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Asking Questions

SEP Sample Rubrics

Asking Questions Continuum *Source: Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students ask questions. Students' questions are typically *scientific* (i.e., answerable through gathering evidence about the natural world).	Students ask questions. Students' questions are both *scientific* and *non-scientific* questions.	Students ask questions, but they are *not typically scientific questions* (i.e., not answerable through the gathering of evidence or about the natural world).	Students ask questions that are not scientific.

Asking Questions Rubric: *Source: CA Science Framework Chapter 9*		
3	**2**	**1**
Question draws on specific evidence in the graphs and could be answered through application of other SEPs (i.e., it is scientifically testable).	Question draws on specific evidence or is scientifically testable but not both.	Question may express curiosity but does not build on evidence presented and is not specific enough to be testable.

Single-Point Rubric: Asking Questions *Adapted from the 9-12 progressions* (Place a checkmark in 1, 2, 3, or 4, then leave feedback if needed)					
Criteria	**1**	**2**	**3**	**4**	**Feedback**
Ask questions to clarify and/or seek additional information					
Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables					
Ask questions that challenge the premise of an argument, the interpretation of a data set, or the suitability of a design					
Evaluate a question to determine if it is testable and relevant					

Developing and Using Models (p. 1 of 2)

SEP Sample Rubrics

Developing and Using Models Continuum *Source: Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students create models focused on *predicting or explaining* the natural world. Students *do evaluate* the merits and limitations of the model.	Students create models focused on *predicting or explaining* the natural world. Students *do not evaluate* the merits and limitations of the model.	Students create models. Students' models focus on *describing* natural phenomena rather than predicting or explaining the natural world. Students *do not evaluate* the merits and limitations of the model.	Students observe models and/or diagrams and can describe them.

Developing and Using Models Rubric: *Source: CA Science Framework Chapter 9*	
6	Systemic: Students have a systemic understanding of science concepts
5	Complex: Students understand how more than two science concepts interact in a given context
4	Basic: Students understand how two scientific concepts interact in a given context
3	Partial: Students recognize potential connections between concepts but cannot elaborate the nature of the connections specific to a given context
2	Isolated: Students have relevant ideas but do not connect them in a given context
1	Irrelevant: Students have irrelevant ideas in a given context

Developing and Using Models Rubric			
4	**3**	**2**	**1**
I can create a clear and detailed model that accurately represents necessary components with labels. I can represent all the scientific processes and complex relationships to predict or explain how or why the phenomenon occurs. I can use ideas from a Crosscutting Concept.	I can create a clear model that accurately represents necessary components with labels. I can sufficiently represent the scientific processes and/or relationships to predict or explain how or why the phenomenon occurs.	I can create a model that accurately represents components with labels. I can partially represent the relationships between components in the phenomenon/system.	I can create a model with partial accuracy that represents components and labels relevant to the phenomenon/system. (No relationships)

SEP Sample Rubrics

Developing and Using Models General look-fors: ☐ Response accurately represents the phenomenon ☐ Response includes an explanation of relevant DCIs and CCCs represented by the model, or a prediction based on the relationships between ideas and concepts represented by the model. ☐ A model can be a diagram, drawing, physical replica, diorama, dramatization, storyboard, or any other graphical, verbal, or mathematical representation. It may include labels or other written text as required by the prompt.				
4 Complete and correct	**3** Almost there	**2** On the way	**1** Getting started	**0**
The student's model completely and accurately represents the **components, relationships, and mechanisms** of the phenomenon, AND the student uses it to develop a **complete and correct** explanation or prediction.	The student's model completely and accurately represents the **components, relationships, and mechanisms** of the phenomenon, AND includes a **mostly** correct use of the model to create an explanation or prediction.	The student's model represents **components** of the phenomenon, AND includes a **partially correct** representation of the relationships or mechanisms associated with the phenomenon.	The student's model represents components of the phenomenon BUT provides **little or no evidence of the relationships or mechanisms** associated with the phenomenon.	The students' analysis is missing, illegible, or irrelevant to the investigation.

Planning and Carrying out Investigations (p. 1 of 2)

SEP Sample Rubrics

Planning and Carrying Out Investigations Continuum
Source: Science Practices Continuum from ILSP

4	3	2	1
Students *design **and** conduct* investigations to gather data. **Students make decisions** about experimental variables, controls, ***and*** investigational methods (e.g., number of trials).	Students *design **or** conduct* investigations to gather data. **Students make decisions** about experimental variables, controls, ***or*** investigational methods (e.g., number of trials).	Students conduct investigations, but these opportunities are typically ***teacher-driven***. Students do *not* make decisions about experimental variables or investigational methods (e.g., number of trials).	Students follow specific, step-by-step directions from the teacher in order to perform a lab activity.

