

Science & Engineering Practices
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.



K–2 Condensed Practices	3–5 Condensed Practices	6–8 Condensed Practices	9–12 Condensed Practices
<p>Asking questions and defining problems in K–2 builds on prior experiences and progresses to simple descriptive questions that can be tested.</p>	<p>Asking questions and defining problems in 3–5 builds on K–2 experiences and progresses to specifying qualitative relationships.</p>	<p>Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, clarify arguments and models.</p>	<p>Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.</p>
<ul style="list-style-type: none"> Ask questions based on observations to find more information about the natural and/or designed world(s). 	<ul style="list-style-type: none"> Ask questions about what would happen if a variable is changed. 	<ul style="list-style-type: none"> Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information. Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument. Ask questions to determine relationships between independent and dependent variables and relationships in models.. Ask questions to clarify and/or refine a model, an explanation, or an engineering problem. 	<ul style="list-style-type: none"> Ask questions that arise from careful observation of phenomena, or unexpected results, to clarify and/or seek additional information. Ask questions that arise from examining models or a theory, to clarify and/or seek additional information and relationships. Ask questions to determine relationships, including quantitative relationships, between independent and dependent variables. Ask questions to clarify and refine a model, an explanation, or an engineering problem.
<ul style="list-style-type: none"> Ask and/or identify questions that can be answered by an investigation. 	<ul style="list-style-type: none"> Identify scientific (testable) and non-scientific (non-testable) questions. Ask questions that can be investigated and predict reasonable outcomes based on patterns such as cause and effect relationships. 	<ul style="list-style-type: none"> Ask questions that require sufficient and appropriate empirical evidence to answer. Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles. 	<ul style="list-style-type: none"> Evaluate a question to determine if it is testable and relevant. Ask questions that can be investigated within the scope of the school laboratory, research facilities, or field (e.g., outdoor environment) with available resources and, when appropriate, frame a hypothesis based on a model or theory.
		<ul style="list-style-type: none"> Ask questions that challenge the premise(s) of an argument or the interpretation of a data set. 	<ul style="list-style-type: none"> Ask and/or evaluate questions that challenge the premise(s) of an argument, the interpretation of a data set, or the suitability of the design.
<ul style="list-style-type: none"> Define a simple problem that can be solved through the development of a new or improved object or tool. 	<ul style="list-style-type: none"> Use prior knowledge to describe problems that can be solved. Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. 	<ul style="list-style-type: none"> Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. 	<ul style="list-style-type: none"> Define a design problem that involves the development of a process or system with interacting components and criteria and constraints that may include social, technical and/or environmental considerations.