##  SCILLSS Classroom Science Assessment Workshop

**Facilitator Guidance to Support Activities**

Key ideas, guiding questions, and/or strategies are listed to guide facilitators as they support educators in the completion of activities and discussion related to the development of classroom science assessments using a principled-design approach. Information is organized by the following topics: Unpacking Tool, Task Specifications Tool, Development of Classroom Assessment Task, Development of Rubrics, and Development of Student Exemplars.

## Unpacking Tool

### Activity Guidance

* Help guide educators to complete an unpacking tool for the designated performance expectation(s) (PE).
* Familiarize yourself with the chosen PE(s) and dimensions for your grade or grade band.
* Facilitate discussions related to key aspects and prior knowledge required for each dimension (disciplinary core ideas (DCIs), crosscutting concepts (CCCs), and science and engineering practices (SEPs)).

### Key Ideas

* Unpacking the dimensions of each PE provides a clear focus for what is to be measured and helps educators to plan for assessment.
* The Unpacking Tool requires you to think critically about the three dimensions of the PEs and what they really mean.
* The tool asks educators to consider key aspects and prior knowledge of each dimension as well as the relationship between the CCC and SEP.
* The Unpacking Tool can be a bit time intensive, but the benefit is that once you have done it, you have it. It remains a living document and can be used as a reference or resource that you could share within a building.

### Guiding Questions

* How are the three dimensions interconnected in the PE?
* What are the skills that are associated with a PE?
* What science learning would you expect students to have acquired in previous grades/previous instruction with respect to the three dimensions of the assessed PE?

### Strategies

* Prompt educators to use the following strategies:
	+ Use all of the suggested resources and their knowledge and experience.
	+ Divide out the CCCs, SEPs, and DCIs, and ask what the expectations within those dimensions mean.
	+ Think about each dimension separately to ensure that when the dimensions are brought back together, they are all reflected in the assessment task.
		- The reason for doing this is to ensure that the resulting task focuses on all these dimensions and assesses students’ ability to apply their understanding of the dimensions to explain phenomena or solve problems.
	+ Identify the key aspects within each of the three dimensions that are in the PE but are not entirely explicit.
		- These are the underlying concepts that support each dimension of the PE and represent knowledge necessary for understanding or investigating more complex ideas and solving problems.
	+ Consider the prior knowledge or the background knowledge that is expected of students to develop an understanding of the SEP and DCI.
* Consider the relationships between the CCC and the SEP. When students are performing a SEP, they are often addressing one of the CCCs.
	+ - For example, the CCC Scale, Proportion, and Quantity is an essential consideration when deciding how to develop a model (SEP) to describe a phenomenon.

## Task Specifications Tool

### Discussion Guidance

* Familiarize yourself with the Task Specifications Tool to facilitate discussions to understand and complete the elements of the tool.
* Help guide educators to understand the elements of the Task Specifications Tool for the designated PE.
* Facilitate discussions related to the knowledge, skills, and abilities (KSAs), student demonstrations of learning (SDLs), work products (WPs), tasks features (TFs), variable features (VFs), and assessment boundaries (ABs).

### Key Ideas

* Indicates the components needed to be considered by educators to develop a high-quality task.
* Focuses educators on the aspects of the PE (i.e., KSAs) to address in the task.
* Allows educators to determine what counts as evidence for student learning.
* Helps educators make design choices about what information is presented to a student, how it is presented, how the examinee interacts with the tasks, and how responses are provided to create a task.
* Helps educators develop assessment tasks that allow student opportunities to call upon, transfer, and apply learning.
* Gives an overview of the specifications to follow when making decisions about the actual design of the task, without getting into the specifics of the task (Note: Multiple tasks can be created using the Task Specifications Tool).

### Guiding Questions

* + What are the requirements of the task?
	+ What might be covered in the task?
	+ How will students demonstrate their knowledge?
	+ What do tasks look like?
	+ How will the assessment tasks be designed to ensure accessibility by all students (i.e., stimulate interest, present information in different ways, differentiate the ways students express what they know and can do)?
	+ What is the observable evidence of learning a student is expected to demonstrate?
	+ What is the best way to collect evidence of student learning of a PE or an aspect of a PE (e.g., the work product that is the “container” for the observable evidence)?
	+ What are the qualities of student responses that differentiate a sophisticated from a partial understanding?

#### KSAs

* What ideas and skills are associated with a PE?
* What is that the task/items are intended to measure that will determine what the tasks should evidence the task will illicit?
* What KSAs are necessary for students to demonstrate in a task that reflect understanding of PE?
* Are the KSAs consistent with the expectation of the indicated PE/standard?
* Are the KSAs consistent with the key aspects indicated in the Unpacking Tool?