Planning and Carrying Out Investigations Checklist
Source: CA Science Framework Chapter 9

- ☐ Recognition that an experiment can be done to test the claim (versus simply reading the product label)
- ☐ Identification of what variable is manipulated (independent variable is...)
- ☐ Identification of what variable is measured (dependent variable is...)
- ☐ Description of how dependent variable is measured
- ☐ Realization that there is one other variable that must be held constant (versus no mention)
- ☐ Understanding of the placebo effect
- ☐ Realization that there are many variables that must be held constant (versus only one or no mention)
- ☐ Understanding that the larger the sample size or number of subjects, the better the data
- ☐ Understanding that the experiment needs to be repeated
- ☐ Awareness that one can never prove a hypothesis, that one can never be 100 percent sure, that there might be another experiment that could be done that would disprove the hypothesis, that there are possible sources of error, that there are limits to generalizing the conclusions (credit for any of these)

Planning and Carrying out Investigations (p. 2 of 2)

SEP Sample Rubrics

Planning and Carrying Out Investigations Rubric			
4	**3**	**2**	**1**
I can design my own complete investigation to gather data on a scientific question, taking into consideration the constraints of classroom equipment, and I can justify design decisions.	I can design some aspects of an investigation to gather data on a scientific question (e.g., variables, controls, tools, and/or investigative methods) and I can justify those decisions.	I can identify important aspects of the design of an investigation planned by someone else (e.g., variables, constants), and explain why they are important.	I can identify some important aspects of the design of an investigation planned by someone else (e.g., variables, constants).

Planning and Carrying Out Investigations

- ☐ Response describes the data to be collected.
- ☐ Response describes appropriate tools and methods for collecting the data.
- ☐ Response includes appropriate variables and controls related to the CCCs and DCIs being investigated.

4 - Complete and correct	**3 -** Almost there	**2 -** On the way	**1 -** Getting started	**0**
The student's plan/investigation is appropriate and includes **all** essential elements, with no errors or omissions.	The student's plan/investigation is appropriate and includes **most** essential elements, BUT has one or more **minor to moderate omissions** and/or **errors**.	The student's plan/investigation has a basic plan, with two or more elements appropriate to the goal of the investigation, BUT has one or more **significant omissions** and/or **errors**.	The student's plan/investigation has **at least one element** relevant to the goal of the investigation, BUT is **generally incorrect** or missing multiple components essential to the goal of the investigation.	The students' analysis is missing, illegible, or irrelevant to the investigation.

*Based on the prompt, essential elements may include:

- ☐ Phenomenon under investigation
- ☐ Goal of the investigation
- ☐ Descriptions of data to be collected
- ☐ How the data relates to the investigation
- ☑ ~~Methods and tools used to collect or measure data~~
- ☐ Systemic collecting and recording of data
- ☐ Identification of tested (independent, dependent) and controlled variables
- ☐ Indication of whether the investigation will be conducted individually or collaboratively
- ☐ Evaluation and revision of the investigation

Analyzing and Interpreting Data

SEP Sample Rubrics

Analyzing and Interpreting Data

- ☐ Response describes patterns and trends in data.
- ☐ Response interprets patterns and trends, using CCCs and DCIs to describe possible causal relationships.

4 Complete and correct	**3** Almost there	**2** On the way	**1** Getting started	**0**
The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes patterns in the data, and **interprets** them completely and correctly to identify and describe relationships. When appropriate, the student: ● Makes distinctions between causation and correlation. ● States how biases and errors may affect interpretation of the data.	The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes patterns in the data, BUT **incorrectly and/or incompletely interprets them** to identify and describe relationships.	The student analyzes the data with appropriate tools, techniques, and reasoning. The student identifies and describes, BUT **does not interpret**, patterns and relationships	The student attempts to analyze the data BUT does **not use appropriate tools, techniques, and/or reasoning** to identify and describe patterns and relationships.	The students' analysis is missing, illegible, or irrelevant to the investigation.

