

Unit 1 Scientific Method & Laboratory Safety

Content Area: **Science**
Course(s): **Science Gr. 6**
Time Period: **September**
Length: **4 Weeks**
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Title Section

Department of Curriculum and Instruction



Belleville Public Schools

Curriculum Guide

Physical Science, 6th Grade

Scientific Method and Laboratory Safety

Belleville Board of Education

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Unit Overview

In Unit 1, The Scientific Method and Laboratory Safety, the students are expected to learn:

- how to follow proper scientific sequence
- how to correctly formulate a hypothesis based upon an observation and/or experience
- how to design an experimental procedure, collect evidentiary data, analyze data, and draw upon that data to formulate accurate conclusions
- how to identify variables in a scientific experiment
- how to safely conduct themselves inside of a laboratory
- how to identify laboratory tools and their use

SCI.5-6.5.1.6	All students will understand that science is both a body of knowledge and an evidence-based, model-building enterprise that continually extends, refines, and revises knowledge. The four Science Practices strands encompass the knowledge and reasoning skills that students must acquire to be proficient in science.
SCI.5-6.5.1.6.A	Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
SCI.5-6.5.1.6.C	Scientific knowledge builds on itself over time.
SCI.5-6.5.1.6.D	The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.
SCI.5-6.5.2.6	<p>All students will understand that physical science principles, including fundamental ideas about matter, energy, and motion, are powerful conceptual tools for making sense of phenomena in physical, living, and Earth systems science.</p> <p>Tracking fluxes of energy and matter into, out of, and within systems helps one understand the systems' possibilities and limitations.</p> <p>Events have causes, sometimes simple, sometimes multifaceted. A major activity of science is investigating and explaining causal relationships and the mechanisms by which they are mediated. Such mechanisms can then be tested across given contexts and used to predict and explain events in new contexts.</p>

Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

In considering phenomena, it is critical to recognize what is relevant at different measures of size, time, and energy and to recognize how changes in scale, proportion, or quantity affect a system's structure or performance.

Enduring Understanding

Enduring understandings:

- Students understand core concepts and principles of science and use measurement and observation tools to assist in categorizing, representing, and interpreting the natural and designed world.
- Students master the conceptual, mathematical, physical, and computational tools that need to be applied when constructing and evaluating claims.
- Scientific knowledge builds on itself over time.
- The growth of scientific knowledge involves critique and communication, which are social practices that are governed by a core set of values and norms.
- Scientists use an inquiry process to find answer to questions.

Essential Questions

- What do I need to inquire about?
- Why is this investigation important?
- What resources are available to help me answer this question?
- How do I collaborate with others?
- How do I communicate my information with others?

Exit Skills

By the end of Grade 6 Physical Science Unit 1, the student should be able to:

- Question for a purpose based on his/her observations.
- Write a formal hypothesis, using the "if..., then..., because" model.
- Identify the independent, dependent, and control variables in an experiment.
- Observe, collect and record data, to detail the results for an experiment.
- Measure and record accurate data.
- Use appropriate measurement tools, tables, graphs, and charts.
- Present findings in a variety of formats.
- Accept suggestions from peers to improve investigations.

New Jersey Student Learning Standards (NJSLS-S)

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Interdisciplinary Connections

LA.W.6.1	Write arguments to support claims with clear reasons and relevant evidence.
LA.W.6.1.A	Introduce claim(s) and organize the reasons and evidence clearly.
LA.RI.6.1	Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
LA.RI.6.2	Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.
LA.RI.6.3	Analyze in detail how a key individual, event, or idea is introduced, illustrated, and elaborated in a text (e.g., through examples or anecdotes).
LA.RI.6.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
LA.RI.6.7	Integrate information presented in different media or formats (e.g., visually, quantitatively) as well as in words to develop a coherent understanding of a topic or issue.
LA.RI.6.8	Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.
LA.RI.6.9	Compare, contrast and reflect on (e.g., practical knowledge, historical/cultural context, and background knowledge) one author's presentation of events with that of another (e.g., a memoir written by and a biography on the same person).
MA.6.EE.A.1	Write and evaluate numerical expressions involving whole-number exponents.
MA.6.EE.A.2	Write, read, and evaluate expressions in which letters stand for numbers.
MA.6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
MA.6.EE.B.7	Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.
MA.6.EE.C	Represent and analyze quantitative relationships between dependent and independent variables.

