



Implementing Depth of Knowledge in the
Classroom



Nevada Department of Education
www.doe.nv.gov

Agenda

Introduction	15 minutes	(DOK 1)
DOK overview	30 minutes	(DOK 1-4)
DOK in our lives	30 minutes	(DOK 1-4)
DOK in the classroom	40 minutes	(DOK 1-4)

BREAK (15 minutes)

DOK in assessments	30 minutes	(DOK 1-3)
-content specific DOK language		
Museum walk	40 minutes	(DOK 1-3)
DOK in your room	20 minutes	(DOK 1-4)
Next steps/questions	20 minutes	(DOK 1-4)

Purpose and Goal

Purpose: To provide administrators and teachers with information about Depth of Knowledge for the classroom
(DOK 1)

Goal: Model practical DOK information and techniques for the classroom.
(DOK 2)

Background Information about Depth of Knowledge

- Adapted from the model developed and employed by Dr. Norman Webb, University of Wisconsin, to align standards with assessments. (DOK 3)
- Currently the alignment model is used for alignment in more than twenty-two states. (DOK 1)
- Nevada began to assimilate DOK into the state assessment program in January of 2008. (DOK 4)

What is Depth of Knowledge?

DOK measures the degree to which the knowledge elicited from students on tasks (assessments, classroom projects or problems) is as complex as what students are expected to know and do as stated in the state standards.

-- Norman Webb

Purpose of the Alignment Process

- Ensure that the intent of the standard and the level of student demonstration required by that standard matches the assessment items as required under NCLB.
- Has guided Nevada in determining the “essence” of the DOK level for each standard and prioritized strands (indicators, theme, and benchmark) in each content area for the state assessments.
- Has provided a consistent framework across and within content areas for alignment and curriculum purposes.

Grade 5 CRT Item Specifications – Data Analysis

Content Standard 5.0 Students will collect, organize, display, interpret, and analyze data to determine statistical relationships and probability projections to solve problems, communicate, reason, and make connections within and beyond the field of mathematics.

“Enduring and Important Knowledge” identified in previous grade-levels may be included within the context of some problems.

Assessed Indicators	Depth of Knowledge Essence (*)	Item Specifications and Assessment Development Notes
<p>5.5.1 Data Collection and Organization <i>Pose questions that can be used to guide the collection of categorical and numerical data.</i> <i>(Not tested on state CRT)</i> Organize and represent data using a variety of graphical representations including stem-and-leaf plots and histograms.</p>	<p align="center">DOK 2</p>	<p>Data displays may include tables/charts, single and double bar graphs, number lines, frequency tables, pictographs, line plots, stem-and-leaf plots, or histograms. Histograms must use ranges on the horizontal axis. Items may ask students to select the correct data display given a set of data. Items may demand computation prior to creating the display. Items may ask students to read a display. Constructed Response Items may ask students to construct a data display that represents a given set of data.</p>
<p>5.5.2 Central Tendency Compute range. Model and compute the measures of central tendency for mean, median, and mode</p>	<p align="center">DOK 1</p>	<p>Items assessing mean may include up to six data points. Items assessing median, mode, or range may contain up to ten data points. Items assessing mode must use a data set that has exactly one mode. Data sets may only be shown in a list or in a table/chart.</p>
<p>5.5.3 Interpretation of Data Interpret data and make predictions using stem-and-leaf plots and histograms.</p>	<p align="center">DOK 2</p>	<p>Items that ask students to interpret data and make predictions are limited to stem-and-leaf, histograms and frequency tables. Histograms must use ranges on the horizontal axis. Items may ask students to make an inference or prediction based on a data display. Items may ask students to compare data in a data display or to perform calculations to answer questions about a data display (e.g., How many more students chose blue than red?).</p>
<p>5.5.4 Combinations Represent and solve problems involving combinations using a variety of methods.</p>	<p align="center">DOK 2</p>	<p>Items may ask students to identify all possible outcomes of an activity with 1 or 2 events. Outcomes may be listed using tree diagrams and lists. Activities may include up to 12 possible outcomes. Items may ask a question about a sample space represented by a diagram or an organized list</p>

Where Does DOK Fit into the Big Picture of Aligning Assessments?