Analyzing and Interpreting Data Continuum: *Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students *make decisions* about how to analyze data (e.g. table or graph) and work with the data to create the representation. Students make sense of data by *recognizing patterns or relationships* in the natural world.	Students work with data to organize or group the data in a table or graph. Students make sense of data by *recognizing patterns or relationships* in the natural world.	Students work with data to organize or group the data in a table or graph. However, students *do not recognize patterns or relationships* in the natural world.	Students record data, but do not analyze data.

Using Mathematics and Computational Thinking

SEP Sample Rubrics

Using Mathematics and Computational Thinking Continuum *Source: Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students *make decisions* about what mathematical skills or concepts to use. Students use mathematical skills or concepts to answer a scientific question.	Students use mathematical skills or concepts to *answer a scientific question*.	Students use mathematical skills or concepts but these are *not connected to answering a scientific question*.	Students follow step-by-step teacher directions to use math skills.

Single-Point Rubric: Using Mathematics and Computational Thinking *Adapted from the 9-12 progressions* (Place a checkmark in 1, 2, 3, or 4, then leave feedback if needed)					
Criteria	**1**	**2**	**3**	**4**	**Feedback**
Decide if qualitative or quantitative data are best.					
Use mathematical, computational, and/or algorithmic representations of phenomena.					
Apply the following as applicable: ● Algebra and functions ● Ratios, rates, percentages, and unit conversions					
Use mathematical expressions or simulations to see if a model “makes sense” by comparing the outcomes with what is known about the real world.					
Create and/or revise a computational model or simulation of a phenomenon, process, or system.					

Constructing Explanations

SEP Sample Rubrics

Constructing Explanations CER Rubric			
4	**3**	**2**	**1**
I can write a clear claim that accurately answers the prompt. I can provide valid evidence that sufficiently supports the claim, using a variety of sources. I can use reasoning (scientific concepts and principles) to explain the phenomenon and the connection between each piece of evidence and the claim.	I can write a clear claim that accurately answers the prompt. I can provide valid evidence that sufficiently supports the claim. I can use reasoning (scientific concepts and principles) to partially explain the phenomenon and the connection between evidence and the claim.	I can write a claim that partially answers the prompt. I can provide valid evidence that partially supports the claim. I can use reasoning (scientific concepts or principles) to partially explain the phenomenon OR the connection between evidence and the claim.	I can write a relevant claim that is unclear or inaccurate. I can provide related evidence that may not support the claim. Reasoning may be inaccurate, unclear, or missing scientific concepts and principles.

Constructing Explanations

- ☐ Response includes relevant evidence, DCIs, and CCCs.
- ☐ Response logically links evidence and concepts to develop a causal mechanism for a phenomenon.
- ☐ Concepts may include models, representations, and/or accepted scientific theories.

4 Complete and correct	**3** Almost there	**2** On the way	**1** Getting started	**0**
The student's explanation: • Is supported by sufficient use of appropriate evidence and concepts AND • **Links** the evidence and concepts to provide a clear and complete **causal mechanism** for the phenomenon.	The student's explanation: • Is supported by sufficient use of appropriate evidence and concepts BUT • **Does not** clearly link the evidence and concepts to provide a complete **causal mechanism** for the phenomenon.	The student's response includes **some use of evidence and concepts** relevant to the phenomenon, BUT some key pieces of evidence and/or concepts are **missing**.	The student's response makes **little to no use of appropriate evidence and concepts** to develop an explanation for the phenomenon.	The students' analysis is missing, illegible, or irrelevant to the investigation.

Designing Solutions & Engineering

SEP Sample Rubrics

Evidence and Trade-Offs Rubric

- ☐ Response uses relevant evidence, DCIs, and CCCs to compare multiple options in order to make a choice.
- ☐ Response takes a position supported by evidence and describes what is given up (traded off) for the chosen option.

4 Complete and correct	**3** Almost there	**2** On the way	**1** Getting started	**0**
The student provides a clear and relevant choice with **appropriate and sufficient** evidence and reasoning, including BOTH: ● A thorough description of the trade-offs of the decision ● Reasons why an alternative choice was rejected	The student provides a clear and relevant choice with appropriate and sufficient evidence and reasoning, BUT **one** of the following are **insufficient**: ● A thorough description of the trade-offs of the decision ● Reasons why an alternative choice was rejected	The student provides a clear and relevant choice BUT evidence and reasoning are **incomplete**.	The student provides a clear and relevant choice BUT provides reasons that are **subjective**, **inaccurate**, or **unscientific**.	The students' analysis is missing, illegible, or irrelevant to the investigation.

