SCIENCE CLASSROOM OBSERVATION INSTRUMENT
High School Version

School _____**Name of Teacher** _____ **Level/Class**_____

Length of Observation: _____

Learning Target of the Lesson_____

_____

I. LESSON OVERVIEW

A. Learning Objective of the Lesson (Mark all that apply)

☐ Clearly communicated by the teacher using multiple means ☐ Communicated orally only ☐ Communicated in writing only ☐ Student activities consistent with the lesson objective(s) ☐ Student activities not consistent with the lesson objective(s) ☐ Lesson objective communicated but not clear ☐ Lesson objective not communicated
☐ Lesson objective communicated but not observed

II. SCIENCE AND ENGINEERING PRACTICES (Check all that apply in each section)

The students are:

A. Asking Questions and Defining Problems

☐ Asked questions that arise from careful observations of phenomena, unexpected results, or 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.
☐ Asked questions to determine relationships, including quantitative relationships, between independent and dependent variables.
☐ 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.
☐ Asked and/or evaluated questions that challenge the premise(s) of an argument, the interpretation of a data set, or the sustainability of the design.
☐ Defined 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.
☐ Did not address this practice
Comment:

B. Developing and Using Models

☐ Evaluates merits and limitations of two different models of the same proposed tool, process, mechanisms, or system in order to select or revise a model that best fits the evidence or design criteria.
☐ Design a test of a model to ascertain its reliability.
☐ Develop, revise, and/or use a model based on evidence to illustrate and/or predict the relationships between systems or between component of systems.
☐ Develop and/or use multiple types of models to provide mechanistic accounts and/or predict phenomena, and more flexibly between model types based on merits and limitations.
☐ Develop a complex model that allows for manipulation and testing of a proposed process or system.
☐ Develop and/or use a model (including mathematical and computational) to generate data to support explanations, predict phenomena, analyze systems, and/or solve problems.
☐ Did not address this practice
Comment:

C. Planning and Carrying Out Investigations

☐ Plan an investigation or test a design individually and collaboratively to produce data to serve as the basis for evidence as part of building and revising models, supporting explanations for phenomena, or testing solutions to problems. Consider possible confounding variables or effects and evaluate the investigation's design to ensure variables are controlled.

☐ Plan and conduct an investigation individually and collaboratively to produce data to serve as the basis for evidence, and in the design: decide on types, how much, and accuracy of data needed to produce reliable measurements and consider limitations on the precision of the data (e.g., number of trials, cost, risk, time), and refine the design accordingly.

☐ Plan and conduct an investigation or test a design solution in a safe and ethical manner including considerations of environmental, social, and personal impacts.

☐ Select appropriate tools to collect, record, analyze, and evaluate data.

☐ Make directional hypotheses that specify what happens to a dependent variable when an independent variable is manipulated.

☐ Manipulate variables and collect data about a complex model of a proposed process or system to identify failure points or improve performance relative to criteria for success or other variables.

☐ Did not address this practice.

Comment:

D. Analyzing and Interpreting Data

☐ Analyze data using tools, technologies, and/or models (e.g., computational, mathematical) in order to make valid and reliable scientific claims or determine an optimal design solution

☐ Apply concepts of statistics and probability (including determining function fits to data, slope, intercept, and correlation coefficient for linear fits) to scientific and engineering questions and problems, using digital tools when feasible

☐ Consider limitations of data analysis (e.g., measurement error, sample selection) when analyzing and interpreting data.

☐ Compare and contrast various types of data sets (e.g., self-generated, archival) to examine consistency of measurements and observations.

☐ Evaluate the impact of new data on a working explanation and/or model of a proposed process or system

☐ Analyze data to identify design features or characteristics of the components of a proposed process or system to optimize it relative to criteria for success.

☐ Did not address this practice.

Comment:

E. Using Mathematics and Computational Thinking

☐ Create and/or revise a computational model or simulation of a phenomenon, designed device, process, or system

☐ Used mathematical representations to describe and/or support scientific conclusions and design solutions.

☐ Create algorithms (a series of ordered steps) to solve a problem.

☐ Apply mathematical concepts and/or processes (such as ratio, rate, percent, basic operations, and simple algebra) to scientific and engineering questions and problems.

☐ Use digital tools and/or mathematical concepts to test and compare proposed solutions to an engineering design problem.

☐ Did not address this practice.

Comment:

F. Constructing Explanations and Designing Solutions

☐ Make a quantitative and/or qualitative claim regarding the relationship between dependent and independent variables
☐ Construct and revise an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future
☐ Apply techniques of algebra and functions to represent and solve scientific and engineering problems
☐ Apply scientific ideas, principles, and/or evidence to provide an explanation of phenomena and solve design problems, taking into account possible unanticipated effects.
☐ Apply scientific reasoning, theory, and/or models to link evidence to the claims to assess the extent to which the reasoning and data support the explanation or conclusion.
☐ Design, evaluate, and/or refine a solution to a complex real-world problem, based on scientific knowledge, student-generated sources of evidence, prioritized criteria, and tradeoff considerations
☐ Did not address this practice
Comment:

G. Engaging in Argument From Evidence

☐ Compare and evaluate competing arguments or design solutions in light of currently accepted explanations, new evidence, limitations (e.g., trade-offs), constraints, and ethical issues
☐ Evaluate the claims, evidence, and/or reasoning behind currently accepted explanations or solutions to determine the merits of argument
☐ Respectfully provide and/or receive critiques on scientific arguments by probing reasoning and evidence, challenging ideas and conclusions, responding thoughtfully to diverse perspectives, and determining additional information required to resolve contradictions
☐ Construct, use, and/or present an oral and written argument or counter-arguments based on data and evidence
☐ Make and defend a claim based on evidence about the natural world or the effectiveness of a design solution that reflects scientific knowledge and student-generated evidence
☐ Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and/or logical arguments regarding relevant factors (e.g., economic, societal, environmental, ethical considerations).
☐ Did not address this practice
Comment:

H. Obtaining, Evaluating and Communicating Information

☐ Critically read scientific literature adapted for classroom use to determine the central ideas or conclusions and/or to obtain scientific and/or technical information to summarize complex evidence, concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
☐ Compare, integrate, and evaluate sources of information presented in different media or formats (e.g., visually, quantitatively) as well as in words in order to address a scientific question or solve a problem.
☐ Gather, read, and evaluate scientific and/or technical information from multiple authoritative sources, assessing the evidence and usefulness of each source.
☐ Evaluate the validity and reliability of and/or synthesize multiple claims, methods, and/or designs that appear in scientific and technical texts or media reports, verifying the data when possible.
☐ Communicate scientific and/or technical information or ideas (e.g., about phenomena and/or the process of development and the design and performance of a proposed process or system) in multiple formats (i.e., orally, graphically, textually, mathematically).
☐ Did not address this practice.
Comment: