Synthesis of Components of the 5 E Learning Cycle

5 E Component	Description	Some Examples (there are many more!)
Engage	*Students engage in scientifically oriented questions* Students engage in activities that activate prior knowledge, capture their attention spark their curiosity, and stimulate their thinking	• Demonstration (teacher or students) of a discrepant event • Reading from a piece of literature, poem, journal entry, or news story • Free write about the topic • Brainstorm questions to investigate
Explore	*Students give priority to evidence in responding to questions* Students work singly or collectively to think, plan, investigate (i.e., collect data), and organize collected data, evidence and/or information	• Construct a model • Design and/or carry out an investigation • Solve a problem • Gather information from resources (i.e., Internet, books, etc.) to answer a question, make a decision, or solve a problem
Explain	*Students formulate explanation from evidence* Students analyze the data and/or information collected and use their data to answer the original question. Priority is given to data (rather than opinion). Through discussion, students clarify and refine their understanding	• Students use charts, graphs, pictures, etc. to represent their data in a way that is easy for others to interpret • Students use their data to formulate a cogent explanation of what it means and how the data collected applies to the question for investigation
Extend	*Students connect explanations to scientific knowledge* Students apply (i.e., extend) their understanding of the phenomena to a new problem, setting, or situation	• Students are given a similar problem and asked to apply what they have learned to explain what is likely to happen and/or why something happened • Students apply what is learned to their everyday lives to show its applicability
Evaluate	*Students communicate and justify explanations* Students evaluate the validity of their thinking and processes (this should happen <u>all through the learning cycle</u>) and communicate that to one another and to the scientific community	• Students evaluate the effectiveness of their data collection procedures (i.e., what data will this procedure yield?...will it help us answer our question?) • Does this conclusion make sense in relationship to the data collected?...to the general body of knowledge in science?...to their own experience?; If so, how? • Critique the process to make revisions and refine the investigative process (i.e., how could this investigation have been done better?) • Students ask metacognitive questions (i.e., what do we know now that we didn't know before?...what are we still wondering about?