Depth of Knowledge (DOK)

St. Louis Area Curriculum Coordinators Association
September 29, 2006

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School Improvement and Accreditation

Norman Webb's alignment system

- **Categorical Concurrence** --- measures the extent to which the same or consistent categories of content appear in the standards and the assessments.
- **Depth-of-Knowledge Consistency** --- measures the degree to which the knowledge elicited from students on the assessment is as complex within the context area as what students are expected to know and do as stated in the standards.
- **Range-of-Knowledge Correspondence** --- determines whether the span of knowledge expected of students on the basis of a standard corresponds to the span of knowledge that students need in order to correctly answer the corresponding assessment items/activities.
- **Balance of Representation** --- measures whether objectives that fall under a specific standard are given relatively equal emphasis on the assessment.
- **Source of Challenge** --- determines whether the primary difficulty of the assessment items is significantly related to students' knowledge and skill in the content area as represented in the standards.

Adapted from pages 4-5 36 of *Web Alignment Tool (WAT) Training Manual*
http://www.wcer.wisc.edu/wat/Training%20Manual%202.1%20Draft%20091205.doc

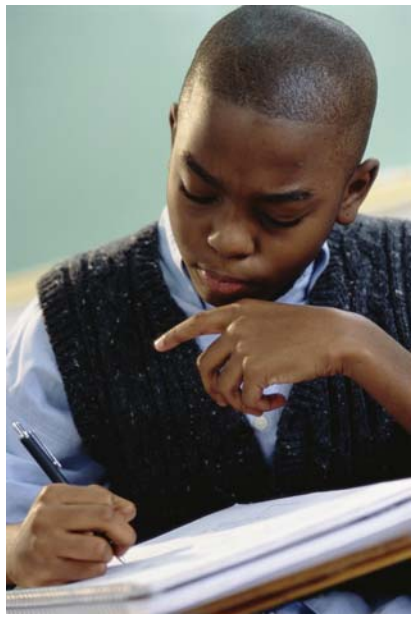
Depth of Knowledge Consistency

Measures the degree to which the knowledge elicited from students on assessments is as complex as what students are expected to know and do as stated in the curriculum/GLEs/Show-Me Standards

Depth of Knowledge

"The mind is not a vessel to be filled but a fire to be kindled."

—On Listening to Lectures (Plutarch)



Depth of Knowledge

Level 1 Recall

Recall of a fact, information, or procedure.

