ASET Science & Engineering Practices (SEP) Tool: Planning and Carrying out Investigations

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

SEP 3	**Planning and Carrying out Investigations:** Scientists and engineers plan and carry out investigations in the field or laboratory, working collaboratively as well as individually. Their investigations are systematic and require clarifying what counts as data and identifying variables or parameters. Engineering investigations identify the effectiveness, efficiency, and durability of designs under different conditions.

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) **Identify the phenomenon** to be investigated and **purpose** of the investigation				
2) Take appropriate **parameters** into account **when planning how to investigate** a scientific question or test a design solution				
3) Make **predictions** and/or **hypotheses** about the outcome of an investigation*				
4) **Conduct** an investigation				
5) **Collect data** to answer a scientific question or test a design solution				
6) **Evaluate** and/or **revise** an experimental design				
Notes on Context/Special Considerations (part of school year, differentiation, student developmental considerations, etc.):				

*This component is based on criteria required at the K-2 and 3-5 grade band. Making predictions/hypothesis may happen at the start of an experiment or towards the end depending on the level of experience students have with the content

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

Science & Engineering Practices		
SEP 3: Planning and Carrying out Investigations: Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions. In 9-12 they build on K-8 experiences and progress to include investigations that provide evidence for and test conceptual, mathematical, physical, and empirical 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 ……*		
	6-8 Grade Band	**9-12 Grade Band**
1) **Identify the phenomenon** to be investigated and **purpose** of the investigation	Students identify the: a. phenomenon under investigation (from a given investigation plan or for a plan they will design) b. purpose of the investigation	Students identify the: a. phenomenon under investigation (from a given investigation plan or for a plan they will design) b. purpose of the investigation
2) Take appropriate **parameters** into account **when planning how to investigate** a scientific question or test a design solution	Students plan an investigation or test a design individually and collaboratively, to produce data to serve as the basis for evidence. and identify: a. independent and dependent variables and controls b. what tools are needed to do the gathering c. how measurements will be recorded d. how many data are needed to support a claim	Students plan an investigation or test a design individually and collaboratively, to produce data to serve as evidence. Students should consider whether an observational or experimental investigation is appropriate and whether descriptive or numerical data will best serve as evidence to explain the phenomenon. In the design, as appropriate to the design, students will decide on: ● what tools are needed to do the gathering ● how data will be recorded ● how many data are needed to support a claim ● what limitations the data have ● how much will it cost to conduct the investigation or test a design ● how much time will it take to conduct the investigation ● [For experimental investigations students should] identify independent and dependent variables and controls In the design students will consider safety and ethics including consideration of: ● environmental impacts ● social impacts ● personal impacts

3) Make **predictions** and/or **hypotheses** about the outcome of an investigation*	Students make testable hypotheses (specifying variables and outcome) a. based on prior experiences and/or observed patterns b. about what would happen if a variable changes.	Students make a hypotheses that specify the direction and magnitude of the effect on a dependent variable(s) when an independent variable is manipulated
4) **Conduct** an investigation	Systematically carry out the given/planned investigation and make observations and/or record data If the investigation plan was given to students, they will describe: a. the data to be collected and the evidence to be derived from the data b. how the tools and methods included in the experimental design will provide the evidence necessary to address the purpose of the investigation	Systematically carry out the given/planned investigation and make observations and/or record data If the investigation plan was given to students, they will describe: a. the data to be collected and the evidence to be derived from the data b. how the tools and methods included in the experimental design will provide the evidence necessary to address the purpose of the investigation
5) **Collect data** to answer a scientific question or test a design solution	Students collect/produce data a. to serve as the basis for evidence to answer a scientific question [science] or test design solutions [engineering] under a range of conditions b. about the performance of a proposed object, tool, process, or system under a range of conditions [engineering] c. that meet the *specific* goals of an investigation.	Students manipulate variables and collect/produce data: a. to serve as the basis for evidence to answer a scientific question [science] or test design solutions [engineering] under a range of conditions b. about the performance of a proposed object, tool, process, or system under a range of conditions [engineering] c. that meet the *specific* goals of an investigation. d. to identify failure points or improve performance relative to criteria for success or other variables [engineering]
6) **Evaluate** and/or **revise** an experimental design	Students should: a. evaluate the accuracy of various methods for collecting data to determine the most appropriate. b. revise the experimental design, if needed, to collect/produce data that meets the specific goals of the investigation	Students select appropriate tools to collect, record, analyze, and evaluate data by: a. evaluate the accuracy of various methods for collecting data to determine the most appropriate. b. revise the experimental design, if needed, to collect/produce data that meets the specific goals of the investigation