There are five aspects of assessment alignment:

1. **Categorical Concurrence** This means that there is a good balance of items per standard.
2. **Depth of Knowledge Consistency** This means that there is a good distribution of items at the various levels of complexity.
3. **Range of Knowledge Correspondence** This means that items on the assessment may have a depth of knowledge level beyond or below what the coded essence is for the state indicators.
4. **Balance of Representation** This means that the objectives under a standard are properly represented.
5. **Source of Challenge** This means the primary essence of the assessment is related to student's knowledge and skill in the content area as represented in the standards per instruction.

Depth of Knowledge is about intended outcome not difficulty

- DOK is a reference to the **complexity** of mental processing that must occur to respond to a question, perform a task, or generate a product.
- DOK levels can (or cannot) be cumulative: containing DOK 1, DOK 2, and DOK 3 level demands.
- DOK focuses on how **deeply** a student should know the standards of each content at a given grade level based on instruction.

Example of how DOK is about intended outcome not difficulty

- Adding is a mental process.
 - A1 for fact items only.
 - A2 for all other procedures.
- Knowing the rule (algorithm) for adding is the intended outcome that influences the DOK.
 - Once someone learns the “rule” of how to add; $4 + 4$ is DOK 1 and is also easy. (Earlier grades [Grade 3 and 4] set up of the problem pushes item to DOK 2)
 - Adding $4,678,895 + 9,578,885$ is still a DOK 1 but may be more “difficult”.

Depth of Knowledge

- Assigning depth-of-knowledge to assessment items is an essential requirement of alignment analysis.
- There are four levels of depth of knowledge used for all content areas.
- Nevada has adapted Webb's descriptors for DOK to reflect our philosophy.

Nevada Level 1 Descriptors:

Recall and Reproduction

Recall or recognition of a fact and/or information, (definitions, terms, dates, etc.) required to complete a problem or task.

Level 1 Examples

- Which of these is a form of matter? **(Science)**
- Which two words are **homophones** (words that sound the same)? **(Reading)**
- Look at the number below.
6,593
Which digit is in the ones place? **(Math)**

Level 1 Examples (part II)

- Name four periods of classical music. **(Music)**
- Identify one term that is used in both art and language arts. **(Art)**
- Choose the correct punctuation to complete the following sentence: “When did bob get the letter from his grandmother_” **(Writing)**
- Identify which foods contain nutrients which are important in the growth and development of healthy bodies. **(P.E.)**
- Identify the purpose of the Constitution. **(Social Studies)**

Nevada Level 2 Descriptors:

Basic Application of Skills and Concepts

Using information, using conceptual knowledge, selecting and/or applying appropriate procedure(s); includes the engagement of some mental processing beyond recalling or reproducing a response; requires a decision as to how to approach a problem or task.

Level 2 Examples

- Diego buys a greeting card that costs \$1.29 . He pays for the card with two \$1.00 bills and receives the correct amount of money as change. Which group of coins could Diego have received as change? **(Math)**
- Which of these is an example of an animal's instinctive behavior? **(Science)**

Level 2 Examples (part II)

- What steps are needed to edit this paper? **(Writing)**
- Read and perform a simple rhythm. **(Music)**
- Explain Nevada's role in the Civil War. **(Social Studies)**
- The author most likely wrote this passage to: **(Reading)**
- Describe how physical, social, and emotional changes occur during preadolescence. **(Health/P.E.)**

Nevada Level 3 Descriptors:

Strategic Thinking

Requires reasoning, developing a plan for approaching a problem or task, decision making, justification, and complex thinking.

Level 3 Examples

- Tory drew a regular polygon on a piece of paper. She then bisected an angle of the polygon with a line and extended the line through the polygon. This created two polygons with the properties listed below.
 - The sum of the interior angles in each polygon is 360° .
 - Neither polygon has any pairs of parallel sides.

