

# Spotlight on Science Skills

NBTA Middle Level Subject Council

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## The Premise of Spotlight on Science Skills

Spotlight on Science Skills documents were created in grades 3-8 to provide insight to teachers about what each cluster of scientific process skills required at that given grade level.

## The Starting Point

Scientific process skills were divided based on the work that teachers need to do with students during scientific investigations. Work done to prepare for the investigation and the analysis of the results of the investigation.

Outcomes were divided into two main General Curriculum Outcomes (GCO)

1. Plan & Perform (PP)
2. Analyze & Explain (AE)

## The Outcomes

**PP1** - Propose scientific questions

**PP2** - State a prediction and a hypothesis based on an observed pattern of events

**PP3** - Identify major variables to control and test in investigations

**PP4** - Plan a set of steps to solve a practical problem

**PP5** - Record observations and collect relevant data

**AE1** - Classify by attributes & display of relevant data

**AE2** - Analysis of data representations: trends, discrepancies & sources of error

**AE3** - Conclusions

**AE4** - Applications of learning

## The Purpose

Using the Spotlight on Science Skills documents, teachers will understand how each skill is both formatively and summatively assessed. Teachers will also have time to share assessment practices that they have used that are successful.

## Understanding the Rubric for Formative Assessment

During day to day collection of evidence, the rubric for each outcome is designed to allow teacher to place a benchmark of where each student stands with a given scientific process skill and based on their performance with the skill the appropriate feedback can be communicated to the individual.

Based on Achievement Indicators and Criteria Rubrics of Skills in Spotlight on Science Skills

Exceeding - 4	Meeting - 3	Approaching - 2	Working Below - 1
Independently and consistently...	Generally...	With prompting...	Has difficulty even with support to...

## Understanding the Rubric for Summative Assessment

After giving students several opportunities to perform a specific process skill and to use the feedback given to them, each category is designed to measure how the students performs on the GCO as a whole.

Formative Assessment

<p><b>STSE - 100</b> Nature of Science and Technology Relationships Between Science and Technology Social and Environmental Contexts of Science and Tech</p>
<p><b>Plan and Perform - 200</b> Initiating and Planning Performing and Recording</p>
<p><b>Analyze and Explain - 200</b> Analyzing and Interpreting</p>
<p><b>Knowledge - 300</b> Diversity of Life, Flight, Space, Electricity Ecosystems, Earth's Crust, Mix &amp; Solutions, Heat Water Systems, Optics, Fluids, Cells</p>

<p><b>Observations</b> Checklists Presentations Record of Practice</p>
<p><b>Conversations</b> Group Work Records Student-Teacher Conferences Self-Assessments Records of Practice</p>
<p><b>Products/Performances</b> Journals Tests, Quizzes, Exam Records of work</p>

STSE - 100
Plan and Perform 200
Analyze and Explain 200
Knowledge 300

Summative Assessment

### **PP1 - Questioning**

- Write questions using language that suggests an investigation
- Develop testable questions that indicate the variable to test (independent)
- Develop testable questions that indicate the variable to measure (dependent)
- Use language that is precise and relevant to the question

### **PP2 - Predicting/Hypothesizing**

- Write prediction or hypothesis statements that are testable
- Write hypothesis statements using the "if, then, because" format, including a plausible reason; tentative words such as evidence suggests and may may be used
- Write prediction and hypothesis statements in passive voice

### **PP3 - Identifying Variables**

- Distinguish between what is tested, what is measured/observed and what is controlled
- Identify one independent variable and one dependent variable, with other variables controlled
- Collect evidence relevant to the relationship of the independent and dependent variable

### **PP4 - Designing Investigations**

- Plan procedures with a set of steps to test a single question
- Plan procedures to minimize experimental bias
- Plan procedures to use multiple trials to increase accuracy, if appropriate
- Plan procedures with enough details they can be repeated by someone else
- Plan procedures identifying needed equipment and materials
- Plan procedures identifying relevant measurements and/or observations to be made
- Plan procedures with one independent and one dependent variable and written in a way to controls the major variables

### **PP5 - Collect and Recording Data**

- Collect measurements and/or observations relevant to the question being tested
- Collect the type of data appropriate to the dependent variable, quantitative when possible
- Record evidence with labels and in an organized manner
- Collect quantitative data accurately and record with units
- Record qualitative data factually without inferences

### **AE1 - Organizing and Displaying Data**

- Identify relevant characteristics that distinguish or are in common across a variety of item or organisms
- Organize and display information about characteristics appropriately (e.g., Venn diagram)
- Use charts or graphs with appropriate titles and labels
  - Graphs require data to be correctly displayed, correct, scale, appropriate labels, title
  - Charts include all necessary headings and units
- Differentiate between discrete and continuous data and use the appropriate type of graph based on data (e.g., bar graph, double bar graph, line graph, pictograph)

### **AE2 - Reflecting and Analyzing**

- Identify and explain a general pattern/trend/relationship from the observed and organized data
- Identify a discrepancy in data and note possible sources or error
- Use interpolation and/or extrapolation to identify values consistent with the pattern/trend

### **AE3 - Drawing Conclusions**

- Make a conclusion based on logic and available evidence
- Make a conclusion that answers the initial question
- Include a statement that their data either supports or refutes the initial prediction/hypothesis
- Justify this claim by providing evidence from data collected
- Compare the results of their investigation to those of others and recognize that results may vary

### **AE4 - Extending Thinking**

- Demonstrate higher order thinking, depending on the task, communicated during discussion and/or reflection