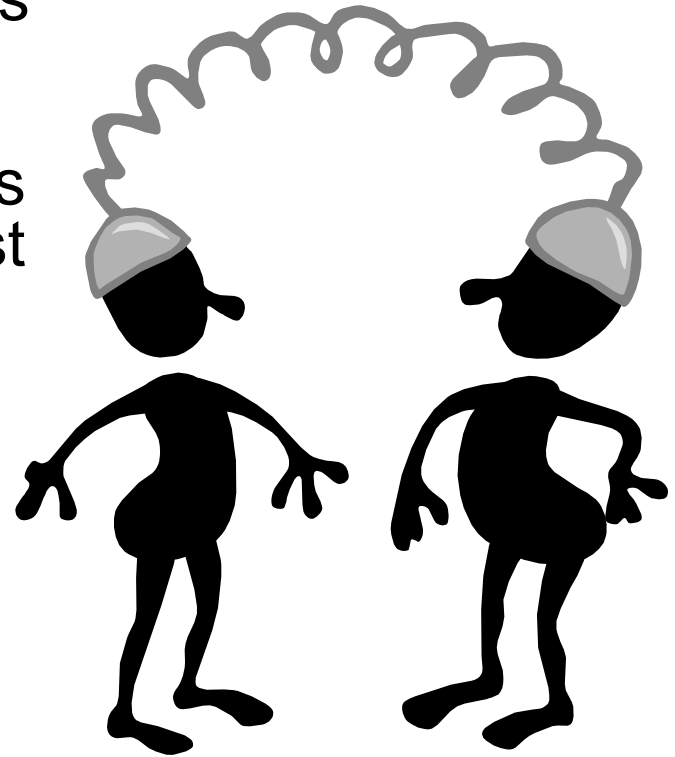


# How to Ask HOT Questions

Often Level 1 & 2 students are denied access to higher level questions because they still have difficulty with skills

However, higher level thinking questions are sometimes easier for level 1 & 2 students to answer because open ended questions have more entry points and require more “think time” by the rest of the class.

When a class is heavily focused on recall questions, lower readers may be limited because of their need for processing time.



# Suggestions for Drafting Questions at Higher Levels

- Model Thinking Process Explicitly
  - for some students learning what is required will remain a mystery unless taught explicitly
- Use Advance Organizers
  - Using note-taking and graphic organizers BEFORE the lesson can cue students as to what to expect
  - Questions and agendas can also be used to help students anticipate what to look for in the coming lesson
- Use Concept Mapping
  - Concept Mapping provides students with a framework for visualizing thinking.



# Questioning Strategies That Provoke HOT

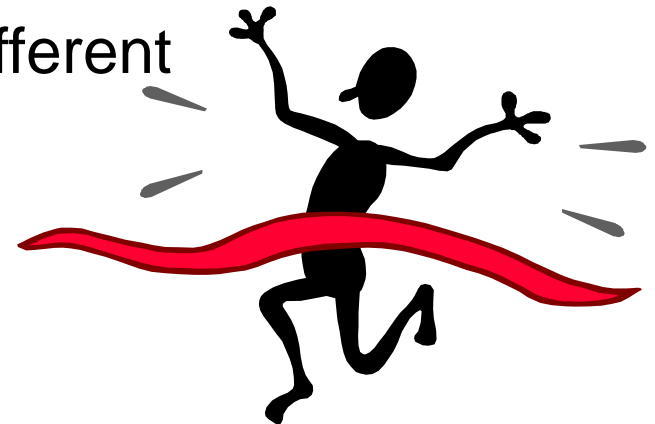
- Require students to **manipulate prior information**
  - Why do you suppose.....?
  - “What can you conclude from the evidence?”
- Ask students to **state an idea or definition in their own words.**
- Ask questions that **require a solution to a problem.**
- Involve students in **observing and describing an event or object.**
  - “What do you notice?”
  - “Tell me about this.”
  - “What do you see?”
- Ask students to **compare or contrast.**



# Tips for Creating High-Level Questions

The following simple tips can get ALL students involved in the lesson and help them gain a deeper understanding of the content by challenging them to think critically.