Which of these could be the original regular polygon that Tory drew? **(Math)**

- In September, Alex observed a dry creek in a wildlife area in northwestern Nevada. In February of the next year, water started to flow in the creek, and a small pond formed in the area. By the end of May, the creek was dry again, and the pond was gone.
 - A Identify one possible natural source of the water that flowed in the creek.
 - B Describe the property of water that most likely changed when the pond disappeared.
 - C Explain how some of the water that had been in the pond could return to the source you identified in Part A. **(Science)**

Level 3 Examples (part II)

- Improvise a simple melody. **(Music)**
- What conclusion can be drawn from these three texts? **(Reading)**
- Develop and defend a personal answer to the question, “What is art?” **(Art)**
- Justify the drafting of the Constitution and the effects on the formation of the new nation. **(Social Studies)**
- Write a letter to convince the editor of Interesting Museum Magazine that your selection would be of interest and include information that will support your claim. **(Writing)**

Nevada Level 4 Descriptors:

Extended Thinking

An investigation or application that requires time to research, think, and process multiple conditions of the problem or task; includes non-routine manipulations or connections across disciplines/content areas/multiple sources.

Level 4 Examples

- Analyze an author's craft (e.g., style, bias, literary techniques, point of view) **(Reading)**
- Collect data on the population of your school over the last 10 years. Graph the information. What would you predict the school population will be in six years? What trends do you see in the population? Can you suggest any reasons for these trends? Would enrollment figures suggest a need to increase the size of your school facility in the next 10 years? Why or why not? **(Math)**

Level 4 Examples (part II)

- Compose using two or more parts (harmony, voice, leading, cadence etc...) **(Music)**
- Design a three 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. **(Agricultural Science)**
- Independently research a “big” idea using a variety of sources. Develop the visual idea through a series of sketches. Select media and style and apply elements and principles to communicate a personal perspective through the creation of an original artwork. **(Art)**

Level 4 Examples (part III)

- Apply rights and responsibilities of individuals to events in US history and everyday life. **(Social Studies)**
- Writing a research paper or applying information from one text to another text to develop a persuasive argument **(Writing)**
- Students will identify major factors (price, quality, features) to consider when making consumer decisions and will compare and evaluate products and services based on these factors and justify your decision based on the appropriate factors. **(Health/P.E.)**

DOK (Depth of Knowledge)

Level 3: Strategic Reasoning

- A. Focus is on reasoning & planning in order to respond (e.g., write an essay, apply in new/novel situation).
- B. Complex and abstract thinking is required.
- C. Often need to provide support for reasoning or conclusions drawn.
- D. More than one "correct" response or approach is often possible.

Level 1: Recall

- A. Focus is on specific facts, definitions, details, or using routine procedures (measure, divide, follow recipe, etc.)
- B. Explaining "that..."
- C. Can be "difficult" without requiring "deep" content knowledge to respond to item (memorize a complex theory without being able to explain its meaning or apply it to a real work situation)
- D. Combination of level ones does NOT = level 2.
- E. One right answer