#### Student Demonstrations of Learning and Work Products

* What types of performances will provide evidence that students have learned the KSA(s)?
* How will students demonstrate their learning? What type of responses or artifacts will students produce?
* What are the ways in which students will provide evidence of their learning?
* How does the evidence reflect the selected KSA(s)?
* What are the kinds of behaviors and performances that show what students should know and be able to do after instruction?
* What are the items, situations or stimuli that will elicit evidence of student learning?

#### Task Features, Variable Features, and Assessment Boundaries

* What are the features of task situations that allow students to demonstrate the degree to which expectations have been met?
* What features allow for a range of tasks to be developed at varying levels of complexity which in turn can affect the difficulty of the task?
* What features allow for a variation in the focus of the task?
* What are features of any assessment task that are required to appropriately measure one or more of the KSAs?
* What type of information will be presented and what is the order of presentation?
* What is fixed and what can vary?
* What features should be included to address the characteristics of students such as their interests, familiarity, and provided instruction?
* What information should not be assessed (i.e., related above grade-level ideas and skills)?

### Strategies

* Prompt educators to use the following strategies:
	+ Use all of the suggested resources and their knowledge and experience.
	+ Follow the steps outlined in the Task Specifications Tool to review and gain familiarity with each element.
	+ To complete the KSA(s):
		- Consider the number of KSAs that are required to address the breadth and the dimensions represented in the PE/standard.
		- Consider if the specificity and range of the KSAs is sufficient to support the development of multiple tasks and items within a task.
		- Consider how the KSA(s) support the development and consideration for how students will demonstrate learning.
		- Consider how assessing the KSA(s) will elicit sufficient evidence of student learning to make appropriate inferences about that learning.
	+ To complete the SDLs and WPs:
		- Review the KSA element to gain a complete understanding of what is expected of students to demonstrate to provide evidence that they have learned one or more aspects of a PE.
		- Consider how the type of evidence elicited by the SDLs and WPs ensure that educators can make accurate inferences about student competencies.
		- Consider and evaluate the types and variation of the “vehicles” (i.e., work products) that are intended to contain observable evidence (e.g., a model, an argument, a description, a graph, a chart).
		- Consider how the SDLS and WPs with respect to the assessed KSA(s) will inform educator actions either to 1) continue with the instructional sequence as planned; or 2) adjust the design, delivery, and sequence of instruction.
		- Consider how the SDLs and WPs will inform instructional decisions made at the individual student level, for a small group of students, or at the class level.
		- Consider how the creation of the task is aligned to specific aspect(s) of the PE to be assessed and support the other design choices about what information is presented to a student, how it is presented, how the examinee interacts with the tasks, and how responses are provided.
	+ To complete the TFs, VFs, and ABs:
		- Consider the range and completeness of the task features from which the task writer selects to develop tasks that align to the KSA(s) targeted for assessment.
		- Consider how specific task features will be represented in a single question/task as each may not represent all the features listed.
		- Consider the combination of these elements to vary the complexity or focus of the item.
		- Consider the phenomenon or problem situation that will be included in a scenario or context.
		- Consider the reading level, the amount of reading, the use of graphics, symbols, and equations, etc.
		- Reference the “Clarification Statement” in the NGSS for the PE as appropriate.
		- Review the “Assessment Boundaries” in the NGSS/standards.

## Development of Classroom Assessment Task

### Activity Guidance

* Familiarize yourself with the Task Development Toolto facilitate discussions to complete the task.
* Help guide educators to complete the assessment task for the designated PE.
* Facilitate discussions that require educators to consider the evidence/artifacts that need to be elicited by the task that will show what students know and can do.
* Consider possible scenarios, phenomena, or design problems.
* Facilitate discussions related to the KSAs, SDLs, and the WPs for the task.

### Key Ideas

* A well-constructed assessment task generates meaningful information about students’ science learning by providing students opportunities to demonstrate what and how well they have learned with respect to a PE or part of that PE through observed behaviors, work products, or performances.
* A three-dimensional assessment task must elicit evidence related to students’ integration of knowledge of DCIs, engagement with SEPs, and facility with building connections across ideas (CCCs).[[1]](#footnote-1)
* The task may necessarily be comprised of multiple items to elicit evidence that provides specific information about student understanding and competence of the three dimensions as they relate to a PE (e.g., core ideas, representing data, interpreting data, engaging in argument from evidence).
* A single item may not be sufficient to elicit evidence to allow educators to identify where students may have misunderstandings and need additional instruction.
* When evaluating a task, ensure that educators:
	+ Check each item and item question to determine alignment to KSAs and task specifications.
	+ Check that the items require students to demonstrate understanding of the grade-appropriate elements of the SEPs, CCCs, and DCIs.
	+ Check that the items require students to use SEPs, CCCs, and/or DCIs to interpret evidence and/or models to make, evaluate, support, and/or refute claims about a phenomenon or problem.
	+ Check prompts and scenarios in relation to equity and language issues.