1. Create a “HOT” Question for Each Lesson
2. Require ALL students to answer the question (“all-write” strategy).
3. Require students to defend answers.
4. Differentiate questions as appropriate.
5. Promote examination of new and different perspectives.



# Questions?????????

- Usually questions at the lower levels are appropriate for:
  - Evaluating students' preparation and comprehension.
  - Diagnosing students' strengths and weaknesses.
  - Reviewing and/or summarizing content.
- Questions at higher levels are usually more appropriate for
  - Encouraging students to think deeply and critically.
  - Problem-solving.
  - Encouraging discussions.
  - Stimulating students to seek information on their own.



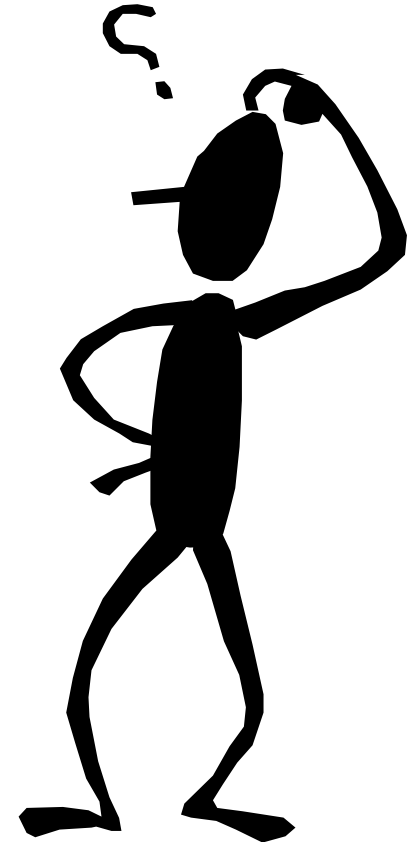
## Correlation Chart for FCAT—Webb's Cognitive Complexity—Bloom's Taxonomy

**Background:** The degree of challenge of FCAT multiple-choice items is currently categorized in two ways: **Item Difficulty** [prediction of the percentage of students who will choose the correct answer] and **Cognitive Complexity** [the cognitive demand associated with an item]. Bloom's Taxonomy is difficult to use to categorize test items because it requires an inference about the skill, knowledge, and background of the students responding to the item. Therefore, in 2004, FDOE began using Dr. Norman L. Webb's Depth of Knowledge (DOK) levels. The focus shifted from the ability of the student to the expectations of the item. Note that a test item may fit one or more descriptions, but should be classified in the highest level of complexity demanded by the item.

FCAT Complexity Levels	FCAT Degree of Challenge % Correct	Webb's Depth of Knowledge (DOK) Levels	Bloom's Taxonomy Categories	Examples of Stems - Reading
Low	More than 70%	<b>Level 1: Recall / Reproduce</b> Recall of facts, information or procedure (1 step)	<b>Knowledge</b> Recall specifics & universals  <b>Comprehension</b> Low level w/verbatim repetition	<ul style="list-style-type: none"> <li>• Define</li> <li>• Locate details from text or visual</li> <li>• Identify correct order</li> </ul>
Moderate	Between 40% & 70%	<b>Level 2: Basic Application of Skill/Concept</b> Use of information, concept knowledge (2 or more steps)	<b>Application</b> Use of abstractions in concrete situations	<ul style="list-style-type: none"> <li>• Use context to define words in text</li> <li>• Determine how details support main ideas</li> <li>• Interpret visuals</li> <li>• Identify cause-and-effect</li> <li>• Identify similarities and differences</li> <li>• Recognize elements of plot</li> <li>• Recognize patterns of organization</li> <li>• Summarize</li> <li>• Compare word meanings</li> </ul>
High	Less than 40%	<b>Level 3: Strategic Thinking</b> Requires reasoning, developing a plan or sequence of steps, has some complexity, more than one possible answer; generally takes less than 10 minutes to complete	<b>Analysis</b> Breakdown of a situation into its component parts	<ul style="list-style-type: none"> <li>• Analyze the use of figurative language</li> <li>• Show how visuals contribute to a text</li> <li>• Determine author's purpose &amp;/or point of view and describe how it affects text</li> <li>• Evaluating strong vs. weak arguments</li> <li>• Analyze similarities and differences;</li> <li>• Describe and analyze characteristics of various types of literature;</li> <li>• Describe and illustrate how common themes are found across texts</li> <li>• Analyze cause-and-effect relationships</li> </ul>
		<b>Level 4: Extended Thinking</b> Requires investigation, time to think and process multiple conditions of problem or task; and more than 10 minutes to do non-routine manipulations	<b>Synthesis and Evaluation</b> Putting together elements & parts to form a whole, then making value judgments about the method	

