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<tr>
<td><strong>1. Asking questions and defining problems</strong></td>
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<td><em>Science</em> begins with a question about a phenomenon such as “Why is the sky blue?” or “What causes cancer?” A basic practice of the scientist is the ability to formulate empirically answerable questions about phenomena to establish what is already known, and to determine what questions have yet to be satisfactorily answered.</td>
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<td><strong>2. Developing and using models</strong></td>
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<td><em>Science</em> often involves the construction and use of models and simulations to help develop explanations about natural phenomena. Models make it possible to go beyond observables and simulate a world not yet seen. Models enable predictions of the form “if...then... therefore” to be made in order to test hypothetical explanations.</td>
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<td><strong>3. Planning and carrying out investigations</strong></td>
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<td><em>Scientific investigations</em> may be conducted in the field or in the laboratory. A major practice of scientists is planning and carrying out systematic investigations that require clarifying what counts as data and in experiments identifying variables.</td>
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<td><strong>4. Analyzing and interpreting data</strong></td>
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<td><em>Scientific investigations</em> produce data that must be analyzed in order to derive meaning. Because data usually do not speak for themselves, scientists use a range of tools—including tabulation, graphical interpretation, visualization, and statistical analysis—to identify the significant features and patterns in the data. Sources of error are identified and the degree of certainty calculated. Modern technology makes the collection of large data sets much easier providing secondary sources for analysis.</td>
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<td><strong>5. Using mathematics and computational thinking</strong></td>
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<td>In <em>science</em>, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; statistically analyzing data; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable prediction of the behavior of physical systems along with the testing of such predictions. Moreover, statistical techniques are also invaluable for identifying significant patterns and establishing correlational relationships.</td>
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<td><strong>6. Constructing explanations and designing solutions</strong></td>
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<td>The goal of <em>science</em> is the construction of theories that provide explanatory accounts of the material world. A theory becomes accepted when it has multiple independent lines of empirical evidence, greater explanatory power, a breadth of phenomena it accounts for, and has explanatory coherence and parsimony. Scientific explanations are explicit applications of theory to a specific situation or phenomenon, perhaps with the intermediary of a theory-based model for the system under study. The goal for students is to construct logically coherent explanations of phenomena of science, or a model that represents it, and are consistent with the available evidence.</td>
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<td><strong>7. Engaging in argument from evidence</strong></td>
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<td>In <em>science</em>, reasoning and argument are essential for clarifying strengths and weaknesses of a line of evidence and for identifying the best explanation for a natural phenomenon. Scientists must defend their explanations, formulate evidence based on a solid foundation of data, examine their understanding in light of the evidence and comments by others, and collaborate with peers in searching for the best explanation for the phenomena being investigated.</td>
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<td><strong>8. Obtaining, evaluating, and communicating information</strong></td>
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<td><em>Science</em> cannot advance if scientists are unable to communicate their findings clearly and persuasively or learn about the findings of others. A major practice of science is thus to communicate ideas and the results of inquiry—orally, in writing; with the use of tables, diagrams, graphs and equations; and by engaging in extended discussions with peers. Science requires the ability to derive meaning from scientific texts such as papers, the internet, symposia, or lectures to evaluate the scientific validity of the information thus acquired and to integrate that information into proposed explanations.</td>
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