

INTRODUCTION

The Hinsdale School District PreK-12 science curriculum is a coordinated program built around science education and the expectations of the New Hampshire Curriculum Frameworks. It proceeds sequentially; introducing, expanding, and further exploring content at appropriate grade levels with increasing degrees of depth and complexity. The Common Core State Standards for English Language Arts include standards pertaining to all content areas.

Teachers are responsible for incorporating the Common Core State Standards into their science instruction.

IMPORTANT NOTE TO ALL TEACHERS

It is important for teachers to follow the curriculum for each grade level or class as described in this guide; the integrity of the PreK-12 sequence has been carefully considered in its creation. Grade levels and individual classes have some degree of flexibility in designing the sequence of topics through the year, but *addressing the provided scope is required*. At the elementary level, the topics for each grade level have been carefully planned so as to address necessary content without redundancy or omission to meet the expectations of the NH frameworks and high stakes testing. At the middle school and high school levels the curricula are also constructed to fully meet the expectations of the NH frameworks and high stakes testing. The guiding questions in each section make clear the topics of inquiry (scope) for each grade. These topics change and build on each other through the grades (sequence), making it imperative that each teacher use the guiding questions to plan instruction.

SCIENCE INQUIRY

Science Inquiry!

Actual doing!

Capture student interest and motivate continued learning!

Inquiry involves QUESTIONING. Inquiry requires being able to identify assumptions, to use critical and logical thinking, and the ability to consider alternative explanations. Inquiry might be highly structured where known outcomes are clear, or students may be free to explore with unanticipated results!

Students engaged in Inquiry:

- make observations
- pose questions
- propose answers
- examine what they may already know
- review already researched information
- explain / communicate results
- use tools to
 - gather
 - analyze
 - interpret data

Students use journals to record observations, thoughts, ideas, and models, create diagrams, and represent data and observations with plots and tables. Students present their work to others with models, graphs, reports, posters, etc.

Asking students questions to guide continued exploration provides opportunities for discussion, further reflection, and student decision-making.

Appropriate activities are safe, developmentally appropriate, and directly related to the curriculum. Sufficient tools and materials must be available and science inquiry vocabulary (provided in guide) used.

Essential Understandings

The Science Curriculum for Hinsdale Elementary, Middle and High School is built around the standards listed in the New Hampshire Curriculum Framework. Science is divided into three content domains (Earth Space Science, Life Science, and Physical Science) and one Science Process Skills domain. The three content domains should encompass the Scientific Process Skills of Inquiry and Critical Thinking Skills. The following list of Essential Understandings or Enduring Knowledge Statements are used across all grade levels.

**Essential Understandings
Earth Space Science**

Strand (Enduring Knowledge Statements)	Stem (rows) in GSEs
ESS1– The Earth and Earth materials, as we know them today, have developed over long periods of time, through constant change processes.	1. Atmosphere, Climate, and Weather
	2. Composition and Features
	3. Fossils
	4. Observation Of The Earth From Space
	5. Processes and Rates Of Change
	6. Rock Cycle
	7. Water
ESS2– The Earth is part of a solar system, made up of distinct parts, which have temporal and spatial interrelationships.	1. Earth, Sun And Moon
	2. Energy
	3. Solar System
	4. View From Earth
ESS3– The origin and evolution of galaxies and the universe demonstrate fundamental principles of physical science across vast distances and time.	1. Size And Scale
	2. Stars And Galaxies
	3. Universe
ESS4– The growth of scientific knowledge in Earth Space Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.	1. Design Technology
	2. Tools
	3. Local And Global Environmental Issues
	4. Career and Technical Education

