

**The Standards 1, 2, 6, & 7 Process Skills Checklist** is intended to be a tool for curriculum development. These process skills should be incorporated into all core-based science curricula. These skills are not tied to specific content in the core, but should be practiced throughout the school year.

<b><i>Std 1: Mathematical Analysis</i></b>	✓	Comment
<b>Key Idea 1:</b> Abstraction and symbolic representation are used to communicate mathematically.		
<b>M1.1</b> Use algebraic and geometric representations to describe and compare data.		
<ul style="list-style-type: none"> <li>• Use scaled diagrams to represent and manipulate vector quantities.</li> </ul>		
<ul style="list-style-type: none"> <li>• Represent physical quantities in graphical form.</li> </ul>		
<ul style="list-style-type: none"> <li>• Construct graphs of real-world data (scatter plots, line or curve of best fit).</li> </ul>		
<ul style="list-style-type: none"> <li>• Manipulate equations to solve for unknowns.</li> </ul>		
<ul style="list-style-type: none"> <li>• Use dimensional analysis to confirm algebraic solutions.</li> </ul>		
<b>Key Idea 2:</b> Deductive and inductive reasoning are used to reach mathematical conclusions.		
<b>M2.1</b> Use deductive reasoning to construct and evaluate conjectures and arguments, recognizing that patterns and relationships in mathematics assist them in arriving at these conjectures and arguments.		
<ul style="list-style-type: none"> <li>• Interpret graphs of real world data to determine the mathematical relationship between the variables.</li> </ul>		
<b>Key Idea 3:</b> Critical thinking skills are used in the solution of mathematical problems.		
<b>M3.1</b> Apply algebraic and geometric concepts and skills to the solution of problems.		
<ul style="list-style-type: none"> <li>• Explain the physical relevance of properties of a graphical representation of real-world data, e.g., slope, intercepts, area under the curve.</li> </ul>		

<b><i>Std. 1: Scientific Inquiry</i></b>	✓	Comment
<b>Key Idea 1:</b> The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process. Students:		
<ul style="list-style-type: none"> <li>• develop extended visual models and mathematical formulations to represent an understanding of natural phenomena</li> </ul>		
<ul style="list-style-type: none"> <li>• clarify ideas through reasoning, research, and discussion</li> </ul>		
<ul style="list-style-type: none"> <li>• evaluate competing explanations and overcome misconceptions</li> </ul>		
<b>Key Idea 2:</b> 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. Students:		
S2.1 Devise ways of making observations to test proposed explanations.		
<ul style="list-style-type: none"> <li>• Design an experiment to investigate the relationship between physical phenomena.</li> </ul>		
S2.2 Refine research ideas through library investigations, including electronic information retrieval and reviews of the literature, and through peer feedback obtained from review and discussion.		
S2.3 Develop and present proposals including formal hypotheses to test explanations; i.e., predict what should be observed under specific conditions if the explanation is true.		
S2.4 Carry out a research plan for testing explanations, including selecting and developing techniques, acquiring and building apparatus, and recording observations as necessary		

**The Standards 1, 2, 6, & 7 Process Skills Checklist** is intended to be a tool for curriculum development. These process skills should be incorporated into all core-based science curricula. These skills are not tied to specific content in the core, but should be practiced throughout the school year.

<b><i>Std. 1: Scientific Inquiry</i></b>	✓	Comment
<b>Key Idea 3:</b> The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena. Students:		
<b>S3.1</b> Use various means of representing and organizing observations (e.g., diagrams, tables, charts, graphs, equations, and matrices) and insightfully interpret the organized data.		
<ul style="list-style-type: none"> <li>• Use appropriate methods to present scientific information (e.g., lab reports, posters, research papers, or multimedia presentations).</li> </ul>		
<ul style="list-style-type: none"> <li>• Identify possible sources of error in data collection and explain their effects on experimental results.</li> </ul>		
<b>S3.2</b> Apply statistical analysis techniques when appropriate to test if chance alone explains the result.		
<ul style="list-style-type: none"> <li>• Examine collected data to evaluate the reliability of experimental results, including percent error, range, standard deviation, line of best fit, and the use of the correct number of significant digits.</li> </ul>		
<b>S3.3</b> Assess correspondence between the predicted result contained in the hypothesis and the actual result, and reach a conclusion as to whether or not the explanation on which the prediction was based is supported.		
<b>S3.4</b> Based on results of the test and through public discussion, they revise the explanation and contemplate additional research. ( <i>Note: Public discussion may include lab partners, lab groups, classes, etc.</i> )		

<b><i>Std 2: Information Systems</i></b>	✓	Comment
<b>Key Idea 1:</b> Information technology is used to retrieve, process, and communicate information technology as a tool to enhance learning. Students:		
<b>1.1</b> Understand and use the more advanced features of word processing, spreadsheets, and database software.		
<b>1.3</b> Access, select, collate, and analyze information obtained from a wide range of sources such as research databases, foundations, organizations, national libraries, and electronic communication networks, including the Internet.		
<ul style="list-style-type: none"> <li>• Use knowledge of physics to evaluate articles in the popular press on contemporary scientific topics.</li> </ul>		
<b>1.4</b> Utilize electronic networks to share information.		
<b>1.5</b> Model solutions to a range of problems in mathematics, science, and technology, using computer simulation software.		
<ul style="list-style-type: none"> <li>• Use software to model and extend classroom and laboratory experiences, recognizing the differences between the model used for understanding and real world behavior.</li> </ul>		
<b>Key Idea 2:</b> Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.		
<b>Key Idea 3:</b> Information technology can have positive and negative impacts on society, depending on how it is used.		

