Rubric for Performance Indicators of Student Outcome 6:

<table>
<thead>
<tr>
<th>Performance Indicator</th>
<th>1: Beginning</th>
<th>2: Developing</th>
<th>3: Proficient</th>
<th>4: Exemplary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Design an Experiment Plan</td>
<td>• Missing Experiment Plan</td>
<td>• Flawed Experiment Plan</td>
<td>• Adequate Experiment Plan</td>
<td>• Well thought out Experiment Plan</td>
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<tr>
<td></td>
<td>• Missing Driving Question</td>
<td>• Weak Driving Question</td>
<td>• Driving Question is presented, though it might have minor flaws</td>
<td>• Driving Question is appropriately narrow and focused</td>
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<tr>
<td></td>
<td>• Missing identification of key variables</td>
<td>• Majority of key variables are not identified</td>
<td>• Almost all variables have been identified</td>
<td>• All relevant variables and externalities have been identified</td>
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<tr>
<td></td>
<td>• Missing data collection procedure</td>
<td>• Data collection procedure is formulated poorly</td>
<td>• Data collection procedure is formulated adequately, but does not account for all externalities</td>
<td>• Data collection procedure is detailed without being unnecessarily complicated</td>
</tr>
<tr>
<td>Acquire data on appropriate variables</td>
<td>• Data acquisition appears to have significant errors or unrealistic accuracy (fake data?)</td>
<td>• Data acquisition does not include any detail on instrument precision or accuracy performance (sensitivity &amp; calibration)</td>
<td>• Data acquisition includes most instrument capabilities (sensitivity &amp; calibration)</td>
<td>• Data acquisition includes all relevant sensitivity and calibration information</td>
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<td></td>
<td>• Data collected for variables that are not part of Experiment Plan or some variables are not sampled</td>
<td>• Acquired data is not accompanied by a data acquisition illustration or diagram (test setup not adequately described)</td>
<td>• Data acquisition setup is illustrated / explained, but a few minor details are missing</td>
<td>• Data acquisition setup is carefully and thoroughly explained</td>
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<td></td>
<td>• Missing large portions of data range</td>
<td>• Input data range is significantly limited or obviously meaningless for some variables</td>
<td>• Input data covers most of the “range of interest” for the key variables</td>
<td>• Input data covers entire range of interest, as well as some additional points / configurations that might be of interest without wasting time on unnecessary procedures</td>
</tr>
<tr>
<td>Compare experimental data and results to appropriate theoretical models</td>
<td>No comparison made, or comparison made to nonsensical models</td>
<td>Weak comparison of data to appropriate model</td>
<td>Adequate comparison made to appropriate model</td>
<td>Thorough comparison conducted between sufficiently varied data set and detailed model</td>
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<td>Comparison of data made to model that doesn’t include some important relationships among key variables</td>
<td>Model includes important relationships among key variables, though some minor details are missing</td>
<td>Theoretical model is sufficiently detailed to provide insight into Driving Question</td>
</tr>
</tbody>
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<tr>
<th>Explain observed differences between model and experiment (bad model, bad measurements, noise, etc.)</th>
<th>Differences are not identified or are incorrectly explained</th>
<th>Most differences are correctly identified, but many are poorly explained</th>
<th>All major differences are identified; only a few minor differences have been ignored</th>
<th>All relevant differences have been identified</th>
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<td></td>
<td>Neither the possibility of using the wrong model nor of collecting erroneous data has been identified</td>
<td>Explanation of differences does not consider use of wrong model or possibility of having erroneous data</td>
<td>Both model and data have been explored as possible sources of error</td>
<td>Potential weaknesses in both model and data collection procedure have been identified, but both are well done</td>
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</table>