**S**cience and **E**ngineering **P**ractice Reference Guide

**#1 Asking Questions and Defining Problem**

Student Performance: Examples:

\*Formulate a question that addresses the phenomenon

\*Identify the nature of the question

\*Evaluate the empirical testability of the question

\*Identify the problem to be solved

\*Define the criteria

\*Define the constraints

#**2 Developing and Using Models**

Student Performances: Examples:

\*Identify components of the model

\*Identify relationships between components

\*Use connections to describe, explain, and predict

**#3 Planning and Carrying out an Investigation**

Student Performances: Examples:

\*Identify the evidence and purpose

\*Plan the investigation

\*Collect the data

\*Refine the design

**#4 Analyzing and Interpreting Data**

Student Performances: Examples:

\*Organize data

\*Identify relationships within datasets

\*Identify relationships between datasets

\*Interpret data

**#5 Using Mathematics and Computational Thinking**

Student Performances: Examples:

\*Identify representations in a system

\*Use math and mathematical modeling



\*Use computational thinking

\*Analyze results

**#6 Constructing Explanations and Designing Solutions**

Student Performances: Examples:

\*Formulate a question

\*Identify a scientific cause

\*Describe a casual mechanism

\*Generate the design solution

\*Describe the criteria and constraints

\*Evaluate potential refinement

**#7 Engaging in Argument from Evidence**

Student Performances: Examples:

\*Identify a given claim

\*Identify provided evidence

\*Evaluate and critique evidence

\*Evaluate reasoning and synthesis

**#8 Obtaining, Evaluating, and Communicating Information**

Student Performances: Examples:

\*Obtain information

\*Evaluate information

\*Communicate information

\*Select appropriate communication style and format

**C**ross **C**utting **C**oncept Reference Guide

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| **#1 Patterns**  Sentence Starters:  - One patterned I observed is ….  - Based on the pattern I observed I can conclude …  - I would group \_\_\_\_ and \_\_\_\_\_ together because ….  - One similarity I observed between \_\_\_\_\_ and \_\_\_\_\_ is …. | **#4 System and System Models**  Sentence Starters:  We observed a system that included the following key parts ….  One way the key parts of the system work together is ….  We used a model to represent \_\_\_\_\_ because ….  The model represented \_\_\_\_\_ well because ….  The model of \_\_\_\_\_ was limited because …. |
| **#2 Cause an Effect**  Sentence Starters:  I think that \_\_\_\_ caused \_\_\_\_ because ….  The relationship between \_\_\_\_\_ and \_\_\_\_\_ is ….  I think \_\_\_\_\_ and \_\_\_\_\_ affect each other over time by ….  If we were to change \_\_\_\_\_ I predict that ….. | **#5 Matter and Energy**  Sentence Starters:  A type of energy I observed in this system is ….  Some important examples of matter in this system are ….  In this system, we observe energy flowing as ….  In this system we observe energy cycling as …. |
| **#3 Scale, Proportion, and Quantity**  Sentence Starters:  \_\_\_\_\_ is about the same size as \_\_\_\_\_.  If \_\_\_\_\_ was twice as large I predict that ….  If \_\_\_\_\_ was half the size I predict that ….  As \_\_\_\_\_ increases within the system, so does \_\_\_\_\_.  As \_\_\_\_\_ increases within the system, \_\_\_\_\_ tends to decrease. | **#6 Structure and Function**  Sentence Starters:  The shape of \_\_\_\_\_ allows it to ….  Some of the structures, or pats, I observe are ….  The function of \_\_\_ is affected by its structure because ….  The structures in this model show how…. |
| **#7 Stability and Change**  Sentence Starters:  We observed a change in ….  Over time, I would expect \_\_\_\_\_ to change because ….  One place be observed stability was ….  Over time, I think \_\_\_\_\_ would stay the same because …. | |