ASET Science & Engineering Practices (SEP) Tool: Asking Questions and Defining Problems

Reviewer Name or ID:
Science Lesson/Unit Title:
Intended grade:

SEP 1	**Asking Questions and Defining Problems:** A practice of science is to ask and refine questions that lead to descriptions and explanations of how the natural and designed world(s) works and which can be empirically tested. Engineering questions clarify problems to determine criteria for successful solutions and identify constraints to solve problems about the designed world. Both scientists and engineers also ask questions to clarify ideas.			
Components of SEP **In this lesson/unit plan, it is clear that *students* have a structured opportunity to:**	**Mark with "x" if present in lesson**	**What teacher actions were taken to facilitate this component for students?**	**What are the students doing?**	***How* is this component reflected in your research/laboratory experience?**
1) Ask questions based on observations and/or other appropriate information of a scientific phenomenon				
2) Generate, identify, and/or evaluate questions that can be systematically investigated (i.e., questions that are testable/investigable/scientific)				
3) Ask questions that challenge the premise of an argument or interpretation of a data set *				
4) [Engineering] Define or describe a problem that can be solved (through an object, tool, process, and/or system)				
Notes on Context/Special Considerations (part of school year, differentiation, student developmental considerations, etc.):				

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ASET Grade Band Criteria *(Grade Bands: 6-8, 9-12)*

Science & Engineering Practices

SEP 1: Asking Questions and Defining Problems: Asking questions and defining problems in 6-8 builds on K-5 experiences and progresses to specify relationships between variables, clarifying arguments and models. In 9-12 they build on these K-8 experiences and progress to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.

*By the end of the grade band **students** will have had a structured opportunity to develop an understanding of each of these. Individual lessons or units should include opportunities for **students** to practice one or more of the following components ……*

	6-8 Grade Band	**9-12 Grade Band**
1) Ask questions based on observations and/or other appropriate information of a scientific phenomenon	Students will: a. generate their own questions **that**: i. are based on observable evidence and prior knowledge ii. arise from careful observation of phenomena, models, or unexpected results b. generate their own questions **to**: i. clarify and/or seek additional information ii. clarify and/or refine a model, an explanation, or an engineering problem	Students will: a. generate their own questions **that**: i. are based on observable evidence and prior knowledge ii. arise from careful observation of phenomena, or unexpected results iii. arise from examining models or a theory b. generate their own questions **to**: i. clarify and/or seek additional information (and relationships) ii. clarify and refine a model, an explanation, or an engineering problem
2) Generate, identify, and/or evaluate questions that can be systematically investigated (i.e., questions that are testable/investigable /scientific)	Students generate questions: a. that can be investigated within the scope of the classroom/school laboratory, outdoor environment, and museums and other public facilities with available resources b. to frame a hypothesis based on observations and scientific principles c. that require sufficient and appropriate empirical evidence to answer d. to determine relationships between independent and dependent variables and relationships in models	Students generate questions: a. that can be investigated within the scope of the classroom/school laboratory, outdoor environment, and museums and other public facilities with available resources b. to frame a hypothesis based on observations, scientific principles, and a model or theory c. that require sufficient and appropriate empirical evidence to answer d. to determine relationships, including quantitative relationships, between independent and dependent variables and relationships in models e. evaluate a question to determine if it is testable and relevant
3) Ask questions that challenge the premise of an argument or interpretation of a	Students ask questions that challenge and/or clarify the premise(s) of an argument or the interpretation of a data set. This includes considering the weight and relevance of evidence provided for a claim and the validity of data being used.	Students ask and/or evaluate questions that challenge and/or clarify the premise(s) of an argument or the interpretation of a data set, or the suitability of the design. This includes considering the weight and relevance of evidence

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data set *		provided for a claim and the validity of data being used.
4) *[Engineering]* Define or describe a problem that can be solved (through an object, tool, process, and/or system)	a. Students define a design problem that: i. can be solved through the development of an object, tool, process or system ii. includes multiple criteria for success and constraints (e.g., materials, time or cost), and scientific knowledge that may limit possible solutions b. Students identify the system in which the problem is embedded, including the: i. major components and relationships in the system ii. system boundaries	a. Students define a design problem that: i. involves the development of a process or system with interacting components and criteria and constraints ii. includes social, technical, and/or environmental considerations b. Students identify the system in which the problem is embedded, including the: i. major components and relationships in the system ii. system boundaries

* This component is not required in K-2 or 3-5 grade bands

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