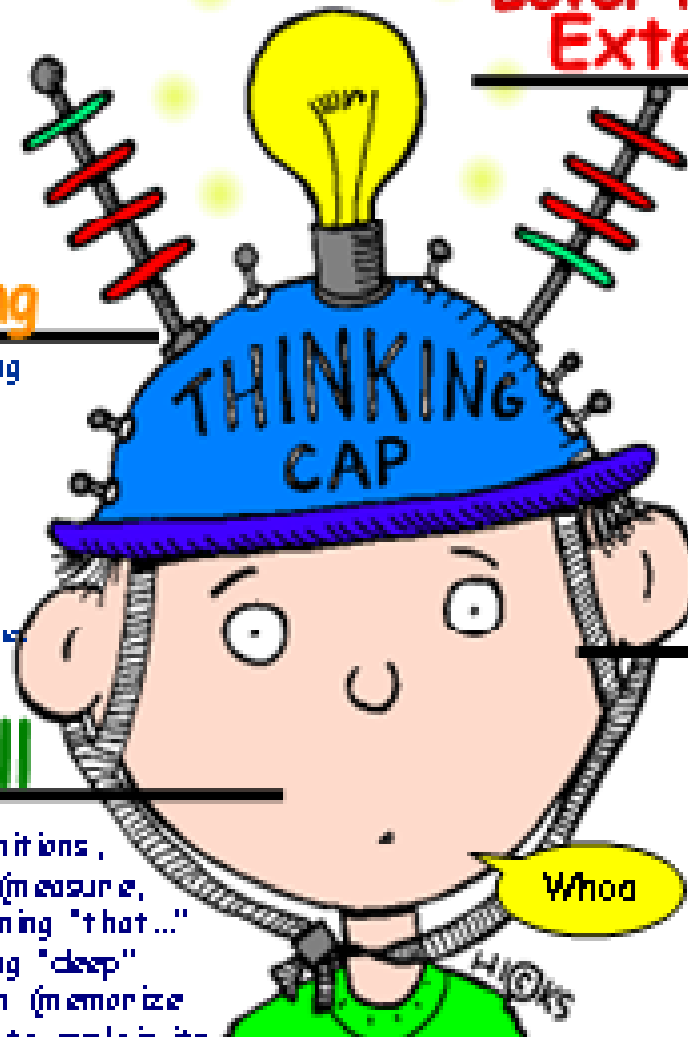
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Level 4: Extended Reasoning

- A. Requires complex reasoning, planning, and thinking (generally over extended periods of time) for the investigation.
- B. Assessment activities have multiple steps with extended time provided.
- C. Students may be asked to relate concepts within the content area and among other content areas.
- D. Students make real-world applications in new situations.

Level 2: Skill/Concept

- A. Focus is on applying skills and concepts (in a familiar/typical situation), relationships (compare, cause-effect), main ideas.
- B. Requires deeper knowledge than definition
- C. Explaining how or why
- D. Making decisions
- E. Estimating, interpreting in order to respond
- F. One right answer



"He who learns but does not think, is lost!
He who thinks but does not learn
is in great danger." Confucius

The Power of the Verb

- Depth of Knowledge is **NOT** determined by the verb, but the context in which the verb is used and the depth of thinking required.
- Remember DOK 1 + DOK 1 + DOK 1 = DOK 1.
- DOK is about **complexity**, not difficulty.

Same verb—three DOK levels

- ❖ **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)**
- ❖ **DOK 2- Describe** the difference between metamorphic and sedimentary rocks. **(requires cognitive processing to determine the differences in the two rock types)**
- ❖ **DOK 1- Describe** three characteristics of metamorphic rocks. **(simple recall)**

BLOOM'S TAXONOMY	WEBB'S DEPTH OF KNOWLEDGE
<p>KNOWLEDGE "The recall of specifics and universals, involving little more than bringing to mind the appropriate material"</p>	
<p>COMPREHENSION "Ability to process knowledge on a low level such that the knowledge can be reproduced or communicated without a verbatim repetition."</p>	<p><i>Recall</i> – Recall of a fact, information, or procedure (e.g., What are 3 critical skill cues for the overhand throw?)</p>
<p>APPLICATION "The use of abstractions in concrete situations."</p>	<p><i>Basic Application of Skill/Concept</i> – Use of information, conceptual knowledge, procedures, two or more steps, etc. (e.g., Explain why each skill cue is important to the overhand throw. "By stepping forward you are able to throw the ball further.")</p>
<p>ANALYSIS "The breakdown of a situation into its component parts."</p>	<p><i>Strategic Thinking</i> – Requires reasoning, developing a plan or sequence of steps; has some complexity; more than one possible answer; generally takes less than 10 minutes to do (e.g., Design 2 different plays in basketball and explain what different skills are needed and when the plays should be carried out.)</p>
<p>SYNTHESIS AND EVALUATION "Putting together elements & parts to form a whole, then making value judgments about the method."</p>	<p><i>Extended Thinking</i> – Requires an investigation; time to think and process multiple conditions of the problem or task; and more than 10 minutes to do non-routine manipulations (e.g., Analyze 3 different tennis, racquetball, and badminton strokes for similarities, differences, and purposes. Then, discuss the relationship between the mechanics of the stroke and the strategy for using the stroke during game play.)</p>

Remember...