Level 2 Skill/Concept

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

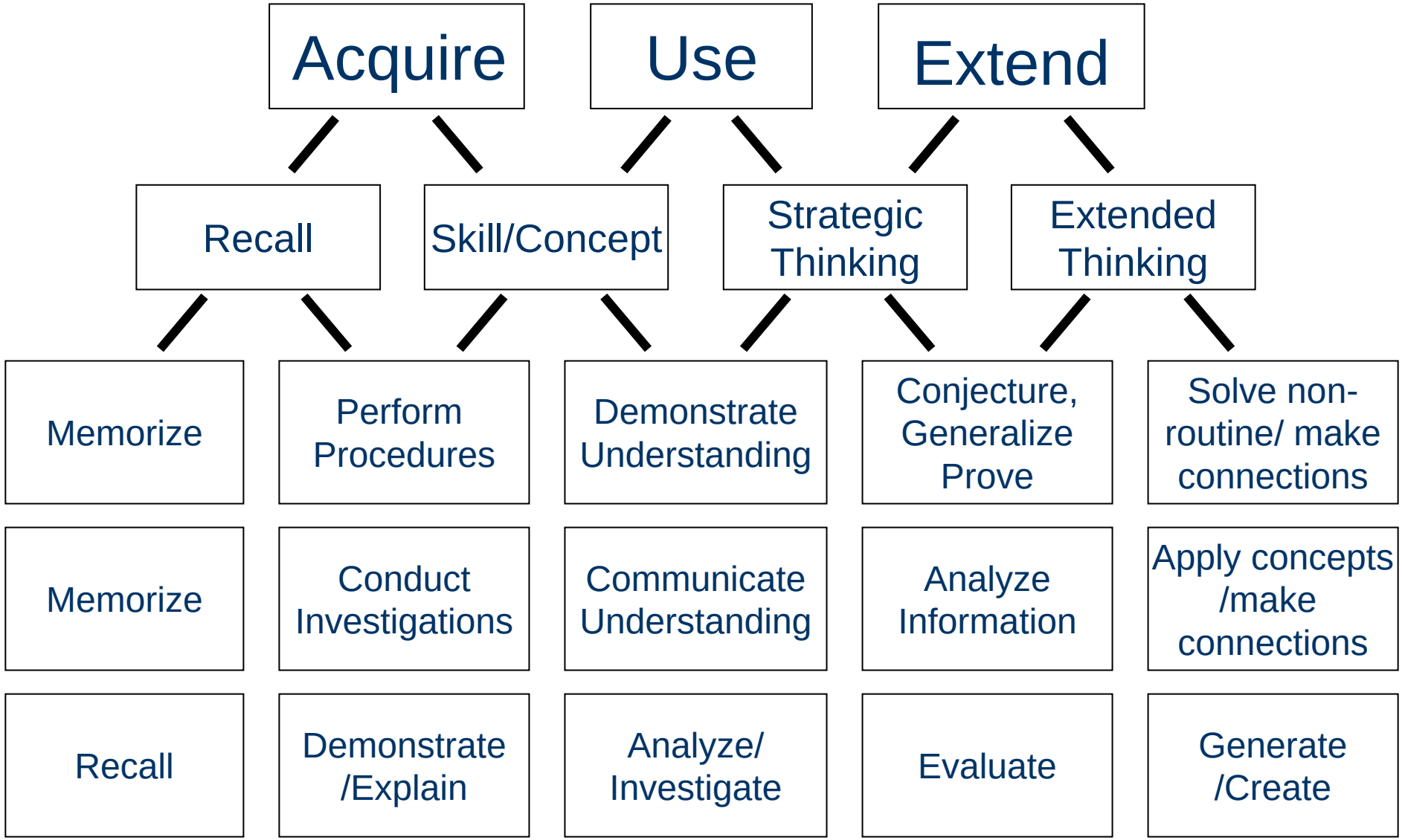
Level 3 Strategic Thinking

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



Dr. Bonita Potter, Office of Academic Education – Mississippi

http://www.mde.k12.ms.us/C&Ipresentation.ppt#327,30,Slide 30

This information is adapted from Webb, Norman L., Research Monograph No. 8, "Criteria for Alignment of Expectations and Assessments in Mathematics and Science Education," Council of Chief State School Officers, 1997.

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.

Wyoming School Health and Physical Education Network (2001). *Standards, Assessment, and Beyond.* Retrieved May 25, 2006, from http://www.uwyo.edu/wyhpenet

When assigning the DOK level, consider…

- the level of work students are most commonly required to perform
- the *complexity* of the task, rather than its *difficulty*.
  - The DOK level describes the kind of thinking involved in a task, not the likelihood that the task will be completed correctly.
- the complete domain of items that would be appropriate for completing the task.
  - Identify the DOK level of the most common of these items.

If there is a question regarding which of two levels an objective addresses, it is usually appropriate to select the higher of the two levels.

Sample Question

Math, grade 4

Each day that Jasmine turns in her homework on time, she earns 5 points. Jasmine has turned in her homework on time for the last 8 days. How many points has Jasmine earned altogether?

a) 30

b) 35

c) 40

d) 45

The fact that this is a story problem does not make this more than a level 1 item. The text here quickly reveals that the problem is simple multiplication. However, story problems can often have higher DOK levels even if the computations required are only level 1, as long as there is some skillful or strategic thinking required in determining what computations to perform.

http://www.wcer.wisc.edu/wat/tutorial/MathTutorial/Question18.aspx

Sample Question

Science, grade 10

A scientist synthesizes a new drug. She wants to test its effectiveness in stopping the growth of cancerous tumors. She decides to conduct a series of experiments on laboratory mice to test her hypothesis. What should she do?

a) Give half the mice the drug, the other half none, and compare their tumor rates.
b) Give the drug to all mice, but only to half every other day, and record tumor rates.
c) Double the dosage to all mice each day until tumors start to disappear.
d) Give the drug only to those mice who have tumors and record their weights.

