

**HOPATCONG BOROUGH SCHOOL**  
**MIDDLE SCHOOL SCIENCE CURRICULUM**  
**GRADE 7**  
**AUGUST 2009**

## **LIFE SCIENCE 2009**

**COURSE DESCRIPTION:** The seventh grade science curriculum will focus on life science. A specific emphasis will be placed on structure of living things (life functions, organization, and classification), diversity of living things (genetic material, evolution, adaptations), organisms and their environment (organisms and ecosystems, human and natural impacts on ecosystems). Furthermore, the seventh grade curriculum will provide a brief review of all standards covered in the sixth grade curriculum. This course is designed to encourage students to develop and use problem-solving and decision-making skills along with collaborative research techniques through experimentation. Students will be formulating questions and hypotheses along with interpreting and analyzing data, drawing conclusions and communicating results.

All middle school science classes will cover problem solving and mathematics (problem solving in science, scientific procedures, mathematics in science), history of science, technology, and society (relationship of science, technology, and society, scientific measurement tools and observational strategies, technological advances and space exploration).

Technology literacy will be addressed in the science classroom as students utilize computer applications to gather and organize data and solve problems.

By the discovery process, the students will develop an understanding of fundamental scientific principles and science-related skills.

The sequence of the course will be determined by the classroom teacher pending material availability.

## **CORE CURRICULUM CONTENT STANDARDS:**

**STANDARD 5.1 (SCIENTIFIC PROCESSES)** All students will develop Problem-solving, decision-making and inquiry skills, reflected by formulating usable questions and hypotheses, planning experiments, conducting systematic observations, interpreting and analyzing data, drawing conclusions, and communicating results.

**STANDARD 5.2 (SCIENCE AND SOCIETY)** All students will develop an understanding of how people of various cultures have contributed to the advancement of science and technology, and how major discoveries and events have advanced science and technology.

**STANDARD 5.3 (MATHEMATICAL APPLICATIONS)** All students will integrate mathematics as a tool for problem-solving in science, and as a means of expressing and/or modeling scientific theories.

**STANDARD 5.4 (NATURE AND PROCESS OF TECHNOLOGY)** All students will understand the interrelationships between science and technology and develop a conceptual understanding of the nature and process of technology.

**STANDARD 5.5 (CHARACTERISTICS OF LIFE)** All students will gain an understanding of the structure, characteristics, and basic needs of organisms and will investigate the diversity of life.

**STANDARD 5.8 (EARTH SCIENCE)** All students will gain an understanding of the structure, dynamics, and geophysical systems of the earth.

**STANDARD 5.9 (ASTRONOMY AND SPACE SCIENCE)** All students will gain an understanding of the origin, evolution, and structure of the universe.

**STANDARD 5.10 (ENVIRONMENTAL STUDIES)** All students will develop an understanding of the environment as a system of interdependent components affected by human activity and natural phenomena.

**STANDARD 8.1 (COMPUTER AND INFORMATION LITERACY)** All students will use computer applications to gather and organize information and to solve problems.

**STANDARD 8.2 (TECHNOLOGY EDUCATION)** All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the designed world as they relate to the individual society, and the environment.

**CUMULATIVE PROGRESS INDICATORS  
SUGGESTED ACTIVITIES THAT ADDRESS THESE STANDARDS WHICH MAY  
INCLUDE BUT ARE NOT LIMITED TO:**

**5.1 Scientific Processes**

**A. Habits of Mind**

1. What constitutes evidence?
2. When do you know you have enough and the right kind of evidence?
3. How can this result be best justified and explained to others?
  - Evaluate the strengths and weaknesses of data, claims, and arguments.
  - Communicate experimental findings to others.
  - Recognize that the results of scientific investigations are seldom exactly the same and that replication is often necessary.
  - Recognize that curiosity, skepticism, open-mindedness, and honesty are attributes of scientists.

**B. Inquiry and Problem Solving**

1. What makes a question scientific?
  - Identify questions and make predictions that can be addressed by conducting investigations.
  - Design and conduct investigations incorporating the use of a control.
  - Collect, organize, and interpret the data that result from experiments.

**C. Safety**

1. What does Safety First demand of us in each setting?
2. What rules are general and what are situation-specific?
  - Know when and how to use appropriate safety equipment with all classroom materials.
  - Understand and practice safety procedures for conducting science investigations

*SUGGESTED ACTIVITIES:*

- The students will develop the skills necessary for being a middle school student by finding the main idea of a paragraph, taking notes from an oral presentation or demonstration and learning and developing new test taking skills.
- The teacher will present to the students a number of problems faced by scientists. The students will use the scientific method and previously learned problem-solving skills to bring the problem to conclusion.
- The students will list and understand important safety rules they must follow in the science classroom and lab.
- The students will demonstrate proper and safe use of laboratory equipment.
- The students will use Observers to understand the scientific method.
- Students will use microscopes to understand microscope anatomy as well as observe prepared and wet mount slides and draw what is viewed.

