



# Science

**Support Level Descriptors,  
Reporting Concepts,  
Test Blueprints, and  
Reporting Concepts  
Raw Reference Scores**

**Fall 2022**



**State of New Jersey  
Department of Education**

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## Start Strong Science Support Level Descriptors

### Elementary School – Strong Support May Be Needed

Students at this level demonstrated minimal understanding of the Elementary School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

To a limited degree, students at this level are typically able to:

- Identify questions that are based on observations and recognize that some questions are testable.
- Make observations and/or measurements during a simple investigation and read graphs to a limited degree of accuracy.
- Identify components of a basic model and generate solutions to simple problems.
- Identify that measurements, observations, and patterns serve as evidence.
- Identify supportable arguments and make claims.
- Identify or use relevant information from multiple sources.

Students at this level will likely need strong support to learn more advanced concepts and be able to:

- Ask relevant and testable questions.
- Plan an investigation that includes the identification of necessary tools, the collection of data from observations and/or measurements, and the identification of outcomes resulting from changed variables in relation to cause and effect.
- Organize data and describe how it should be interpreted.
- Identify similarities or differences in data sets.
- Use and/or describe models and their components to address a scientific idea.
- Compare and communicate information from multiple sources.
- Identify arguments that are supported by evidence.
- Identify evidence or facts used in a claim.

### Elementary School – Some Support May Be Needed

Students at this level demonstrated partial understanding of the Elementary School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Ask relevant and testable questions.
- Plan an investigation that includes the identification of necessary tools, the collection of data from observations and/or measurements, and the identification of outcomes resulting from changed variables in relation to cause and effect.
- Organize data and describe how it should be interpreted.
- Identify similarities or differences in data sets.
- Use and/or describe models and their components to address a scientific idea.
- Compare and communicate information from multiple sources.
- Identify arguments that are supported by evidence.
- Identify evidence or facts used in a claim.

Students at this level will likely need some support to learn more advanced concepts and be able to:

- Predict reasonable outcomes from relevant and testable questions.
- Plan an investigation by evaluating appropriate methods or tools for collecting data while controlling variables.
- Analyze, represent, and interpret data in order to reveal patterns that suggest relationships.
- Develop and/or revise models to describe scientific ideas.
- Construct an explanation using evidence.
- Compare and combine information across texts in order to communicate scientific explanations.
- Construct, support, or evaluate a claim using relevant evidence.

## Elementary School – Less Support May Be Needed

Students at this level demonstrated appropriate understanding of the Elementary School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Predict reasonable outcomes from relevant and testable questions.
- Plan an investigation by evaluating appropriate methods or tools for collecting data while controlling variables.
- Analyze, represent, and interpret data in order to reveal patterns that suggest relationships.
- Develop and/or revise models to describe scientific ideas.
- Construct an explanation using evidence.
- Compare and combine information across texts in order to communicate scientific explanations.
- Construct, support, or evaluate a claim using relevant evidence.

Students at this level will likely need minimal support to learn more advanced concepts and be able to:

- Generate testable questions that include variables.
- Plan and conduct an investigation and compare the data sets from multiple trials.
- Evaluate data to determine if it provides evidence to support scientific claims.
- Organize complex data sets to support conclusions.
- Evaluate/revise/design a model to show cause and effect relationships.
- Use evidence to evaluate and/or refine an explanation of relationships between variables.
- Evaluate information in and across scientific texts.
- Make and/or evaluate a claim using multiple data sets.

### Middle School – Strong Support May Be Needed

Students at this level demonstrated minimal understanding of the Middle School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

To a limited degree, students at this level are typically able to:

- Identify relationships from graphical displays, data sets, and mathematical representations.
- Plan an investigation, and identify tools and methods for data collection.
- Identify questions that arise from observations, that can be investigated with constraints, and can challenge an argument.
- Identify a model that shows the relationship between variables, and that predicts or describes phenomena.
- Identify central ideas and assess credibility of qualitative scientific information from various sources, including identifying simple evidence that supports or refutes an explanation or argument.

