NGSS Science & Engineering Practices Grades 6-8

1 = unable to perform; 2 = perform with assistance; 3 = proficient; 4 = exemplary

Practice / Indicator	1	2	3	4	NOTES
Asking questions and defining problems in grades 6–8 builds from grades K–5 experiences and progresses to formulating and refining empirically testable questions and explanatory models					
Ask questions that arise from phenomena, models, or unexpected results.					
Ask questions to clarify or identify the premise(s) of an argument.					
Ask questions to determine relationships between independent and dependent variables.					
Ask questions that challenge the interpretation of a data set.					
Ask questions to refine a model, an explanation, or an engineering problem					
Modeling in 6–8 builds on K–5 and progresses to developing, using, and revising models to explain, explore, and predict more abstract phenomena and design systems.					
Use and/or construct models to predict, explain, and/or collect data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs.					
Pose models to describe mechanisms at unobservable scales.					
Modify models–based on their limitations–to increase detail or clarity, or to explore what will happen if a component is changed.					
Use and construct models of simple systems with uncertain and less predictable factors.					
Planning and carrying out investigations to answer questions or test solutions to problems in 6–8 builds on K–5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.					
Plan and carry out investigations individually and collaboratively, identifying independent and dependent variables and controls.					
Discuss and evaluate the accuracy of various methods for collecting data.					
Collect data and generate evidence to answer scientific questions or test design solutions under a range of conditions.					
Formulate a question that can be investigated within the scope of the classroom, school laboratory, or field with available resources and, when appropriate, frame a hypothesis (a possible explanation that predicts a particular and stable outcome) based on a model or theory					
Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.					
Use mean, median, mode, and variability to analyze and characterize data.					
Use graphical displays to analyze data in order to identify linear and nonlinear relationships.					
Consider limitations of data analysis, such as measurement error, and seek to improve precision and accuracy of data with better technological tools and methods such as multiple trials.					
Distinguish between causal and correlational relationships.					
Use data to define an operational range for a design solution.					
Use graphical displays (e.g., maps) of large data sets to identify					

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temporal and spatial relationships.					
Mathematical and computational thinking at the 6–8 level builds on K–5 and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.					
Use digital tools (e.g., computers) to analyze very large data sets for patterns and trends.					
Use mathematical concepts such as ratios, averages, basic probability, and simple functions, including linear relationships, to analyze data.					
Use mathematical arguments to justify scientific conclusions and design solutions.					
Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific knowledge, principles and theories					
Construct explanations for either qualitative or quantitative relationships between variables.					
Apply scientific reasoning to show why the data are adequate for the explanation or conclusion.					
Base explanations on evidence and the assumption that natural laws operate today as they did in the past and will continue to do so in the future.					
Undertake design projects, engaging in the design cycle, to construct and implement a solution that meets specific design criteria and constraints.					
Apply scientific knowledge to explain real-world examples or events and solve design problems.					
Construct explanations from models or representations.					
Engaging in argument from evidence in 6–8 builds from 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.					
Use oral and written arguments supported by empirical evidence and reasoning to support or refute an argument for a phenomenon or a solution to a problem.					
Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.					
Compare two arguments from evidence to identify which is better by identifying flaws in logic or methods					
Obtaining, evaluating, and communicating information in 6–8 builds on K–5 and progresses to evaluating the merit and validity of ideas and methods.					
Communicate understanding of scientific information that is presented in different formats (e.g., verbally, graphically, textually, mathematically).					
Generate and communicate ideas using scientific language and reasoning.					
Gather, read, and explain information from appropriate sources and evaluate the credibility of the publication, authors, possible bias of the source, and methods used.					
Read critically using scientific knowledge and reasoning to evaluate data, hypotheses, conclusions, and competing information.					