Algebra I ECA

Depth of Knowledge PowerPoint

Depth of Knowledge

- Depth of knowledge can vary on a number of dimensions, including
    - level of cognitive complexity of information students should be expected to know,
    - how well they should be able to transfer this knowledge to different contexts,
    - how well they should be able to form generalizations, and
    - how much prerequisite knowledge they must have in order to grasp ideas.

    Source: Webb (1997).

Depth of Knowledge

- The depth of knowledge required by an expectation or in an assessment is related to
  - the number of connections of concepts and ideas a student needs to make in order to produce a response,
  - the level of reasoning, and
  - the use of other self-monitoring processes.

Source: Webb (1997).

Depth of Knowledge vs. Bloom's Taxonomy

Level 1 (Recall)	Knowledge
	Comprehension
Level 2 (Skill/Concept)	Application
Level 3 (Strategic Thinking)	Analysis
Level 4 (Extended Thinking)	Synthesis
	Evaluation

Adapted from Wyoming School Health and Physical Education Network (2002)

Depth of Knowledge Level 1 (Recall)

- Recall of information such as a fact, definition, term, or a simple procedure

- Performing a simple algorithm or applying a formula.
  - 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.

Source: Webb (1999).

Algebra I DOK Level I Example Items

- What is the slope of the graph of y = 3x -2?

- Simplify $(2x^2 + 5x - 1) + (x^2 + 8).$

Depth of Knowledge
Level 2 (Skill/Concept)

- The engagement of some mental processing beyond an habitual response
- Requires students to make some decisions as to how to approach the problem or activity
- 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.

Source: Webb (1999).

Algebra I DOK Level 2 Example Items

- Solve $-3x + 5 = \frac{1}{2}(14x + 6)$.

- Solve the system of equations below.

$$3x - 2y = -7$$

$$-3x + y = 11$$

- Megan bought 7 charms for $31.50. Each charm costs the same amount of money. Write an inequality that can be used to find the maximum amount of charms Megan can buy with $75. What is the maximum amount of charms Megan can buy with $75?

- Graph $y = x^2 + 4x + 1.$

Depth of Knowledge
Level 3 (Strategic Thinking)

- Requires reasoning, planning, using evidence, and a higher level of thinking than the previous two levels.

- Cognitive demands are complex and abstract.

- 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.

Source: Webb (1999).

Algebra I DOK Level 3 Example Items

- Consider the statement: "For any rational number *n*, *n* squared is always greater than *n*." Give a value of *n* that is a counterexample to the given statement.

- The height of a certain insect, in feet, that jumps straight up into the air is modeled by the equation $h = -16t^2 + vt,$ where *t* is the time in seconds after the insect jumps, and *v* is the initial upward velocity of the insect.

  Write an equation that can be used to find the height *h* of this insect, in feet, after *t* seconds if the insect's initial upward velocity is 4 feet per second.

  How many seconds will it take for the insect to hit the ground after it jumps?

Depth of Knowledge
Level 4 (Extended Thinking)

- Requires complex reasoning, planning, developing, and thinking, most likely over an extended period of time.

- 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.

Source: Webb (1999).

Suggestions for the Classroom

- Assign the right amount of "routine" homework with 1 to 2 high level questions

- When practicing a skill in class, post high level questions on the chalkboard

- Problem of the Week (POW)

  -Resources: Textbooks, Test Generators, Dept. Meetings, Internet, etc.

- Have students explain how to solve POWs and other high level questions