## **5.2 Science and Society**

### **A. Cultural Contributions**

1. What do we mean in science when we say that we stand on the shoulders of giants?
  - Recognize that scientific theories develop over time, depend on the contributions of many people, and reflect the social and political climate of their time.
  - Know that scientists are men and women of many cultures who often work together to solve scientific and technological problems.
  - Describe how different people in different cultures have made and continue to make contributions to science and technology.

### **B. Historical Perspectives**

1. How do science and technology influence each other?
  - Describe the impact of major events and people in the history of science and technology, in conjunction with other world events.
  - Describe the development and exponential growth of scientific knowledge and technological innovations.

#### *SUGGESTED ACTIVITIES:*

- The teacher will describe theories including: The big bang theory; The theory of evolution; Cell theory, and explain that as technology and understanding of these subjects continue the theories are subject to modification. The students will understand that many world scientists are continually working together in the search for truth and understanding.
- The teacher will identify scientists of different cultures, both male and female that have contributed to current scientific thinking.
- The teacher will explain the impact that scientific discoveries have had on society and the world and how these discoveries have paved the way for more research and advances.
- The students will research scientists and create a PowerPoint presentation.

## **5.3 Mathematical Applications**

### **A-D. Numerical Operations, Geometry and Measurement, Patterns and Algebra, Data Analysis and Probability**

1. How do we use mathematics to model objects, events and relationships in science?
  - Express quantities using appropriate number formats, such as decimals, percents, and scientific notation.
  - Perform mathematical computations using labeled quantities and express answers in correctly derived units.
  - Express physical relationships in terms of mathematical equations derived from collected data.
  - Represent and describe mathematical relationships among variables using graphs and tables.

- Analyze experimental data sets using measures of central tendency such as mean, mode, and median.
- Construct and use a graph of experimental data to draw a line of best fit and identify a linear relationship between variables.
- Use computer spreadsheets, graphing and database applications to assist in quantitative analysis of data.

*SUGGESTED ACTIVITIES:*

- Identify large and small numbers using decimals. Divide by moving the decimal to the left or to the right. Use scientific notation to express these numbers.
- Using the metric system the students will: find the area of different shapes, find the length and width of different shapes.
- Track trends of population growth in bacteria and animals. Make predictions of future trends and patterns of population change.
- Use graphs and charts to present data and statistics including mean, median, and mode. Students will create their own charts and graphs using technology including spreadsheet programs, as well as interpreting graphs and charts from other sources.
- Students will measure bones to estimate their height and determine which bone gives the most accurate prediction.

## **5.4 Nature and Process of Technology**

### **A. Science and Technology**

1. How do science and technology influence each other?

- Compare and contrast science with technology, illustrating similarities and differences between these two human endeavors.

### **B. Nature of Technology**

1. Are there ways to circumvent physical and social constraints when using technology?

- Analyze a product or system to determine the problem it was designed to solve, the design constraints, trade-offs and risks involved in using the product or system, how the product or system might fail, and how the product or system might be improved.

### **C. Technological Design**

1. How is the overarching concept of systems related to design and technology?

- Recognize how feedback loops are used to control systems.

*SUGGESTED ACTIVITIES:*

- Discuss what is meant by science (facts about the natural world, how we obtain these facts using the scientific method) and technology (the application of the results of science to meet specific objectives and goals).
- Students will observe and discuss various technological feats such as diagnostic tools, the artificial heart, and pacemakers. Students will identify the problem the technology is hoping to solve, form hypotheses, and draw conclusions on possible improvements and trade offs.

- Feedback systems used everyday such as stress tests and heart monitors can be discussed.

## **5.5 Characteristics of Life**

### **A. Matter, Energy and Organization in Living Systems**

1. How is matter transformed and energy transferred/transformed?

- Explain how the products respiration and photosynthesis are recycled.
- Recognize that complex multicellular organisms, including humans, are composed of and are defined by interactions of cells, tissues, organs, and systems.

### **B. Diversity and Biological Evolution**

1. How are organisms of the same kind different from each other?

2. How does this help them reproduce and survive?

- Compare and contrast kinds of organisms using their internal and external characteristics.
- Discuss how changing environmental conditions can result in evolution or extinction of a species.
- Recognize that individual organisms with certain traits are more likely to survive and have offspring.

