MAPPING GRADE 6 SCIENCE INSTRUCTION

Concept: Science Process Skills

PWC Objective: 6.1 / Infused

The student will plan and conduct investigations that are increasingly sophisticated and involve a refinement of science process skills. Key concepts include:

- making observations involving fine discrimination between similar objects and organisms **(SOL 6.1a)**
- developing a classification system based on multiple attributes **(SOL 6.1b)**
- recording precise and approximate measures **(SOL 6.1c)**
- using scale models to estimate distance, volume, and quantity **(SOL 6.1d)**
- stating hypotheses in ways that identify the independent (manipulated) and dependent (responding) variables **(SOL 6.1e)**
- devising a method to test the validity of predictions and inferences **(SOL 6.1f)**
- manipulating one variable over time with repeated trials **(SOL 6.1g)**
- collecting, analyzing, and reporting data using appropriate metric measurement **(SOL 6.1h)**
- organizing and communicating data through graphical representations (graphs, charts, diagrams) **(SOL 6.1i)**
- designing models to explain a sequence **(SOL 6.1j)**
- developing and reinforcing an understanding of the nature of science **(SOL 6.1k)**

What Students Should Know (Critical Attributes)	**What Students Should Be Able To Do** (Essential Skills)
Essential Questions: • Why is it necessary to focus and refine research questions? • What purpose does a hypothesis serve and how should it be technically stated? • How do we ensure the validity of data that are produced from an investigation? • What are some methods of collecting, recording, and reporting data from an experiment and why is it important to select appropriate methods for a particular investigation? • What is the purpose of models? **Critical Attributes:** 6.1a To communicate an observation accurately, one must provide critical details of exactly what is being observed. Using that information, we can differentiate between and among similar objects.	• Make observations that can be used to discriminate similar objects and organisms, paying attention to fine detail.

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What Students Should Know (Critical Attributes)		What Students Should Be Able To Do (Essential Skills)
6.1b	An effective classification system allows us to make accurate comparisons and contrasts.	• Develop a classification key that uses numerous characteristics.
6.1c	Systematic investigations require us to measure accurately; however, in the absence of precision tools, we must record careful estimations.	• Make precise and consistent measurements and estimations using centimeter rulers, meter sticks, graduated cylinders, balances, and stopwatches.
6.1d	Models provide a way to visually represent abstract concepts. In order to be truly useful, models must maintain relative value of size and/or quantity (they must be to scale) in order to reflect the object or topic being studied.	• Create approximate scale models to demonstrate an understanding of distance, volume, and quantity.
6.1e	An experiment provides a structured way to test a hypothesis. It is important to state hypotheses in such a way that identifies the relationship between the independent (manipulated) and dependent (responding) variables: "If (this independent variable is applied), then (what dependent variable is predicted to follow)?"	• Differentiate between independent and dependent variables. • Propose hypotheses or predictions from observed patterns.
6.1f	*Experimental design* procedures allow us to more easily narrow the scope of our investigation and to identify, describe, and manipulate the variables in an investigation. This allows us to test the validity of predictions and inferences.	• Compare and contrast predictions and inferences. Analyze and judge the evidence, observations, scientific principles, and data used in making predictions and inferences.
6.1g	It is important not to leap to conclusions using only one trial of an experiment. An experimental procedure should be repeated several times to ensure a degree of accuracy and validity of the results. Accurate observations are necessary to draw realistic conclusions. It is important to recognize all of the potential variables that can affect an outcome.	• Design an experiment in which one variable is manipulated over many trials. (The suggested venue for this is through an independent student research and experimentation.)
6.1h	In a scientific investigation, data should be collected, recorded, analyzed, and reported using appropriate metric measurement.	• Collect, record, analyze, and report data using metric measures. This includes millimeters, centimeters, meters, grams, kilograms, kilometers, milliliters, liters, and degrees Celsius.
6.1i	Data should be organized and communicated through appropriate graphical representation (graphs, charts, tables, and diagrams).	• Organize and communicate data using graphs (bar, line, and circle), charts, and diagrams.
6.1j	Models are a good way of representing abstract concepts and can help us order events or processes and hypothesize about the mechanism responsible for any observable patterns.	• Design a model that explains a sequence; for example, the sequence of events involved in the process of photosynthesis.
6.1k	Use of scientific processes helps us understand that science is empirical in that conclusions are based on verifiable observations and on inferences.	