**The Standards 1, 2, 6, & 7 Process Skills Checklist** is intended to be a tool for curriculum development. These process skills should be incorporated into all core-based science curricula. These skills are not tied to specific content in the core, but should be practiced throughout the school year.

<b><i>Std. 6: Models</i></b> <b><i>(common themes)</i></b>	✓	Comment
<b>Key Idea 2:</b> Models are simplified representations of objects, structures, or systems used in analysis, explanation, interpretation, or design. Students:		
<b>2.1</b> Revise a model to create a more complete or improved representation of the system.		
<b>2.2</b> Collect information about the behavior of a system and use modeling tools to represent the operation of the system.		
<ul style="list-style-type: none"> <li>• Observations of the behavior of a system can be used to develop a model.</li> </ul>		
<b>2.3</b> Find and use mathematical models that behave in the same manner as the processes under investigation.		
<ul style="list-style-type: none"> <li>• Physical and mathematical models represent the behavior of real-world systems.</li> </ul>		
<b>2.4</b> Compare predictions to actual observations, using test models.		
<ul style="list-style-type: none"> <li>• Experimental data can be collected to either validate or reject a model.</li> <li>• A model can be used to predict the behavior of a system.</li> </ul>		
<b><i>Std. 6: Magnitude &amp; Scale</i></b>		
<b>Key Idea 3:</b> The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems. Students:		
<b>3.1</b> Describe the effects of changes in scale on the functioning of physical, biological, or designed systems.		
<b>3.2</b> Extend their use of powers of ten notation to understanding the exponential function and performing operations with exponential factors.		
<ul style="list-style-type: none"> <li>• Orders of magnitude are used to estimate quantitative results.</li> </ul>		

<b><i>Std. 6: Equilibrium &amp; Stability</i></b>	✓	Comment
<b>Key Idea 4:</b> Equilibrium is a state of stability due either to a lack of changes (static equilibrium) or a balance between opposing forces (dynamic equilibrium). Students:		
<b>4.1</b> Describe specific instances of how disturbances might affect a system's equilibrium, from small disturbances that do not upset the equilibrium to larger disturbances (threshold level) that cause the system to become unstable.		
<b>4.2</b> Cite specific examples of how dynamic equilibrium is achieved by equality of change in opposing directions.		
<b><i>Std. 6: Patterns of Change</i></b>		
<b>Key Idea 5:</b> Identifying patterns of change is necessary for making predictions about future behavior and conditions. Students:		
<b>5.1</b> Use sophisticated mathematical models, such as graphs and equations of various algebraic or trigonometric functions.		
<ul style="list-style-type: none"> <li>• Mathematical models such as graphs and equations can be used to predict the behavior of physical systems.</li> </ul>		
<b>5.2</b> Search for multiple trends when analyzing data for patterns, and identify data that do not fit the trends.		
<ul style="list-style-type: none"> <li>• Patterns can be deduced from the organization and presentation of the data.</li> <li>• Patterns in data can be used to identify and develop models.</li> </ul>		
<b><i>Std. 6: Optimization</i></b>		
<b>Key Idea 6:</b> In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs. Students:		
<ul style="list-style-type: none"> <li>• Determine optimal solutions to problems that can be solved using quantitative methods.</li> </ul>		

The Standards 1, 2, 6, & 7 Process Skills Checklist is intended to be a tool for curriculum development. These process skills should be incorporated into all core-based science curricula. These skills are not tied to specific content in the core, but should be practiced throughout the school year.

<b><i>Std. 7: Interdisciplinary Problem Solving</i></b>	✓	Comment
<b><i>Connections</i></b>		
<b>Key Idea 1:</b> The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision making, design, and inquiry into phenomena.		
<ul style="list-style-type: none"> <li>• Physics can be used in solving problems on many scales, e.g., local, national, and global.</li> </ul>		
<ul style="list-style-type: none"> <li>• Scientific methodology is used to solve real-world problems.</li> </ul>		
<b><i>Strategies</i></b>		
<b>Key Idea 2:</b> Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.		
<ul style="list-style-type: none"> <li>• Collect, analyze, interpret, and present data, using appropriate tools.</li> </ul>		
<ul style="list-style-type: none"> <li>• If students participate in an extended, culminating mathematics, science, and technology project, then the students should:</li> </ul>		
<ul style="list-style-type: none"> <li>➤ work effectively</li> <li>➤ gather and process information</li> <li>➤ generate and analyze ideas</li> <li>➤ observe common themes</li> <li>➤ realize ideas</li> <li>➤ present results</li> </ul>		