Single-Point Rubric: Designing Solutions
Adapted from the 9-12 progressions (Place a checkmark in 1, 2, 3, or 4, then leave feedback if needed)

Criteria	**1**	**2**	**3**	**4**	**Feedback**
Design and refine a solution to a complex real-world problem.					
Define criteria and constraints for a design problem that may include social, technical, and/or environmental considerations.					
Justify a design using scientific knowledge, student-generated sources of evidence, prioritized criteria, and trade-off considerations.					
Make and defend a claim about a design solution that reflects scientific knowledge and student-generated evidence.					
Evaluate competing design solutions to a real-world problem based on scientific ideas, empirical evidence, and/or logical arguments regarding economic, societal, environmental, and ethical factors.					

Engaging in Argument from Evidence

SEP Sample Rubrics

Engaging in Argument from Evidence Continuum *Source: Adapted from Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students engage in ***student-driven*** *argumentation*. The student discourse includes evidence, reasoning that links the evidence to their claim, and ***critique*** of competing arguments during which students build on and question each other's ideas.	Students engage in ***student-driven*** *argumentation*. The student discourse includes *evidence and reasoning* to support their claim. Students also agree and disagree, but rarely engage in critique.	Students engage in argumentation where they support their *claims with evidence or reasoning*, but the discourse is primarily ***teacher-driven***.	Students engage in teacher-driven **components** of argumentation (e.g. filling out the "evidence" section of a CER graphic organizer).

Engaging in Argument from Evidence

- ☐ Response includes a clear and relevant claim.
- ☐ Response includes sufficient evidence, including multiple lines of evidence when appropriate.
- ☐ Reasoning is logical, sufficient, connects the evidence to the claim, and uses relevant CCCs and DCIs.

Part	**4 -** Complete and correct	**3 -** Almost there	**2 -** On the way	**1 -** Getting started
Claim	The student's claim is **clear and relevant.**	The student's claim is **relevant but incomplete**.	The student's claim seems **relevant but is unclear**.	The student's claim is **irrelevant**.
Evidence	The student's evidence supports the claim, is accurate and sufficient, AND **student evaluates the strength** of the evidence in supporting the claim.	The student's evidence is **relevant, accurate, and sufficient**.	The student's evidence is relevant BUT is **incomplete** and/or contains **inaccuracies**.	The student's evidence is **irrelevant** or does not support the claim.
Reasoning	The student's reasoning is **appropriate**, logically **connected** to the claim, and **sufficient**.	The student's reasoning is appropriate and logically connected to the claim BUT is **not sufficient**.	The student's reasoning is scientific BUT is **incomplete** or **not** logically connected to the claim.	The student's reasoning is **non**scientific, does **not** logically support the claim, or does **not** connect claim to evidence.

Obtaining, Evaluating, and Communicating Information

SEP Sample Rubrics

Communicating Concepts and Ideas ☐ Response is clear and effective for the intended audience. ☐ Response presents connections between relevant DCIs and CCCs. ☐ When appropriate, response includes effective use of more than one mode of communication (e.g., oral, textual, graphical, mathematical). ☐ Students are evaluated for the communication, not the reasoning.				
4 Complete and correct	**3** Almost there	**2** On the way	**1** Getting started	**0**
The student communicates clearly and correctly about a phenomenon or problem, presenting **connections** between relevant content ideas and relevant Crosscutting Concepts.	The student communicates clearly and correctly about a phenomenon or problem BUT **does not present connections** between the relevant content ideas and Crosscutting Concepts.	The student communicates about a phenomenon or problem, BUT the response is somewhat **confusing**, and/or contains some **errors**.	The student communicates some information about a phenomenon or problem, BUT the response is **incomplete**, **very confusing**, and/or contains **significant errors**.	The students' analysis is missing, illegible, or irrelevant to the investigation.

Obtaining, Evaluating, and Communicating Information Continuum *Source: Adapted from Science Practices Continuum from ILSP*			
4	**3**	**2**	**1**
Students *read and evaluate* text to obtain scientific information. Students *compare and combine* information from multiple texts considering the strengths of the information and sources.	Students *read and evaluate* text to obtain scientific information. Students do *not* compare or combine information from multiple texts.	Students read text to *obtain* scientific information, but do *not evaluate* this information. Students do *not* compare or combine information from multiple texts.	Students engage in multimedia about science topics (videos, interactives, etc.)