

Protocol for Common Core State Standards - Mathematics

Determining the Cognitive Level of a Problem

Lower-Level Demands Memorization Tasks

- Tasks involve either reproducing previously learned facts, rules, formulae, or definitions OR committing facts, rules, formulae or definitions to memory.
- Tasks cannot be solved using procedures because a procedure does not exist or because the time frame in which the task is being completed is too short to use a procedure.
- Tasks are not ambiguous—such tasks involve exact reproduction of previously seen material, and what is to be reproduced is clearly and directly stated.
- Tasks have no connection to the concepts or meaning that underlies the facts, rules, formulae, or definitions being learned or reproduced.

Higher-Level Demands Procedures With Connections Tasks

- Tasks focus students attention on the use of procedures for the purpose of developing deeper levels of understanding of mathematical concepts and ideas.
- Tasks suggest pathways to follow (explicitly or implicitly) that are broad general procedures that have close connections to underlying conceptual ideas as opposed to narrow algorithms that are opaque with respect to underlying concepts.
- Tasks usually are represented in multiple ways (e.g., visual diagrams, manipulatives, symbols, problem situations). Making connections among multiple representations helps develop meaning.
- Tasks require some degree of cognitive effort. Although general procedures may be followed, they cannot be followed mindlessly. Students need to engage with conceptual ideas that underlie the procedures in order to successfully complete the task and develop understanding.

Lower-Level Demands Procedures Without Connections

- Tasks are algorithmic. Use of the procedure is either specifically called for its use is evident based on prior instruction, experience, or placement of the task.
- Tasks require limited cognitive demand for successful completion. There is little ambiguity about what needs to be done and how to do it.
- Tasks have no connection to the concepts or meaning that underlie the procedure being used.
- are focused on producing correct answers rather than developing mathematical understanding
- Tasks require no explanations, or explanations that focus solely on describing the procedure that was used.

Higher-Level Demands Doing Mathematical Tasks

- Tasks require complex and non-algorithmic thinking (i.e., there is not a predictable, well-rehearsed approach or pathway explicitly suggested by the task, task instructions, or a worked-out example).
- Tasks require students to explore and understand the nature of mathematical concepts, processes, or relationships.
- Tasks demand self-monitoring or self-regulation of one's own cognitive processes.
- Tasks require students to access relevant knowledge and experiences and make appropriate use of them in working through the task.
- Tasks require students to analyze the task and actively examine task constraints that may limit possible solution strategies and solutions.
- Tasks require considerable cognitive effort and may involve some level of anxiety for the student because of the unpredictable nature of the solution process required.