- DOK is a scale of cognitive demand.
- DOK requires looking at the assessment item in order to determine the appropriate coded level.
- The DOK level describes the kind of thinking involved in a task, not the likelihood that the task will be completed correctly.
- The context of the assessment item must be considered to determine the DOK level - **not** just a look at what verb was chosen.

Hands-on DOK Coding Activity I



DOK in our lives:

- Independently code the items for DOK in our lives using the Nevada descriptors.
- With a partner compare your coding and come to a consensus on the coding.
- Whole group debrief.

Hands-on DOK Coding Activity II

DOK in the classroom:

- Independently code the items for DOK in our lives using the Nevada descriptors.
- With a partner compare your coding and come to a **consensus** on the coding.
- Whole group debrief and discussion on decisions made and listen to the various justifications given.
- Whole group consensus.



Hands-on DOK Coding Activity III



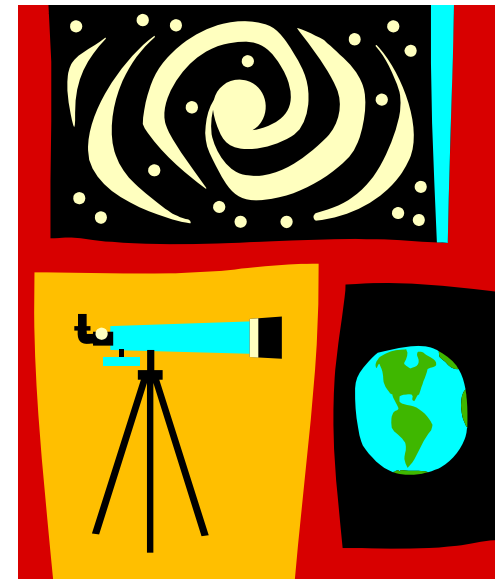
DOK assessment coding:

- Using examples from the Math Instructional Materials independently code these examples using Nevada DOK descriptors.
- For teacher practice use the Science Instructional Materials found on the NDE website www.doe.nv.gov.
- For teacher practice use the ELA examples found on the NDE website www.doe.nv.gov.
- Share Nevada Item Writers Code Justifications.

Hands-on DOK Coding Activity IV

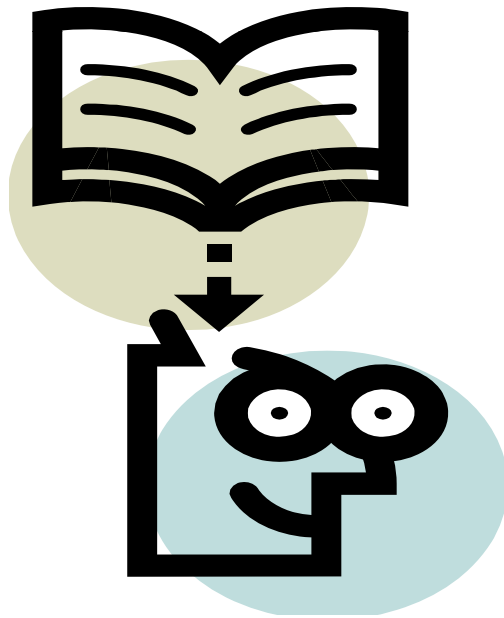
Writing and coding of DOK personal examples for the Museum walk:

- In a small group, using the Mathematics DOK descriptors **write** and **code** 3 items (one-DOK 1, one-DOK 2, and one-DOK 3).
- Place your items on the paper provided and post on the wall **without** your DOK coding.
- Museum walk: using a sticky note travel around the room and place your coding on the different papers.
- Debrief with whole group to determine reason for each groups coding.
- *This process can be duplicated for ELA and Science.*



Hands-on DOK Coding Activity V

DOK in Your Classroom



- Look at the sample textbook question from a Social Studies book.
- Discuss potential DOK codes.
- Share ideas on how you could change the questions to elevate the DOK level of the problems?
- Explore your own textbooks, resources, assessments.