### **C. Reproduction and Heredity**

1. How does the understanding of manipulation of genetics, reproduction, development and evolution affect quality of human life?

- Describe how the sorting and recombining of genetic material results in the potential for variation among offspring of humans and other species.

### *SUGGESTED ACTIVITIES:*

- The teacher will explain the process of respiration at the cellular level including the production of ATP and the carbon cycle.
- The teacher will present basic cell theory including presentation of the organelles and their function. The teacher will identify for the students the relationship of cells, tissues, organs, and organ systems. Giving examples of each.
- Students will use a dichotomous key to classify organisms based on characteristics learned in class.
- The teacher will identify key factors in the environment, which can induce change over time.
- Identify that traits that benefit a species are passed on to the next generation, and those that are detrimental are not.
- Identify adaptations species develop to ensure survival in a given environment.
- Students will identify the sequences of mitosis and meiosis using cut and paste pictures.
- Students will use playing cards to demonstrate and symbolize how genes are mixed during fertilization.
- Students will create a Punnett Square.

- Students will conduct a frog dissection lab.
- Students will participate in the Muscular and Skeletal Systems activity identifying the parts of the body required to perform specific physical activities.
- Students will create a life size digestive system.
- Explain food webs and food chains and the consequences of removal of one part of the system.

## **5.8 Earth Science**

### **A. Earth's Properties and Materials**

1. How does understanding the properties of Earth materials and the physical laws that govern behavior lead to prediction of Earth events?

- Reinforce indicators from previous grade level.

### **B. Atmosphere and Weather**

1. How do changes in one part of an Earth system affect other parts of the system?

- Describe conditions in the atmosphere that lead to weather systems and how these systems are represented on weather maps.

### **C. Processes that Shape the Earth**

1. How do geologic events occurring today provide insight into Earth's past?

- Explain how Earth's landforms and materials are created through constructive and destructive processes.
- Show how successive layers of sedimentary rock and the fossils contained in them can be used to confirm the age, history, changing life forms, and geology of Earth.

### **D. How We Study the Earth**

1. How does technology extend human senses and understanding of Earth?

- Utilize data gathered from emerging technologies (e.g., geographic information systems (GIS) and global positioning systems (GPS)) to create representations and describe processes of change on the Earth's surface.
- Explain how technology designed to investigate features of the Earth's surface impacts how scientists study Earth.

### *SUGGESTED ACTIVITIES:*

- This will be a review of material learned in previous grade levels.
- Use of NJ ASK booklets and NJ ASK practice tests.

## **5.9 Astronomy and Space Science**

### **A. Earth, Moon, Sun System**

1. What predictable, observable patterns occur as a result of the interaction between Earth, Moon, and Sun?

2. What causes these patterns?

- Investigate the Earth, moon, and sun as a system and explain how the motion of these bodies results in the phases of the moon and eclipses.
- Explain how the regular and predictable motions of the Earth and moon produce tides.
- Explain how the tilt, rotation, and orbital pattern of the Earth relative to the sun produce seasons and weather patterns.

## **B. Solar System**

1. How are planets and other objects in the Solar System similar to and different from Earth?
2. What implication does this have for the existence and sustaining of life?
  - Describe the physical characteristics of the planets and other objects within the solar system and compare Earth to the rest of the planets.

## **C. Stars**

1. What characteristic does our Sun share with other stars?
  - Understand that the sun is a star and that it shares characteristics with other stars.

## **D. Galaxies and Universe**

1. Is there order to the Universe?
  - Know that the universe consists of many billions of galaxies, each including billions of stars.

### *SUGGESTED ACTIVITIES:*

- This will be a review of material learned in previous grade levels.
- Use of NJ ASK booklets and NJ ASK practice tests.

## **5.10 Environmental Studies**

### **A. Natural systems and Interactions**

1. How can change in one part of an ecosystem affect change in other parts of the ecosystem?
  - Investigate the impact of catastrophic events such as forest fires, floods, and hurricanes on the environment of New Jersey.

### **B. Human Interactions and Impact**

1. How do humans impact the diversity and stability of ecosystems?
  - Compare and contrast practices that affect the use and management of natural resources.

### *SUGGESTED ACTIVITIES:*

- The teacher will identify naturally occurring events that impact the environment of New Jersey and point out positive and negative effects of such events.
- The teacher will identify the four laws of conservation: every thing must go somewhere, there is no such thing as a free lunch, nature knows best, and everything is connected. The teacher will use examples such as following the path of garbage and pollution through an ecosystem.
- The students will create a self-sufficient ecosystem.