Essential Understandings Life Science

Strand (Enduring Knowledge Statements)	Stem (rows) in GSEs
LS1– All living organisms have identifiable structures and characteristics that allow for survival (organisms, populations, and species).	1. Classification
	2. Living Things And Organization
	3. Reproduction
LS2– Energy flows and matter recycles through an ecosystem.	1. Environment
	2. Flow Of Energy
	3. Recycling Of Materials
LS3– Groups of organisms show evidence of change over time (e.g. evolution, natural selection, structures, behaviors, and biochemistry).	1. Change
	2. Evolution
	3. Natural Selection
LS4– Humans are similar to other species in many ways, and yet are unique among Earth’s life forms.	1. Behavior
	2. Disease
	3. Human Identity
LS5– The growth of scientific knowledge in Life Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.	1. Design Technology
	2. Tools
	3. Social Issues (Local And Global) Medical Technology and Biotechnology
	4. Career Technical Education Connections

(NH Department of Education- NH Curriculum Framework 2006)

**Essential Understandings
Physical Science**

Strand (Enduring Knowledge Statements)	Stem (rows) in GSEs
PS1– All living and nonliving things are composed of matter having characteristic properties that distinguish one substance from another (independent of size/amount of substance).	1. Composition
	2. Properties
PS2– Energy is necessary for change to occur in matter. Energy can be stored, transferred and transformed, but cannot be destroyed.	1. Change
	2. Conservation
	3. Energy
PS3– The motion of an object is affected by force.	1. Forces
	2. Motion
PS4– The growth of scientific knowledge in Physical Science has been advanced through the development of technology and is used (alone or in combination with other sciences) to identify, understand and solve local and global issues.	1. Design Technology
	2. Tools
	3. Social Issues (Local and Global) Energy, Power, and Transportation Manufacturing
	4. Career Technical Education Connections

(NH Department of Education- NH Curriculum Framework 2006)

Essential Understandings Science Process Skills

Strand (Enduring Knowledge Statements)	Stem (rows) in GSEs
SPS1– Scientific Inquiry and Critical Thinking Skills	1. Making observations and asking questions
	2. Designing scientific investigations
	3. Conducting scientific investigations
	4. Representing and Understanding results of Investigations
	5. Evaluating Scientific Investigations
	NECAP Science Assessment Targets for Inquiry (INQ) <i>May subject of performance component</i>
SPS2– Unifying Concepts of Science (including NECAP Science Assessment Targets by Big Idea)	1. Nature of Science (NOS)
	2. Systems and Energy (SAE)
	3. Models and Scale (MAS)
	4. Patterns of Change (POC)
	5. Form and Function (FAF)
SPS3– Personal, Social, and Technological Perspectives	1. Collaboration in Scientific Endeavors
	2. Environment, Natural Resources, and Conservation
	3. Science, Technology, and Design
SPS4– Science Skills for Information, Communication and Media Literacy	1. Information and Media Literacy
	2. Communication Skills
	3. Critical Thinking and Systems Thinking
	4. Problem Identification, Formulation, and Solution
	5. Creativity and Intellectual Curiosity
	6. Interpersonal and Collaborative Skills
	7. Self Direction
	8. Accountability and Adaptability
	9. Social Responsibility

(NH Department of Education- NH Curriculum Framework 2006)

Life Science

	Standards	Guiding Questions
LS1	<p>S:LS1:11:1.1 Classification of life into a hierarchy of groups (Domains to species) 1.2 Using DNA similarities to establish phylogeny 1.3 Binomial Nomenclature</p> <p>S:LS1:11: 2.1 Structure of a Eukaryotic cell. The organelles and their functions.</p> <p>S:LS1:11:2.2 Gene expression, Cell signaling and communication, Cell growth and division.</p> <p>S:LS1:11:2.3 Cell Metabolism. Energy conversions in a cell.</p> <p>S:LS1:11:2.4 Photosynthesis and Cellular Respiration</p> <p>S:LS1:11:2.5 Structure and function of proteins in the cell (Enzymes)</p> <p>S:LS1:11:2.6 Examples of cell functions and cell differentiation in multi-cellular animals</p> <p>S:LS1:11:2.7 Homeostasis</p> <p>S:LS1:11:3.1 Structure and function of DNA</p> <p>S:LS1:11:3.2 sexual reproduction and genetic diversity</p> <p>S:LS1:11:3.3 Life cycles: Asexual, sexual and alternation of generations</p>	<p>What are the similarities and differences between all living things?</p> <p>What are Prokaryotic and Eukaryotic Cells?</p> <p>What are the functions of the Eukaryotic cell organelles?</p> <p>What is the relationship between photosynthesis and cellular respiration and how do these processes contribute to biogeochemical cycles?</p> <p>How do living cells maintain homeostasis?</p> <p>What are the different ways in which living things reproduce?</p> <p>What is the difference between Mitosis and Meiosis?</p>
LS2	(Covered in Environmental Science Curriculum)	