MA.6.RP.A.1	Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
MA.6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

Learning Objectives

- Develop a scientific problem based upon an observation and /or experience that takes the form of a question and can be explored through scientific experimentation
- Construct a hypothesis for a scientific problem that consists of an explanation and a rationale for said explanation that is based upon experience and/or observation
- Develop a procedure to test said hypothesis and be able to carry out said procedure in a well-organized, realistic manner
- Identify which variables in your experiment are dependent, independent, and which in the control for your experiment
- Collect and record data by creating and filing in a clear, labeled data table in accordance with said procedure
- Analyze and compare data gathered in a manner to draw accurate conclusions on the scientific problem while identifying any sources of experimental error(s)
- Develop a conclusion that relates to the data collected and is supported by scientific evidence
- Design multiple trials to further test said hypothesis

Suggested Activities

- Work collaboratively in teams to construct a hypothesis to address various questions or problems.
- Identify the independent, dependent, and control variables in various experimental scenario's.
- Conduct "Come Fly with Me" paper airplane experiment, by predicting results, gathering data and reporting results.
- Cut and paste activity to identify the steps of the scientific method.
- Create a poster about Lab Safety

Evidence of Student Learning - Checking for Understanding (CFU)

- Admit Tickets
- Anticipation Guide
- Common benchmarks
- Compare & Contrast
- Create a Multimedia Poster
- Define
- Describe
- Evaluate
- Evaluation rubrics
- Exit Tickets

- Explaining
- Fist- to-Five or Thumb-Ometer
- Illustration
- Journals
- KWL Chart
- Newspaper Headline
- Outline
- Question Stems
- Quickwrite
- Quizzes
- Red Light, Green Light
- Self- assessments
- Socratic Seminar
- Study Guide
- Teacher Observation Checklist
- Think, Pair, Share
- Think, Write, Pair, Share
- Top 10 List
- Unit tests

Primary Resources & Materials

- Defined Stem
- Internet resources
- Science Department video DVD library
- Laboratory materials
- Student Workbooks
- Interactive Notebook

Ancillary Resources

- Guest Speakers
- Additional Internet sources
- Outdoor area of school

- Computer carts for research when available

Technology Infusion

- Smart board
- DefinedStem.com
- Document Camera
- Pod-casts video streams
- Discovery Education video streams
- You Tube video streams
- Brain-pop video streams
- Laptops
- Khan Academy
- Power Point presentation
- MS Word

Alignment to 21st Century Skills & Technology

These skills will be aligned to the following core content areas:

- English Language Arts; reading informational text, following procedural steps, orally presenting predictions and opinions, and creating written laboratory reports
- Mathematics; measuring
- Science and Scientific Inquiry (Next Generation); see above
- Social Studies, including American History, World History, Geography, Government and Civics, and Economics; history of science and how the Scientific method has connections to World and American history expansion. Discuss the impact of science on society and what kind of moral questions scientists must address.
- World languages; discussion of root words and linguistic origin of vocabulary words.
- Technology; see above
- Visual and Performing Arts: oral and graphic presentation of procedures, results, and conclusion.

21st Century/Interdisciplinary Themes

- Civic Literacy
- Environmental Literacy
- Financial, Economic, Business and Entrepreneurial Literacy
- Global Awareness
- Health Literacy

21st Century Skills

- Communication and Collaboration
- Creativity and Innovation
- Critical thinking and Problem Solving
- ICT (Information, Communications and Technology) Literacy
- Information Literacy
- Life and Career Skills
- Media Literacy

Differentiation

Differentiations:

- Small group instruction
- Small group assignments
- Extra time to complete assignments
- Pairing oral instruction with visuals
- Repeat directions
- Use manipulatives
- Center-based instruction
- Token economy - Science Dollars
- Guided Notes
- Teacher reads assessments allowed
- Rephrase written directions
- Multisensory approaches
- Additional time
- Preview vocabulary
- Preview content & concepts
- Behavior management plan
- Highlight text
- Student(s) work with assigned partner
- Visual presentation
- Assistive technology
- Auditory presentations
- Dictation to scribe