## **8.1 Computer and Information Literacy**

### **A. Basic Computer Skills and Tools**

1. In a world of constant technological change, what skills should we learn?
2. How do I choose which technological tools to use and when it is appropriate to use them?
  - Input and access data and text efficiently and accurately through proficient use of other input devices, such as the mouse.
  - Create documents with advanced text-formatting and graphics using word processing.
  - Construct a simple spreadsheet, enter data, and interpret the information.

- Design and produce a basic multimedia project.
- Use network resources for storing and retrieving data.

### **B. Application of Productivity Tools**

1. How can I transfer what I know to new technological situations/experiences?
2. What are my responsibilities for using technology? What constitutes misuse and how can it best be prevented?
  - Describe and practice safe Internet usage.
  - Describe and practice “etiquette” when using the Internet and electronic mail.
  - Choose appropriate tools and information resources to support research and solve real world problems, including but not limited to online resources, databases, search engines and subject directories.
  - Evaluate the accuracy, relevance, and appropriateness of print and non-print electronic information sources.

### *SUGGESTED ACTIVITIES:*

- Utilize the above skills and tools while teaching science content as applicable.

## **8.2 Technology Education**

### **A. Nature and Impact of Technology**

1. Can we control the pace at which technology is created? Should we, even if we can?
  - Describe the nature of technology and the consequences of technological activity.
  - Describe how components of a technological product, system, or environment interact.
  - Describe how one technological innovation can be applied to solve another human problem that enhances human life or extends human capability.

### **B. Design Process and Impact Assessment**

1. How does technology extend human capabilities? What are the positive and negative consequences of technology? Should technologies that produce negative impact continue to be used?
2. When are the most sophisticated tool required and when and the simplest tools best?
  - Use hands-on activities to analyze products and systems to determine how the design process was applied to create a solution.
  - Select and safely use appropriate tools and materials in analyzing, designing, modeling or making a technological product, system or environment.

### **C. Systems in the Designed World**

1. Can a system continue to operate with a missing or malfunctioning component?
2. Is it always beneficial to use the most economical material/materials for production of a technological product?
  - Explain technological advances in medical, agricultural, energy and power, information and communication, transportation, manufacturing, and construction technologies.
  - Explain reasons why human-designed systems, products, and environments need to be monitored, maintained, and improved to ensure safety, quality, cost efficiency, and sustainability.

*SUGGESTED ACTIVITIES:*

- Research and discuss technological advances in the life sciences.
- Conduct discussions about the ethics of the use of technology in life science.

**Instructional Strategies (may include but are not limited to):**

Lectures

Modeling Lab Procedure

Student Driven Labs and Experiments

Guest speakers/Video Conferencing

Overhead presentations, PowerPoint presentation, and/or Smart board lessons

WebQuests

Podcasts

Wikis, Blogs, Nings, Voicethreads, Twitter, etc.

Brainstorming

Video presentations, United Streaming Clips

Use of NJASK materials

Quizzes/tests

Field trips

Individual class projects

Student oral presentations

Cooperative learning groups

Instructional and Review Games

Problem solving activities

Internet research

Text, magazine and internet readings

Activity sheets

Utilization of rubrics

**Evaluation/Assessment of Students (may include but are not limited to):**

Observation

Class participation

Notebooks and packets

Student projects

Lab reports

Homework

Writing Activities (stories, compare/contrast, poems, response to prompts)

Activity Sheets (Worksheets, graphs, tables, charts, etc.)

Research Projects

Quizzes/tests

Power Points

Communication platforms (Voicethreads, Wikis, Blogs, Nings, etc.)

**Evaluation/Assessment of Curriculum:**

This course of study will be evaluated/assessed by instructional staff during the first year of implementation for the purpose of necessary revision at the end of the first year. In addition, this course of study will be reviewed according to the Five-Year Curriculum Review schedule (see attached).

**Resources/Bibliography:**

Exploring Life Science (Prentice-Hall, Inc. 2000)

Measuring Up on the New Jersey NJASK book (The Peoples Publishing Group, Inc.)

Measuring Up on the New Jersey ASK Diagnostic Practice Test 1 – 3 (The Peoples Publishing Group, Inc.)

Preparing for the New Jersey ASK (Amsco School Publishing, Inc.)

New Jersey ASK Student Preparation Booklet (New Jersey Department of Education)

Internet

Library and Technology Labs

Science-based journals and magazines

Non-fiction trade books

Lab Equipment

Teacher-created resources