

## The 5 E Learning Cycle: Summary and Alignment with Science/Engineering Practices

5 E Learning Cycle Stages	Examples of Student Activities	Science and Engineering Practices that apply to the 5E phases
<p><b>Engage</b> Capturing the interest of students and uncovering their initial ideas about scientific phenomena or engineering problems</p>	<p>Demonstration Question to answer Problem to solve mystery</p>	<ul style="list-style-type: none"> <li>• Asking questions (for science) and defining problems (for engineering)</li> <li>• Use models</li> </ul>
<p><b>Explore</b> The teacher provides students with common, concrete experiences that help them construct concepts and develop skills.</p>	<p>Build models collect data make and test predictions</p>	<ul style="list-style-type: none"> <li>• Planning and carrying out investigations.</li> <li>• Develop and use models</li> <li>• Asking questions (for science) and defining problems (for engineering).</li> </ul>
<p><b>Explain</b> Let the students articulate their ideas in their own words and the teacher helps to clarify their concepts, introduce scientific terminology, and connect student explanations to their in-class “engage” experiences.</p>	<p>Use data/outcomes to develop a written or verbal explanation or solution</p>	<ul style="list-style-type: none"> <li>• Analyzing and interpreting data.</li> <li>• Using mathematics and computational thinking.</li> <li>• Constructing explanations (for science) and designing solutions (for engineering).</li> <li>• Developing a model</li> </ul>
<p><b>Elaborate</b> Teachers help students continue to develop concepts and generalize the concepts in a broader context. Learning activities should challenge students to apply, extend, or elaborate upon concepts and skills in a new situation.</p>	<p>Debate New problem to solve Use solution or outcomes to apply to a new situation.</p>	<ul style="list-style-type: none"> <li>• Engaging in argument from evidence.</li> <li>• Asking questions (for science) and defining problems (for engineering).</li> <li>• Using mathematics and computational thinking.</li> <li>• Obtaining, evaluating, and communicating information.</li> </ul>
<p><b>Evaluate</b> The teacher assesses understanding of concepts and student proficiency with various skills. The evaluation phase provides an opportunity for students to self reflect.</p>	<p>Presentations  Open response questions</p>	<ul style="list-style-type: none"> <li>• Obtaining, evaluating, and communicating information.</li> <li>• Asking questions (for science) and defining problems (for engineering).</li> </ul>

# The 5 E Learning Cycle: Summary and Alignment with Science/Engineering Practices