ASET Science & Engineering Practice (SEP) Tool: Engaging in Argument from Evidence

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

SEP 7	**Engaging in Argument from Evidence:** Argumentation is the process by which evidence-based conclusions and solutions are reached. In science and engineering, reasoning and argument based on evidence are essential to identifying the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation to listen to, compare, and evaluate competing ideas and methods. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building models, and evaluating claims.

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?**
1) **Compare, and critique** two arguments based on the supporting evidence			
2) **Engage in discourse** around a scientific argument with peers			
3) **Construct and/or refine** an argument using evidence and reasoning to support a claim			
4) *[Engineering]* **Make, defend, and/or evaluate a claim about the effectiveness/ merit** of an **object or design solution** using evidence			

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 7: Engaging in Argument from Evidence: Engaging in argument from evidence in 6-8 builds on K-5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). In 9-12 they build on K-8 experiences and progress to using appropriate and sufficient evidence and scientific reasoning to defend and critique claims and explanations about the natural and designed world(s). Arguments may also come from current scientific or historical episodes in science.		
*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) **Compare, and critique** two arguments based on the supporting evidence	Using two arguments on the same topic developed by students or presented by the instructor: a. Identify claims made in each argument b. Distinguish among facts (based on research findings) and speculation or opinion (not supported by objective information) used to support each claim c. Compare and critique claims made by these two arguments on the same topic: i. by identifying if they emphasize similar or different evidence. ii. and/or by comparing the interpretation of evidence. iii. and/or by considering the ethical issues of each	Using competing arguments on the same topic developed by students or presented by the instructor: a. Identify claims made in each argument b. Distinguish among scientific facts (based on research findings and scientific consensus) and speculation or opinion (not supported by scientifically-vetted information) used to support each claim c. Compare and critique claims made by these two arguments on the same topic: i. by identifying if they emphasize similar or different evidence. ii. and/or by comparing the interpretation of evidence. iii. Considering the limitations, constraints, and ethical issues of each iv. In light of currently accepted explanations
2) **Engage in discourse** around a scientific argument with peers *	Respectfully provide and receive critiques *to/from peers* about one's explanations, procedures, models and questions *by:* a. Citing relevant scientific evidence and b. Posing and responding to *specific* questions that elicit pertinent elaboration and detail.	Respectfully provide and/or receive critiques *to/from peers* on scientific arguments *by:* a. Probing reasoning and scientific evidence b. Challenging ideas and conclusions c. Responding thoughtfully to diverse perspectives d. Determining what additional information is required to resolve contradictions

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3) **Construct and/or refine** an argument using evidence and reasoning to support a claim	a. Construct, use, and/or present an oral and written argument, to support or refute an explanation or a model for a phenomenon (science), or a solution to a problem (engineering), that is supported by: i. A claim or set of claims ii. *Relevant* empirical evidence (e.g., observations, data, and/or a model) to support the claim and, iii. Scientific reasoning (*Incorporate scientific principles, theories, and/or ideas)* to support evidence linked to claim b. Refine claim or set of claims based on an evaluation of the evidence presented	a. Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence. b. Refine claim or set of claims based on an evaluation of the data and evidence presented
4) *[Engineering]* **Make, defend, and/or evaluate a claim about the effectiveness/ merit** of an **object or design solution** using evidence	a. Make and defend a claim (or set of claims) related to a design solution that: i. supports or refutes the advertised performance of a device, process, or system, ii. are based on empirical evidence about the effectiveness of a design solution (whether or not the technology meets relevant criteria and constraints) iii. reflects scientific knowledge, and student-generated evidence. b. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria	a. Make and defend a claim (or set of claims) related to a design solution that: i. supports or refutes the advertised performance of a device, process, or system, ii. are based on empirical evidence about the effectiveness of a design solution (whether or not the technology meets relevant criteria and constraints) iii. are based on evidence about the natural or designed world. b. Evaluate competing design solutions based on relevant factors such as economic, societal, environmental, and ethical consideration.

* Teaching methods instructors should consider use of discourse scaffolds or sentence frames to help guide this

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