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

Name or ID:

Lesson/Unit Title:

Intended Grade:

Directions for use

Indicate if a component is present using Y (yes) or N (no) and then, if it is present, fill in the right 2 columns.
A single lesson will most likely not address each of the components below.
The numbering of these components is not meant to indicate they should be used in sequence, they are simply for reference.

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:**	Present? **Y/N**	**What teacher actions were taken to facilitate this component for students?**	**What are the students doing? What sensemaking or intellectual work are students doing?**
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)			

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ASET Grade Band Criteria (Grade Band: 6-8)

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.	
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 ……	
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
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
3) Ask questions that **challenge the premise** of an argument or interpretation of a data set *	**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.
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 relationship**s in the system ii. system **boundaries**

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

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