Students at this level will likely need strong support to learn more advanced concepts and be able to:

- Interpret and use graphical displays, data sets, and mathematical representations to clarify relationships, while identifying limitations and areas for improvement.
- Conduct an investigation to provide data to serve as evidence for scientific questions.
- Identify questions that challenge interpretations of data sets.
- Use a model to show relationships between variables, predict/describe a phenomenon, and generate data.
- Use central ideas and assess credibility of quantitative scientific information from a variety of sources, using this to identify complex evidence that supports or refutes an explanation or argument.

### Middle School – Some Support May Be Needed

Students at this level demonstrated partial understanding of the Middle School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Interpret and use graphical displays, data sets, and mathematical representations to clarify relationships, and identify limitations and areas for improvement.
- Conduct an investigation to provide data to serve as evidence for scientific questions.
- Identify questions that challenge interpretations of data sets.
- Use a model to show relationships between variables, predict/describe a phenomenon, and generate data.
- Use central ideas, and assess credibility of quantitative scientific information from a variety of sources, using this to identify complex evidence that supports or refutes an explanation or argument.

Students at this level will likely need some support to learn more advanced concepts and be able to:

- Analyze/use large graphical displays of data.
- Explain or evaluate mathematical concepts/representations.
- Plan and/or evaluate an investigation, identifying variables and/or controls and/or how much data is needed.
- Ask questions that challenge the interpretation of data sets.
- Describe design problems.
- Develop or modify models to predict/describe phenomena and/or generate data.
- Integrate complex scientific information from various sources.
- Critique, compare and/or identify multiple pieces of evidence to support or refute an explanation, model, or solution.

### Middle School – Less Support May Be Needed

Students at this level demonstrated appropriate understanding of the Middle School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Analyze/use large graphical displays of data.
- Explain or evaluate mathematical concepts/representations.
- Plan and/or evaluate an investigation, identifying variables and/or controls and/or the amount of data needed.
- Ask questions that challenge the interpretation of data sets.
- Describe design problems.
- Develop or modify models to predict/describe phenomena and/or generate data.
- Integrate complex scientific information from various sources.
- Critique, compare and/or identify multiple pieces of evidence to support or refute an explanation, model, or solution, and evaluate conclusions.

Students at this level will likely need minimal support to learn more advanced concepts and be able to:

- Construct graphical displays of data.
- Explain when to use qualitative or quantitative data.
- Create algorithms.
- Plan and refine, or revise an investigation, identifying variables and controls and/or how much data is needed, and explaining how it improves accuracy.
- Analyze and/or evaluate questions that challenge the interpretation of data sets.
- Evaluate design problems.
- Develop, compare, or evaluate complex models that predict and/or describe phenomena and/or show relationships among variables.
- Integrate complex quantitative information with other media.
- Critique competing arguments and/or procedures, and analyze empirical evidence to construct written arguments.



### High School – Strong Support May Be Needed

Students at this level demonstrated minimal understanding of the High School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

To a limited degree, students at this level are typically able to:

- Identify/ask questions that examine relationships, frame a hypothesis, and evaluate/revise an investigation that includes data collecting and the effects of independent variables on dependent variables.
- Organize/use/compare simple data sets and models to identify relationships, mathematical concepts, and components of a system.
- Identify evidence obtained from multiple sources, identify counter arguments and evidence that supports or refutes a scientific claim.
- Critically read and compare scientific texts to describe patterns, and assess the credibility of a claim.

Students at this level will likely need strong support to learn more advanced concepts and be able to:

- Ask questions to clarify a model, determine qualitative relationships, or to counter arguments/data.
- Conduct investigations that test a model, identify constraints/variables, produce data, and identify hypotheses on how independent variables affect dependent variables.
- Organize/use/compare data sets and models, describe when to use qualitative versus quantitative data, apply mathematical concepts, use data and apply statistics to solve scientific problems.
- Use a model to predict relationships.
- Compare and communicate information from multiple sources.
- Identify main points of an argument, and defend a claim based on evidence.

## High School – Some Support May Be Needed

Students at this level demonstrated partial understanding of the High School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Ask questions to clarify a model, to determine qualitative relationships, or to counter arguments using data.
- Design and conduct investigations that test a model, identify constraints/variables, produce data, and identify hypotheses on how independent variables affect dependent variables.
- Organize/use/compare data sets and models, describe when to use qualitative versus quantitative data, apply mathematical concepts, use data and apply statistics to solve scientific problems.
- Use a model to predict relationships.
- Compare and communicate information from multiple sources.
- Identify main points of an argument, and defend a claim based on evidence.