This item is level 2. Students must at least apply knowledge of controlled experiment design to this situation, or derive it from this problem.

http://www.wcer.wisc.edu/wat/tutorial/SciTutorial/Question6.aspx

Sample Question

Social Studies

A newspaper prints a story that criticizes the current administration's Policies. The Bill of Rights allows a government official to respond to this headline by

a) arresting the publisher of the newspaper

b) closing down the newspaper

c) demanding that the newspaper print a new headline

d) writing a letter of protest to the editor

This item is level 3 because it requires students to apply the concepts of the Bill of Rights to a given situation represented by the newspaper headline to determine the correct answer.

Sample Item released from the Delaware Department of Education

http://www.wcer.wisc.edu/wat/tutorial/SocTutorial/Question9.aspx

Sample Question

Communication Arts, grade 10

You will become a storyteller. You will research and write the story of someone who has emigrated to the United States and/or migrated within the United States.

You will get a role card from your native country, and you will become that person.

The role cards feature many countries and many time periods: gender and age are mixed. For example:

- Moira Adair, 50, arriving from Northern Ireland in 1980. Your husband was killed in an IRA bombing. You are a computer expert and have family in Minneapolis.
- Sean Dolan, 21, arriving from Ireland in 1853. You are alone but you have a relative in New York. You are an apprentice stone mason.

You must produce an original map showing your home country as it was when you left. Describe the culture (social, economic, political, dominant religious affiliation, educational system, legal system), including the dominant values, customs, and traditions of the culture. Further, note specific problems in your homeland, explaining why people emigrate to America at that time. The trip to America is the bridge to researching settlement in a specific area or community; this is where imagination takes over for a time, although you will also need to maintain accuracy.

The next major research involves the assimilation process in America. Additionally, you need to research the contributions of your ethnic group to America. To guide you through this project, you will receive a packet of materials that includes everything from graphic organizers to specific prompts. The project culminates in an Ellis Island simulation and a "feast" for which you will research and prepare food, music, and dance from your assigned homeland.

This task is an example of level 4. The extended activity described requires the completion of several assignments that would clearly represent Level 4 reasoning in a variety of objective.

The description of this secondary school model is taken from the Wisconsin Department of Public Instruction document, Planning Curriculum in English Language Arts (280-1). Credit for the assignment belongs to two Washington State Teachers, Norma Coombe and Margaret Garrison, of Peninsula High School of Gig Harbor, Washington.

http://www.wcer.wisc.edu/wat/tutorial/ELATutorial/Question9.aspx

Sample Question

Social Studies

Students are given the scenario of acid rain potentially causing problems in a specific farming community. Students are to define and describe the problems with supporting data. There should be a proposal of alternative solutions to the problem, a selection of one solution, and an explanation of why it would be the best alternative. The selected solution must include a plan for implementation.

The students would investigate, plan, and develop solutions to a problem. This task goes beyond using concepts to solve problems and citing evidence by requiring evidence of the process and the inclusion of an implementation plan. An activity that required students to apply problem-solving criteria to possible solution in order to select the best solution would be Level 3. The addition of both the investigation to gather data that will be used as evidence of the problem and implementation plan makes this task a Level 4.