### Guiding Questions

* Based on the assessed KSA(s) and the required collection of student evidence, does the task include/need to include multiple parts, questions, or prompts connected to a phenomenon or problem-solving context or event?
* How will students demonstrate their KSAs?
* What background information (anticipatory set) is necessary to remind the student of the scientific focus and gets the students to begin thinking about what the task is about and generating their prior knowledge?
* What is an appropriate stimulus/context upon which the items within the task are based?

### Strategies

* Have educators integrate the information within and across the assessment development tools to design a task by considering and identifying:
	+ The key aspects addressed by the SEP, DCI, and CCC (*Unpacking Tool*);
	+ The elicited prior knowledge (*Unpacking Tool*);
	+ The relationship between the identified CCC and the SEPs (*Unpacking Tool*);
	+ The KSA(s) from which the task is developed (*Task Specifications Tool*);
	+ The production of responses that allow students to demonstrate learning of the PE (*Task Specifications Tool*);
	+ The attention to required task features (*Task Specifications Tool*);
	+ The student evidence to be collected (*Classroom-based Assessment Task*); and
	+ The full range of student understanding from low to high levels of competency.
* Confirm that the task includes a prompt and a question for the student to respond. In some cases, a model template is provided for the student, but is not required. This may be a place where educators do not want to provide a template because they want the student to come up with his or her own model.
* Ensure task language is at- or below- grade level. Sometimes domain-specific language may be above grade-level, but if it is a term commonly used in classrooms and is one with which students are familiar, using this language might be appropriate to support science learning.
* Remind educators that the “load” of the work should be carried by the student as they complete the task. These questions may result in variations in the amount and type of front-loading that is included in the task.

## Development of Rubrics

### Activity Guidance

* Familiarize yourself with the Rubric DevelopmentTool to facilitate discussions to design the rubric.
* Help guide educators to design a rubric for their task by facilitating discussions that require educators to consider the evidence that needs to be demonstrated to show what students know and can do.
* Facilitate discussions related to the structure of the rubric (i.e., Will it describe the full range of items and consider responses to the task as a whole, or will it score each question within a task?). There are different types of rubrics that you could develop with different degrees of content depending on the intended purpose and use of your task.

***Key Ideas***

* A rubric defines the criteria that educators use to interpret and evaluate student evidence of learning. The scoring rubric should be developed at the same time as the task; it should help highlight what you are actually measuring with the task and help evaluate whether the task allows students to provide evidence that they have attained the KSAs.
* The primary intention for classroom-based assessment rubric is not necessarily to grade or to provide an evaluation, but rather to assess where students are in their learning and understanding and decide what, how and with whom differentiation is needed in instruction. This is not to say that this cannot be graded, but the intent is to encourage formative thinking.
* Educators must consider the type of student evidence that needs to be collected and how to integrate the DCIs, SEPs, and CCCs within their rubrics. It is critical to write a rubric that includes descriptors for each question or prompt in the assessment task that describes the full range of student understanding from low to high levels of competency.

### Guiding Questions

* What is it that you want to understand about your students? What evidence do you need for students to demonstrate what they know and can do?
* Where would you need to adjust your instruction in response to student performance of the criteria in the rubric?
* How might you differentiate your instruction based on how many students fall into each category indicated on the rubric?

### Strategies

* Confirm educators understand the intent of the rubric is designed to be a tool for educators to determine how they might adapt or improve instruction.
* Have educators consider what evidence they need to categorize students to know which students completed the task according to the provided criteria. This will help provide insight into generally how their classes are performing.

## Development of Student Exemplars

### Activity Guidance

* Have educators use their knowledge and experience to draft a high-level/low-level student response.
* Facilitate discussions with educators to draft a response that reflects all the elements of the required evidence for students to show what they know and can do.
* Have educators consider the accuracy as well as the age- and grade-appropriateness of the response.

***Key Ideas***

* Student exemplars demonstrate examples of high-quality student performance. Exemplar responses should be considered age- and grade-appropriate and should yield accurate inferences about students’ KSAs that inform educator actions either to continue with the instructional sequence as planned; or adjust the design, delivery, and sequence of instruction.
* In general, a high-level response is scientifically accurate, complete and coherent, and consistent with the type of student evidence expected. A low-level response may include misconceptions, is incomplete, and is not consistent with the type of evidence expected.

### Guiding Questions

* How would you expect a student at the targeted grade level or age to respond?
* What evidence is required in the response for a student to demonstrate his or her science learning?

### Strategies

* Have educators consider what a typical, correct response would be from a student at the targeted grade or age.
* Remind educators that the language should be age- and grade-appropriate.
* Emphasize that a high-level response is scientifically accurate, complete and coherent, and consistent with the type of student evidence expected.

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1. See National Research Council, 2012; Pellegrino, 2013. [↑](#footnote-ref-1)