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LS3	<p>S:LS3:11:2.1 Development of life on Earth. Origin of life and evolutionary process.</p> <p>S:LS3:11:2.2 to 2.4, 2.6 and 3.1 Natural Selection</p> <p>S:LS3:11:2.5 DNA analysis and Protein analysis to show phylogeny</p> <p>S:LS3:11:3.2 Explain the diversity of the past and present life forms on Earth.</p> <p>S:LS3:11:3.3 Genetic diversity and survival.</p> <p>S:LS3:11:3.4 Antibiotic resistance and changes in viral genomes as an example of Natural Selection.</p> <p>S:LS3:11:3.5 Genetic variations within a species.</p> <p>S:LS3:11:3.6 Mutations and changes in species genomes.</p> <p>S:LS3:11:3.7 Mendelian genetics and patterns of inheritance.</p> <p>S:LS3:11:3.8 Punnet squares and pedigree charts.</p>	<p>How did life originated on Earth?</p> <p>What are the evidences of Evolution?</p> <p>How do species change the way they look over time?</p> <p>What is the role of genetic diversity in the survival of a species?</p> <p>Why do you have to finish your antibiotics?</p> <p>What are mutations and how do they affect evolution and health?</p> <p>What are Punnet squares?</p> <p>What is a Pedigree?</p>
LS4	<p>S:LS4:11:1.1 and 1.2 Describe how the functions of animal body systems function together to maintain homeostasis.</p> <p>S:LS4:11:2.1 Different factors that cause disease.</p>	<p>What are the similarities between the body systems of humans and other animals?</p> <p>What makes us sick?</p>

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LS4	S:LS4:11:2.2 to 2.4 Preventing and treating disease	How does the immune system function to prevent and fight disease?
LS5	S:LS5:11: 1.1 and 1.2 useful technology in life science. Types of Microscopes and other useful tools S:LS5:11: 3.2 to 3.4 applications of biotechnology in agriculture, pharmaceuticals and genetic engineering	How do Biologists gather data? What types of Microscopes are used in the classroom? What other types of Microscopes are there? How is biotechnology used today?

Life Science

Essential Vocabulary	
<u>CONTENT</u>	<u>VOCABULARY</u>
Biology	Describe
Prokaryotic	Identify
Eukaryotic	Differentiate
Cell	Recognize
Organelle (include all)	Explain
Binomial Nomenclature	Justify
Metabolism	Compare/contrast
Photosynthesis	Evidence
Respiration	Interrelations
Protein synthesis	Interdependence
Homeostasis	Inquiry
Gene	Scientific method
DNA and RNA	Observation
Reproduction	Hypothesis
Mitosis and Meiosis	Prediction
Genetic Diversity	Variable
Heredity	Experiment
Punnet Squares and Pedigrees	Data
Evolution	Measurement
Natural Selection	Analyze
Mutation	Infer
Organ system	Conclude
	Graph

GRADE: 11. Biology

Life Science

Suggested Resources/ Activities

Cell Alive. Com

[Learn.Genetics™](#)

[A Science Odyssey: You Try It: DNA Workshop](#)

[Cellular Respiration](#)

[Human Pedigree Analysis 1](#)

[Darwin: Who Wants to Live a Million Years?: Science Channel](#)

[Classification of Plants | National Geographic Education Video](#)

[Lab 2—Mitosis Slides](#)

<http://www.education.nh.gov/instruction/curriculum/science/index.htm>

(Science Curriculum Website)

<http://www.education.nh.gov/instruction/assessment/necap/released/index.htm>

(Science NECAP- Released items)