http://www.wcer.wisc.edu/wat/tutorial/SocTutorial/Question10.aspx

Depth of Knowledge (DOK) Levels

Level One Activities	Level Two Activities	Level Three Activities	Level Four Activities
Recall elements and details of story structure, such as sequence of events, character, plot and setting. Conduct basic mathematical calculations. Label locations on a map. Represent in words or diagrams a scientific concept or relationship. Perform routine procedures like measuring length or using punctuation marks correctly. Describe the features of a place or people.	Identify and summarize the major events in a narrative. Use context cues to identify the meaning of unfamiliar words. Solve routine multiple-step problems. Describe the cause/effect of a particular event. Identify patterns in events or behavior. Formulate a routine problem given data and conditions. Organize, represent and interpret data.	Support ideas with details and examples. Use voice appropriate to the purpose and audience. Identify research questions and design investigations for a scientific problem. Develop a scientific model for a complex situation. Determine the author's purpose and describe how it affects the interpretation of a reading selection. Apply a concept in other contexts.	Conduct a project that requires specifying a problem, designing and conducting an experiment, analyzing its data, and reporting results/ solutions. Apply mathematical model to illuminate a problem or situation. Analyze and synthesize information from multiple sources. Describe and illustrate how common themes are found across texts from different cultures. Design a mathematical model to inform and solve a practical or abstract situation.

What does this LOOK like in the classroom?

Level One (Recall) –

Level Two (Skill/Concept) –

Level Three (Strategic Thinking) –

Level Four (Extended Thinking) –

Classroom Assessments… a ceiling not a target!

Depth of Knowledge

Level 1 (Recall)	Level 2 (Skill/Concept)	Level 3 (Strategic Thinking)	Level 4 (Extended Thinking)

Lesson Grade Level Expectation	**GLE Ceiling** --- the highest DOK level at which the GLE should be assessed	**Potential DOK Levels for Assessment** --- the DOK at which the GLE has the potential to be assessed depending upon the demand of the GLE
N1B2 Recognize ½, 1/3, and ¼ of a shape	1	1 (Identify)
N1D4 Classify and describe numbers by their characteristics including odd, even and multiples	2	1 (Sort) 2 (Describe)
N3D5 Estimate and justify the results of division of whole numbers	3	1 (Determine an estimate) 2 (Justify a given estimate) 3 (Determine and justify an estimate)

Procedures

- School
  - Is there a good match among the curriculum objectives, instruction and what teachers are assessing?
    - DOK of curriculum objectives
    - DOK of instruction
    - DOK of summative assessment items
- Administrator
  - What is the DOK of the assessments in the building?
    - Expectations
    - Curriculum Alignment
    - Curriculum Implementation

Questions

DOK tutorial:

http://www.wcer.wisc.edu/WAT/index.aspx

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DOK

What this LOOKS like in the classroom…

	Level One	Level Two	Level Three	Level Four
H.S. Music	Name several composers from the Baroque and Classical Periods.	Describe differences between Baroque and Classical Periods.	Critique, compare, and contrast pieces of music from Baroque and Classical Periods.	Choose a period and develop a 16-measure piece of music from that style.
Agriculture Crop Science	Name 2 crops that are commonly grown in Missouri.	Make a graph showing the annual production of the 5 largest crops grown in Missouri.	Develop a logical argument for planting a particular crop in your area, taking into account soils, weather, and other variables.	Design a 3 year crop rotation system for a farm of 360 acres, using as little chemical fertilizer as possible. Justify your system. Project the expected costs and revenues.
US History	Name the presidents of the U.S. in order.	Using the left and right political continuum, categorize the presidents of the 20th and 21st centuries according to their political standing.	Hypothesize how Dwight D. Eisenhower would react to today's world political situation.	Analyze the strategies and effectiveness of George Bush's war strategies in the Persian Gulf with the war strategies of George W. Bush in Iraq.
4th Grade Interdisciplinary	List the ingredients of a peanut butter and jelly sandwich	Collect the ingredients and write the recipe	Investigate how many people are coming to dinner and formulate the appropriate amounts of ingredients for 8 people.	Design a plan to feed the entire class – if one jar of peanut butter makes 10 sandwiches; one jar of jelly serves 8; one loaf of bread contains 18 slices;