

Depth of Knowledge

What is Depth of Knowledge?

Depth of knowledge, or DOK, evaluates the alignment between the depth or complexity of cognitive processing required for a student to complete an assessment task and how well that assessment task aligns with the cognitive complexity expressed in the standards being assessed. The concept of DOK, developed by Norman Webb, breaks down into four levels - explained in the table that follows.

Depth of Knowledge Levels	
Level 1	Ability to recall facts, information and/or procedures
Level 2	Ability to apply the information gained at Level 1 in two or more steps
Level 3	Ability to use strategic thinking, reasoning, or to develop a plan with several steps, with more than one plausible answer – in a short time period
Level 4	Ability to further investigate and think through multiple steps, doing non-routine exercises over an extended period of time

What effects will DOK have on assessment and instruction?

The increased importance of high DOK levels has subject-specific effects on assessment and instruction. In the area of English language arts, there is a new emphasis on text complexity (Krehbiel, 2012). Students are given the opportunity to learn from content-rich informational texts that require close reading and detailed analysis. They are expected to conduct research, to learn and use academic vocabulary, and to craft arguments based on evidence.

In the area of mathematics, there is increased focus on understanding mathematical operations as well as fluently implementing mathematical operations (Briars, 2012). For example, the longstanding practice of memorizing a formula and implementing it to solve a problem may be replaced by learning involving proofs showing why the formula produces the desired result.

How is ATI addressing DOK in item development?

ATI's ongoing program of item development, review, and certification facilitates the construction of items aligned to the Common Core State Standards reflecting a broad range of DOK levels including levels three and four that have been increasingly emphasized in efforts to implement assessment and instruction consistent with the Common Core. ATI has developed a variety of new item types reflecting high DOK levels including: 1) constructed-response items; 2) a broad range of technology-enhanced items; and 3) interdependent item sets accommodating part scores, multiple standards, and multiple subjects.

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ATI has expanded Galileo® item banks focused on the Common Core State Standards. Expansion has included construction of a broad range of items linked to complex content-rich information texts supporting sustained in depth analyses. Strategic reasoning and planning are supported by interdependent item sets that include multiple part scores. For example, an initial item might ask the student to indicate the main idea of a text. Then, a second item might request the student to indicate why this is the main idea.

How can complex skills, many of which cannot be assessed in a single testing period, be measured?

Technology available within Galileo assessment solutions offers a number of ways to measure the achievement of complex skills aligned to Common Core. Items involving analysis and reasoning, available in the current ATI item banks, measure student capabilities and comprehension beyond factual recall. Assessments can be integrated into the instructional process and thereby expanded to cover student performance occurring over time periods that exceed the limited time periods allotted for selected-response tests.

How is ATI addressing alignment with PARCC, SBAC, and AIR?

Currently available selected-response, constructed-response, and technology-enhanced item types within Galileo are reflective of the Partnership for Assessment of Readiness for College and Careers (PARCC), Smarter Balanced Assessment Consortium (SBAC), and American Institutes for Research (AIR) assessment approaches. ATI has constructed and continues to develop and provide users with item types similar to the items released by PARCC, SBAC, and AIR.

For example, one item type in this category is the PARCC-released interdependent item type. The interdependent item type provided by ATI is designed to support several interconnected selected-response items that may be automatically scored using complex algorithms. Other ATI item types resembling items released by PARCC, SBAC, and AIR include constructed-response, performance-based, and technology-enhanced items designed to assess standards that target high DOK levels.

Sample ATI interdependent item set created using the preceding item specification (top), corresponding released PARCC prototype English language arts item (bottom)

The screenshot shows a digital assessment interface. At the top, it displays 'Question 23', 'Test Completion 23 of 24', and buttons for 'Save', 'Calculator', and 'Review & Exit'. The question number '23' is prominently displayed. Below it, a note states: 'This question has two parts. First, answer Part 1. Then, answer Part 2.' The interface is divided into two sections: 'Part 1' and 'Part 2'. Part 1 asks 'What does the prefix "un-" mean?' with four radio button options: A. away, B. not, C. behind, and D. together. Part 2 asks 'Which word contains the prefix "un-"?' with four radio button options: A. under, B. unicorn, C. unhappy, and D. united.

The screenshot shows a 'SAMPLE ITEM' interface. It is divided into 'Part A' and 'Part B'. Part A asks 'What does the word "regal" mean as it is used in the passage?' with four checkbox options: a. generous, b. threatening, c. kingly, and d. uninterested. Part B asks 'Which of the phrases from the passage best helps the reader understand the meaning of "regal"?' with four checkbox options: a. "wagging their tails as they awoke", b. "the wolves, who were shy", c. "their sounds and movements expressed goodwill", and d. "with his head high and his chest out". Below the questions is a 'Passage' section containing text from George, Jean C. Julie of the Wolves (1972) and a note that PARCC is committed to using authentic texts.

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Text References

Are state-level standards and assessments aligned? Wisconsin Center for Education Research
Highlights Fall 1999: 1-3.

Briars, D. J. *The Common Core Transition in Mathematics: What States, Districts and Schools Can Do Now* April 2012: 10-11.

Krehbiel, C. *The Common Core Transition in English Language Arts: What Districts, Schools and Teachers Can Do Now* April 2012: 8-9.

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