Hi-Prep Differentiations:

- Alternative formative and summative assessments
- Games and tournaments
- Group investigations
- Guided Reading
- Independent research and projects
- Interest groups
- Multiple texts
- Project-based learning
- Problem-based learning
- Stations/centers
- Think-Tac-Toes
- Tiered activities/assignments
- Tiered products
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Lo-Prep Differentiations:

- Exploration by interest
- Flexible grouping
- Jigsaw
- Mini workshops to re-teach or extend skills
- Open-ended activities
- Think-Pair-Share
- Varied journal prompts
- Correcting summative and formative assessments
- Retaking the test

Intervention Strategies

- allowing students to correct errors (looking for understanding)
- teaching key aspects of a topic. Eliminate nonessential information
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning
- allowing students to select from given choices
- allowing the use of note cards or open-book during testing
- collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test.

- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- marking students' correct and acceptable work, not the mistakes
- modifying tests to reflect selected objectives
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using authentic assessments with real-life problem-solving
- using true/false, matching, or fill in the blank tests in lieu of essay tests
- using videos, illustrations, pictures, and drawings to explain or clarify

Special Education Learning

- printed copy of board work/notes provided
- additional time for skill mastery
- assistive technology
- behavior management plan
- Center-Based Instruction
- check work frequently for understanding
- computer or electronic device utilizes
- extended time on tests/ quizzes
- have student repeat directions to check for understanding
- highlighted text visual presentation
- modified assignment format
- modified test content
- modified test format
- modified test length
- multiple test sessions
- multi-sensory presentation
- preferential seating
- preview of content, concepts, and vocabulary
- reduced/shortened reading assignments
- Reduced/shortened written assignments
- secure attention before giving instruction/directions
- shortened assignments
- student working with an assigned partner
- teacher initiated weekly assignment sheet
- Use open book, study guides, test prototypes

English Language Learning

- teaching key aspects of a topic. Eliminate nonessential information
- using videos, illustrations, pictures, and drawings to explain or clarify
- allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slide shows, videos, etc.) to demonstrate student's learning;
- allowing students to correct errors (looking for understanding)
- allowing the use of note cards or open-book during testing
- decreasing the amount of work presented or required
- having peers take notes or providing a copy of the teacher's notes
- modifying tests to reflect selected objectives
- Provide Native Language translation when possible
- providing study guides
- reducing or omitting lengthy outside reading assignments
- reducing the number of answer choices on a multiple choice test
- tutoring by peers
- using computer word processing spell check and grammar check features
- using true/false, matching, or fill in the blank tests in lieu of essay tests

Sample Lesson

Unit Name: Scientific Method

NJSLS: SCI 5-6.1.6, 1.6 A, B, C, and D

Interdisciplinary Connection: **Math::** measuring distance, recording data, plotting a bar graph.

ELA: writing a hypothesis and conclusion

Statement of Objective: SWDAT distinguish among Independent Variables, Dependent Variables, Constants, and Controls within an experiment.

Anticipatory Set/Do Now: How does the weight of the paper affect how far a paper airplane will travel? Turn and talk with your science partner.

Learning Activity:

SW present their answers to the whole class. Whole class discussion.

SW write a formal hypothesis on the "Come Fly with Me Lab" Using "if ..., then ..., because ..."

Review the pre lab, and the lab activity

SW in homogeneous groups to conduct the lab activity making airplanes using three different types of paper.

SW run three trials on each plane recording distance of each in data chart using learn up the lab activity to continue tomorrow

SW collect materials and clean up

Exit ticket: Did you notice any patterns while you were recording your data?

Student Assessment/CFU's: See link

Fist to Five, Teacher Observation, Class discussion, Lab Worksheet, Exit Ticket

Materials: Meter Sticks, Graph paper, Computer Paper. and Card Stock. Lab Worksheet
Smart board/projector

21st Century Themes and Skills: See link

Differentiation: See link

Integration of Technology: Smartboard

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