The Silver Bullet

1. ***Teach the Vocabulary of the Standardized Test***
 - 80% to 90% of any test is based on vocabulary
 - Use graphic models
2. ***Use Context for Teaching***
 - Previous knowledge or experience
 - The test-taking context
 - Use other retrieval systems

Relevant Research

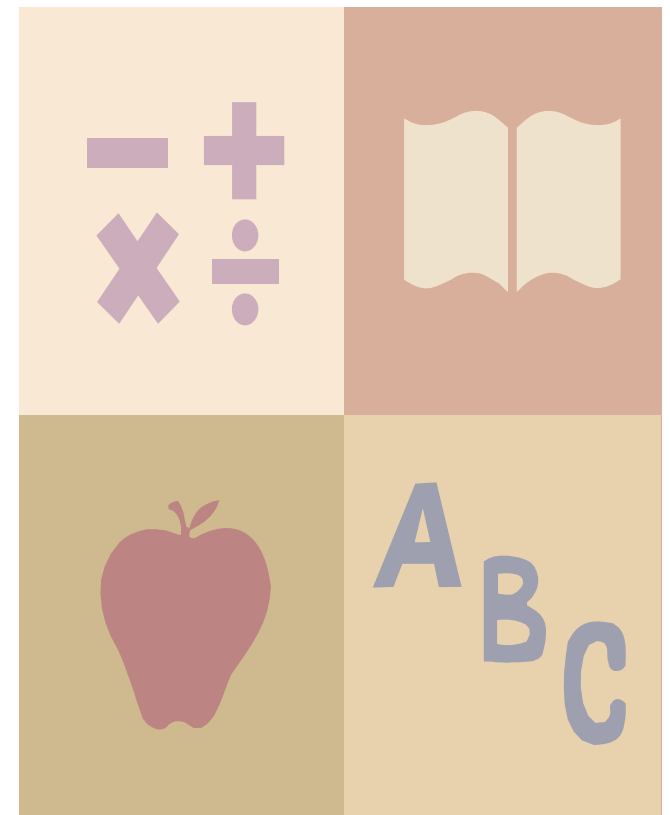


- Systematic vocabulary instruction is one of the most important instructional interventions that teachers can use. (Becker, 1977)
- Student achievement will increase when vocabulary instruction focuses on key words. (Stahl and Fairbanks, 1986)

Navigation of Academic Language

Students have two or three models in which they must navigate within the classroom:

- **Native** (home) language
- **Academic** (school) language
- **Technical** (content) language of the specific content area



High Frequency Test Vocabulary Elementary Grades (Grades 3 – 6)

<p>Combination (6) Comment (5) Compare (5) Complete (3) Consider (5) Create (6) Define (6) Demonstrates (5) Design (4) Detail (5) Determine (5) Develop (4) Diagram (6) Discover (3) Discuss (5) Display (6) Elaborate (6) Establish (5)</p>	<p>Estimate (6) Examine (4) Expand (6) Explain (3) Explore (4) Find (1) Flow chart (5) Generate (6) Greatest (3) Identify (6) Imagine (3) Insert (6) Interpret (5) Investigate (6) Least (3) Limit (5) Locate (4) Match (3) Measure (4) Obtain (5)</p>	<p>Organize (6) Pattern (4) Persuade (4) Prove (3) Reason (3) Recover (6) Reference (6) Reflect (5) Refuse (3) Research (6) Response (6) Select (5) Solve (4) State (3) Support (4) Unpack (5)</p>
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Closing Questions for YOU!!

- **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 instruction/assessments in the building.
 - Expectations
 - Curriculum Alignment
 - Curriculum Implementation

Questions . . .

- About DOK in the classroom.
- About timeline for DOK.
- About the impact on the assessment at the classroom level as well as the state level.

Thank You !!!

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