SCIENTIFIC INQUIRY & THE INTERMEDIATE LEVEL SCIENCE CURRICULUM

The process of scientific inquiry, formalized in the scientific method, is integrated into the intermediate level science curriculum at all grades. The key ideas, performance indicators, and major understandings of this process appear below.

Key Idea 1: The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

S1.1 Formulate questions independently with the aid of references appropriate for guiding the search of explanations of everyday observations.
S1.1a: formulate questions about natural phenomena
S1.1b: identify appropriate references to investigate a question
S1.1c: refine and clarify questions so that they are subject to scientific investigation

S1.2 Construct explanations independently for natural phenomena, especially by proposing preliminary visual models of phenomena.
S1.2a: independently formulate a hypothesis
S1.2b: propose a model of a natural phenomenon
S1.2c: differentiate among observations, inferences, predictions, and explanations

S1.4 Seek to clarify, to assess critically, and to reconcile with their own thinking the ideas presented by others, including peers, teachers, authors, and scientists.

Key Idea 2: Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

S2.1 Use conventional techniques and those of their own design to make further observations and refine their explanations, guided by a need for more information.
S2.1a: demonstrate appropriate safety techniques
S2.1b: conduct an experiment designed by others
S2.1c: design and conduct an experiment to test a hypothesis
S2.1d: use appropriate tools and conventional techniques to solve problems about the natural world, including measuring, observing, describing, classifying, and sequencing.

S2.2 Develop, present, and defend formal research proposals for testing their own explanations of common phenomena, including ways of obtaining needed observations and ways of conducting simple controlled experiments.
S2.2a: include appropriate safety procedures
S2.2b: design scientific investigations (e.g., observing, describing, and comparing, collecting samples, seeking more information, conducting a controlled experiment, discovering new objects or phenomena, and making models
S2.2c: design a simple controlled experiment
S2.2d: identify independent (manipulated), dependent (responding), and constants in a simple controlled experiment
S2.2e: choose an appropriate sample size and number of trials

S2.3 Carry out their research proposals, recording observations and measurements (e.g., lab notes, audiotape, computer disk, videotape) to help assess the explanation.
S2.3a: use appropriate safety procedures
S2.3b: conduct a scientific investigation
S2.3c: collect quantitative and qualitative data

Key Idea 3: The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.

S3.1 Design charts, tables, graphs, and other representations of observations in conventional and creative ways to help them address their research question or hypothesis.
S3.1a: organize results, using appropriate graphs, diagrams, data tables, and other models to show relationships
S3.1b: generate and use scales, create legends, and appropriately label axes

S3.2 Interpret the organized data to answer the research question or hypothesis and to gain insight into the problem.
S3.2a: accurately describe the procedures used and the data gathered
S3.2b: identify sources of error and the limitations of data collected
S3.2c: evaluate the original hypothesis in light of the data
S3.2d: formulate and defend explanations and conclusions as they relate to scientific phenomena
S3.2e: form and defend a logical argument about cause and effect relationships in an investigation
S3.2f: make predictions based on experimental data
S3.2g: suggest improvements and recommendations for further study
S3.2h: use and interpret graphs and data tables

S3.3 Modify their personal understanding of phenomena based on evaluation of their hypothesis.