Students at this level will likely need some support to learn more advanced concepts and be able to:

- Ask questions to revise/refine a model and determine quantitative relationships.
- Frame a hypothesis based on a model/theory, evaluate simple questions that challenge an argument, and plan an investigation to evaluate scientific phenomena.
- Develop simple models, revise various models, apply/analyze data and statistics, and apply/use mathematical representations to see if a model is viable or to decide if qualitative or quantitative data meet criteria for success.
- Make/revise claims, evaluate/defend a claim, choose between competing arguments, and integrate information from multiple sources.

### High School – Less Support May Be Needed

Students at this level demonstrated appropriate understanding of the High School scientific concepts and practices in the three tested content domains: Earth & Space, Life, and Physical Science.

Students at this level are typically able to:

- Ask questions to revise/refine a model and determine quantitative relationships.
- Frame a hypothesis based on a model/theory, evaluate simple questions that challenge an argument, and plan an investigation.
- Develop simple models, revise various models, apply/analyze data and statistics, and apply/use mathematical representations to see if a model is viable or to decide if qualitative or quantitative data meet criteria for success.
- Make/revise claims, evaluate/defend a claim, choose between competing arguments, and integrate information from multiple sources.

Students at this level will likely need minimal support to learn more advanced concepts and be able to:

- Analyze/evaluate/revise questions to determine relationships or to provide explanations.
- Develop/revise complex models that test and predict relationships.
- Revise/evaluate an investigation in which an independent variable is manipulated or in which an unsatisfactory performance is found.
- Evaluate data and statistics to solve problems, to make claims, or to design solutions.
- Create a model or justify the choice of qualitative versus quantitative data through the use of mathematical computations.
- Evaluate/construct/critique claims, and evaluate information from multiple sources to determine the usefulness of evidence.

## Start Strong Science Reporting Concepts

For science, the reporting concepts on the Start Strong Assessment are the same as the three domains and three types of practices that are reported for the NJSLA. Each item aligns to both a Science & Engineering Practice (SEP) Reporting Category (e.g., Investigating, Sensemaking, or Critiquing) and a Domain (e.g., Earth and Space Science, Life Science, or Physical Science.) The reporting concepts and their descriptions are the same for all grades in science.

### Science and Engineering Practices Reporting Concepts

Science and Engineering Practices Reporting Concept	Description	Standards
Investigating Practices	Students were asked to plan and carry out investigations based on observations on phenomena, and organize the data.	Ask questions and define problems (AQDP) Plan and carry out investigations (PACI) Use mathematical and computational thinking (UMCT)
Sensemaking Practices	Students were asked to recognize patterns and relationships in data to develop explanations or models of the phenomena.	Develop and use models (DUM) Analyze and interpret data (AID) Construct explanations and define solutions (CEDS)
Critiquing Practices	Students were asked to evaluate and create arguments regarding different explanations and claims to convey a deeper understanding of the natural world.	Engage in arguments from evidence (EAE) Obtain, evaluate, and communicate information (OEI)

### Science Content Domain Reporting Concepts

Content Domain Reporting Concept	Description
Earth and Space Science	Students were asked to demonstrate knowledge of the processes that operate on and within the Earth and also its place in the solar system and galaxy.
Life Science	Students were asked to demonstrate knowledge of patterns, processes, and relationships of living organisms.
Physical Science	Students were asked to demonstrate knowledge of the mechanisms of cause and effect in all systems and processes that can be understood through a common set of physical and chemical processes.

### Science Cross-Cutting Concepts

Abbreviation	Term	Description
PAT	Patterns	Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.
C and E	Cause and Effect: Mechanism and Prediction	Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.
S, P and Q	Scale, Proportion, and Quantity	In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.
S&SM	Systems and System Models	A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.
E&M	Energy and Matter: Flows, Cycles, and Conservation	Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.
SF	Structure and Function	The way an object is shaped or structured determines many of its properties and functions.
SC	Stability and Change	For both designed and natural systems, conditions that affect stability and factors that control rates of change are critical elements to consider and understand.

