Assessing Modeling Tasks and Student Engagement with the Modeling Process

From Abel, Baird, Hirst, & Salinas (2016). For more information please contact Dr. Todd Abel, Appalachian State University, Boone, NC [abelta@appstate.edu].

Formulate

	Level A	Level B	Level C
Task	• Presents well-defined goals and questions • Provides Variables, constants, and assumptions • Provides or directs the process of mathematization	• Suggests questions and goals if not given OR provides questions and goals but requires explanation • Suggests mathematization if not given or requires explanation if given • Requires students to identify assumptions	• Provides situation but allows for clarification of goals and questions • Requires students to identify assumptions, variables, and resulting mathematization • Allows for a variety of formulations based on context
Student Work	• Explains rationale for assumptions and questions • Demonstrates understanding of why the particular mathematization was appropriate	• Demonstrates understanding of mathematizaation, either by adapting or explaining existing ones • Identifies all assumptions implicit in the mathematization	• Creates a precise and well-formed modeling question • Explains the assumptions made and identifies variables • Creates a correct mathematization within the context

Compute

	Level A	Level B	Level C
Task	• Directs computations that are procedural in nature • Prescribes and directs technology use	• Limits but does not prescribe computation methods • Provides multiple but limited solution paths • Guides but does not prescribe students use of technology	• Allows for multiple computation methods and technologies • Applies a broad range of math • Provides insight into mathematics concepts through computation methods
Student Work	• Evaluates or computes correctly following directed steps	• Chooses appropriate computation method and provides support for choice • Implements chosen computation method accurately	• Selects and explains computation method based upon comparison possible solution techniques • Produces procedurally and conceptually accurate computation

Validate

	Level A	Level B	Level C
Task	• Prompts minimally or not at all for reevaluating the components of the model (question, assumptions, variables, math models, computation, solution)	•Prompts students to consider other possible approaches and review the usefulness of their model	• Motivates students to consider whether the situation can be approached in other ways • Prompts analysis of solutions for sensitivity, efficiency, and sources of error
Student Work	• Demonstrates consideration of whether the solution answers the original question	• Shows evidence of reflection on correctness and challenges computations and answers • Demonstrates evidence of what is wrong, what is correct, and if other solutions are possible	• Includes assessment of assumptions and questions • Analyzes sources of error, precision, accuracy, sensitivity, efficiency, and generalizability

Interpret

	Level A	Level B	Level C
Task	• Requires straightforward or cursory interpretation of mathematical answers	• Prompts students to interpret answers in context and reflect on reasonableness of answers • Motivates students to assess computation	• Requires interpretation of answers in context and reflection on implications within the context • Prompts consideration of other solution methods
Student Work	• Provides solution with correct units or within the correct context	• Provides the solution with correct units in context and shows capacity to explain • Assesses the reasonableness of the answer	• Provides the solution in context and demonstrates consideration of whether question was answered, whether the answer makes sense, and whether computations need to be revisited