STEM TEACHING TOOL #30

Integrating Science Practices Into Assessment Tasks

The Next Generation Science Standards call for the development of "three-dimensional science proficiency," that is, students' integrated understanding of disciplinary core ideas, science and engineering practices, and crosscutting concepts. Assess three-dimensional science proficiency requires *multicomponent tasks* (National Research Council, 2014). These are a set of prompts linked by a common scenario, phenomenon, or engineering design challenge.

Developing three-dimensional science assessments is challenging. Most current assessments focus on testing students' knowledge of science facts. Few focus on having students apply their understanding of disciplinary core ideas in the context of engaging in a science or engineering practice. Fewer still make connections to crosscutting concepts.

The "task format" templates included in this document are tools to help teachers and district leaders design three-dimensional assessment tasks. They are based on the language of *A Framework for K-12 Science Education* and the NGSS Evidence Statements, focusing on all eight science practices and two engineering practices. These task formats represent different ways that assessment tasks can be written to engage students in science practice. They do not specify precisely which disciplinary core ideas are to be integrated into tasks, which would be determined by the team designing the assessments.

The different formats get at different aspects of a given science and engineering practice. Some formats are likely to be more demanding cognitively for students than others. The idea of presenting multiple formats is to give task developers a sense of the range of tasks that can be written. A good "test" of a student's grasp of a particular practice, in the context of a disciplinary core idea and crosscutting concept, would be comprised of multiple tasks and draw on multiple formats.

How to Read a Template Task

Scenario presented to students

Format	Task Requirements for Students
1	Present students with a textual description of an investigation of an observable phenomenon, *then* Ask students to formulate a scientific question relevant to Investigating that phenomenon.

Task(s) for students to complete

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Potential Task Formats: Asking Questions (Science)

Format	Task Requirements for Students
1	Present students with a scenario that describes a phenomenon using text, images, video, and/or data, *then* Ask students to select from a list of questions to identify which ones can be investigated.
2	Present students with a scenario that describes a phenomenon using text, images, video, and/or data, *then* Ask students to ask questions about the phenomenon based on their observations of the information in the scenario to gather more information, *and/or* Ask students to formulate scientific questions to investigate that phenomenon.
3	Present students with a scenario that describes a phenomenon using text, images, video, and/or data, *then* Ask students to generate a scientific question relevant to investigating that phenomenon, *and* Ask students to describe what evidence is needed to answer the question they generated.
4	Present students with a scenario that describes a phenomenon using text, images, video, and/or data, and a scientific question, *then* Ask students to evaluate whether or not the question is relevant to explaining the phenomenon, *and* If the question is relevant, ask students to describe what evidence is needed to answer that question.
5	Present students with a scenario that describes a phenomenon using text, images, video, and/or data, and a research question, *then* Ask students what questions we need to answer along the way to answer the research question, Ask students to describe what evidence is needed to answer those questions might and how they help build toward an explanation of the phenomenon, *or* Ask students to ask questions about unexpected results.
6	Present students with a scenario that describes an investigation of an observable phenomenon, a research question, and a set of data and findings, *then* Ask students to formulate a follow-up question to extend the investigation.
7	Present students with a scenario that describes an investigation of an observable phenomenon, a research question, *then* Ask students to revise the question to make it investigable with available resources in the classroom.

8	Present students with a scenario that describes an investigation of an observable phenomenon and with a question or a set of questions, *then* Ask students to evaluate and explain whether or not the question(s) is empirically testable.
9	Present students with a scenario of a scientific argument in the context of an investigation, *then* Ask students to generate questions they would ask to clarify the argument or to ask for elaboration of the ideas presented in the argument.
10	Present students with a scenario that describes a phenomenon using text and/or and a model of the phenomenon, *then* Ask students what questions they need to answer to clarify or determine the components and interactions/relationships in the model, and Ask students to explain how those questions will add information necessary for the model to adequately explain the phenomenon.