## Start Strong Science Test Blueprints

These tables describe how many points were allocated to each major content cluster and/or reporting concept in the 2022 Start Strong assessment. Note that information about standard alignment for specific items will be available in the Results by Question and Student Performance Item Level Reports.

Each item in science belongs to one reporting concept for the content domain that it is aligned with, as well as one reporting concept for the science and engineering practice that it is aligned with.

### Grade 6 Test Blueprint (based on Grades 3–5 Learning Standards)

Content Domain Reporting Concept	Science and Engineering Practices Reporting Concept	Number of Items	Number of Points
Earth and Space Science	Investigating	1	1
Earth and Space Science	Sensemaking	6	6
Earth and Space Science	Critiquing	1	1
Life Science	Investigating	3	3
Life Science	Sensemaking	1	1
Life Science	Critiquing	3	3
Physical Science	Investigating	5	5
Physical Science	Sensemaking	3	3
Physical Science	Critiquing	2	2

### Grade 9 Test Blueprint (based on Middle School Learning Standards)

<b>Content Domain Reporting Concept</b>	<b>Science and Engineering Practices Reporting Concept</b>	<b>Number of Items</b>	<b>Number of Points</b>
Earth and Space Science	Investigating	4	4
Earth and Space Science	Sensemaking	2	2
Earth and Space Science	Critiquing	2	2
Life Science	Investigating	1	1
Life Science	Sensemaking	5	5
Life Science	Critiquing	1	1
Physical Science	Investigating	4	4
Physical Science	Sensemaking	3	3
Physical Science	Critiquing	2	3

**Grade 12 Test Blueprint (based on High School Learning Standards)**

<b>Content Domain Reporting Concept</b>	<b>Science and Engineering Practices Reporting Concept</b>	<b>Number of Items</b>	<b>Number of Points</b>
Earth and Space Science	Investigating	3	3
Earth and Space Science	Sensemaking	5	5
Earth and Space Science	Critiquing	2	2
Life Science	Investigating	0	0
Life Science	Sensemaking	4	4
Life Science	Critiquing	3	3
Physical Science	Investigating	5	5
Physical Science	Sensemaking	2	2
Physical Science	Critiquing	1	1



## Start Strong Science Reporting Concept Raw Reference Scores

This table provides some contextualizing information to assist in the interpretation of the Science reporting concept scores. For each grade and reporting concept, the columns labeled “Some Support Reference Score” and “Less Support Reference Score” represent the expected average reporting concept score of students who have just barely entered into the “Some Support” or “Less Support” level. The “Points Available” column represents the number of points possible for each Science reporting concept. An example of how to use this information is presented in the following paragraph.

Student A is in Grade 9 and received a 12 on the Start Strong Science assessment, meaning he is classified as “Some Support May Be Needed.” He received a Sensemaking reporting concept score of 3. Given Student A’s overall “Some Support” classification and the information provided in Table 4, it would be expected that his Sensemaking score would fall within the range of 4.6 (“Some Support”) and 7.3 (“Less Support”); however, his score of 3 indicates he might need more support in the area of Sensemaking. This information in conjunction with observations from the classroom could then be used to identify the support Student A might require in the knowledge, skills, and abilities associated with Sensemaking. Similar reasoning could be used for each reporting concept.

**Science Reporting Concept Raw Reference Scores**

Grade	Reporting Concept	Some Support Reference Score	Less Support Reference Score	Points Available
6	Earth	4.1	5.9	8
6	Life	3.9	5.5	7
6	Physical	4.8	7.0	10
6	Investigating	3.8	5.9	8
6	Sensemaking	6.4	8.6	11
6	Critiquing	2.5	3.9	6
9	Earth	3.0	5.2	8
9	Life	3.0	4.8	7
9	Physical	2.5	5.3	10
9	Investigating	2.3	4.9	9
9	Sensemaking	4.6	7.3	10
9	Critiquing	1.6	3.2	6
12	Earth	4.9	6.6	10
12	Life	4.0	5.2	7
12	Physical	3.4	4.9	8
12	Investigating	4.0	5.4	8
12	Sensemaking	5.6	7.6	11