### Figure 3.7 5Es in the Science Classroom

<table>
<thead>
<tr>
<th>Phase</th>
<th>Description: Involve students in activities that . . .</th>
<th>Teacher Role: Plan and implement experiences that . . .</th>
<th>Student Role: Active participation and involvement as students . . .</th>
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</table>
| **Engage** | • Focus students’ attention  
• Stimulate thinking  
• Generate interest  
• Access prior knowledge  
• Give students time to think and investigate, make decisions, solve problems, and collect information | • Create interest  
• Introduce a science topic using kinesthetic strategies  
• Motivate students  
• Ask for student input  
• Connect content to student interest  
• Tap prior knowledge  
• Raise questions and encourage responses  
• Use books or short articles on a science topic  
• Analyze a graphic organizer or completed anchor chart  
• Show, using examples of how to tell stories of science models that have been built  
• Have students assume roles and responsibilities (PI, MM, MD, RR) randomly  
• Accommodate all levels of language proficiency  
• Provide opportunities to use language | • Ask questions  
• Manipulate materials  
• Analyze illustrations  
• Participate in K-W-L, K-L-E-W  
• Brainstorm with partner or group members  
• Participate in class discussion to complete an anchor chart  
• Solve a problem  
• Construct models  
• Write stories of their models in their science notebook  
• Ask questions such as, *Why did ____ happen? What do I already know (or think I already know) about ____? What have I found out about ____?*  
• Show interest in the topic by asking questions, reviewing science literature books, checking the Internet, etc.  
• Follow directions and assume a group’s roles and responsibilities |

| **Explore** | • Develop inquiry skills (observing, predicting, investigating)  
• Get students to think, make decisions, and collect information; investigate and test their ideas; identify relationships; solve problems  
• Involve students in constructing models to explain their thinking | • Facilitate science learning  
• Accommodate all learning styles  
• Accommodate all levels of language proficiency  
• Provide opportunities to encourage language usage, listen as students interact with one another, ask “skinny” and “rich” questions, encourage cooperative learning | • Conduct investigations  
• Use observation skills while manipulating different objects  
• Construct models and tell their stories  
• Use observation skills while manipulating different objects  
• Record data on a “t” table  
• Analyze results (evidence) collected  
• Draw conclusions based on results  
• Participate in discussions  
• Cooperate with group members during the investigation  |

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<td><strong>Explain</strong></td>
<td>Review tasks completed in the engage and explore phases • Model and use talk-aloud strategies for science terms that they encountered in previous phases • Clarify understanding of concepts, processes, and/or skills by using examples, pictures, and manipulatives • Explain and define terms and provide real-world examples • Allow students to analyze what they did when they carried out the engage and explore exercises</td>
<td>Encourage the use of new words and concepts • Ask students to clarify and support their responses using evidence they collected • Use students’ past experiences as a basis for explaining concepts and to address misconceptions • Encourage students to use their own words when defining, explaining, describing, and sharing their ideas • Use green/red cards to assess students' level of understanding</td>
<td>Review the investigation by “walking through” it • Support their ideas with claims and evidence • Complete graphic organizers • Respond to “skinny” and “rich” questions • Use green/red cards to demonstrate they understand the teacher’s explanation (red side up if they do not understand or green side up if they do understand) • Compare data gathered by each group and determine the group with the highest _____, the lowest _____, the most _____, the least _____, the best _____, the greatest _____, etc.</td>
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<td><strong>Elaborate</strong></td>
<td>Connect learning to similar situations • Encourage students to communicate new understanding using science terms, etc. • Answer the question, What is the relationship between _________ and _________? • Get them to: o Identify the hypothesis o Identify variables o Create and test hypotheses o Record data collected on “t” tables o Plot data collected on graphs o Explain results o Draw conclusions</td>
<td>Involve students in answering the What is the relationship? question • Get students to do the following steps: o State the question o Identify the hypothesis o Identify the variables o Conduct investigations o Collect data (three times to ensure consistent results) on “t” table o Plot data collected on a graph o Explain results o Draw conclusions</td>
<td>Problem solve using a new situation • Make decisions • Write information in their science notebooks • Conduct investigations • Follow these steps for experiments: o Write the question o Write and test a hypothesis o Name the independent and dependent variables o Prepare “t” table o Conduct the investigation o Collect data o Record data on table o Construct a graph, label all parts, and plot the data collected o Explain results in their science notebooks o Draw conclusions and write them in their science notebooks o Write the story of the investigation starting with the question and ending with the conclusions in their science notebooks</td>
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| Evaluate | • Use measures to assess performance  
• Demonstrate the level of understanding of concepts, skills, processes, and their applications  
• Demonstrate understanding of new concepts by observing or responding to “rich” questions  
• Demonstrate that they know, understand, and can use what they have learned by telling, writing, showing, and/or doing  
• Use small groups so students can discuss cause-and-effect relationships, claims and evidence, variables, the significance of the data collected, and results recorded on the graph  
• Ask them to create write/tell the stories about:  
  ○ the relationship between ____ and ____ in the investigation  
  ○ their models  
  ○ Complete two/three/four column foldable to respond to ____, ____ , and ____. Also complete the wonderings column in K-L-E-W.  
• Get them to use oral language to communicate with their peers and to record information in their science notebooks | • Involve the observation of students as they apply new concepts and skills in different real-world situations  
• Use a variety of formative assessment strategies  
• Provide opportunities to:  
  ○ Assess students’ knowledge and/or skills using a rubric of performance and knowledge measures  
  ○ Review science notebook entries over time to identify changes in students’ thinking and behaviors  
  ○ Show that students are being cooperative by demonstrating respect, making good decisions, and solving problems  
• Encourage students to assess their own learning  
• Ask “rich” questions, such as:  
  ○ Why do you think ____ happened when you ____?  
  ○ What evidence have you collected regarding ____?  
  ○ What claims do you have about ____?  
  ○ What have you found out about ____?  
  ○ How would you explain/describe ____? | • Create products  
• Draw/write in their science notebooks to demonstrate their use of science language and show they understand the inquiry skills of observing, predicting, etc.  
• Respond to peers  
• Create and write stories using the steps to the investigation as a guide to sequence their writing or pictures  
• Take part in a science loop  
• Assess their science entries in their notebooks  
• Put information in graphic organizers, foldables, and K-W-L/K-L-E-W charts  
• List claims and evidence based on information collected during investigations and recorded on tables, graphics, etc.  
• Perform their roles and responsibilities within the small groups  
• Demonstrate that they are being cooperative by showing respect, making good decisions, and solving problems  
• Create and complete foldables, graphic organizers, and the wonderings column in K-L-E-W  
• Complete self-assessments |