# Something to think about...

- If 10-20% of the questions on FCAT are low Level of Complexity...How much class time would we devote to DOK Level 1 thinking?
- If 80% of the question on FCAT (and in life) require Moderate to High levels of Complexity....What are we doing to promote these complex levels of higher order thinking?



*The correct answer for each multiple-choice question is circled. To the left of each answer choice is the percentage of students who chose that answer.*

- 46** What is the main idea of this article?
- 41% **F.** Women have had political influence since the Revolutionary period.
  - 9% G. Women have accepted their political roles since the Revolutionary period.
  - 23% H. The Revolutionary period was a time when women achieved political equality.
  - 28% I. The Revolutionary period was a time when women increased their political power.

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.1	main idea	Moderate

47 What is the author's point of view in this article?

- 90% **A.** She favors women's rights.
- 1% B. She opposes political families.
- 4% C. She favors a patriarchal system.
- 4% D. She opposes women in government.

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.2	author's point of view	Moderate

**48** What is the main idea of the first paragraph?

- 7% E. The Constitution contained provisions for women's right to vote.
- 82% **G.** Women's rights were not considered when the Constitution was drafted.
- 6% H. The Founding Fathers came from similar economic and racial backgrounds.
- 6% I. In 1787, women had no right to vote, but they did have a voice in government.

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.1	main idea	Moderate

- 49 What is the meaning of the word *uncoerced* as used in this sentence from the second paragraph in the article?

The prevailing thought of the day was that the American voter must be independent and uncoerced.

- 39% A. unbiased  
10% B. unconcerned  
5% C. uneducated  
45% **D. unforced**

Benchmark	Content Focus	Content Difficulty
LA.A.1.4.2	analyze words/text	Moderate

**50** Which phrase best describes participation in democratic government in the eighteenth century?

- 37% **F.** available to some men
- 13% G. available to citizens only
- 15% H. available to some women
- 29% I. available to property owners

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.1	details/facts	Low

**53** Abigail Adams' letters are important today because they

- 45% **A.** provide insight into early U.S. history.
- 24% **B.** changed opinions of the Founding Fathers.
- 22% **C.** influenced the language of the Constitution.
- 8% **D.** established policy for John Adams' administration.

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.7	validity and reliability	High



- 54** In his response to Abigail Adams' letter of March 31, 1776, John Adams wrote the following:

Your letter was the first intimation that another tribe, more numerous and powerful than all the rest, were grown discontented.

Based on information in Abigail Adams' letter, what is the "tribe" to which John Adams is referring?

- 10% F. ancestors
- 7% G. husbands
- 74% **H.** ladies
- 9% I. tyrants

Benchmark	Content Focus	Content Difficulty
LA.A.2.4.8	synthesize information (multiple sources)	High

# Your Turn

- Read the article, “Do We Need \$75,000 a Year To Be Happy?”
- Write one question for each of the three DOK levels represented on FCAT.

