Subject Area: **Science** **Grade Level 5**

Mission Statement: It is the mission of the Elba Central School District to actualize the phrase "Elba Equals Educational Excellence for Everyone." We are committed to providing both quality and equity. Every student will have the opportunity to develop to the best of his/her ability.

Elba Standards: In addition to the knowledge and basic skills they need in order to participate in society, graduates of Elba Central School will develop:

1. Empowering skills: decision making, goal setting, creative thinking and problem solving abilities;
2. Communication and social interaction skills;
3. Technological literacy;
4. Total wellness (social, physical, emotional health and self-esteem);
5. The values necessary to participate in society.
   As a result of achieving these outcomes, our students will embrace lifelong learning.

New York State Standards:

Standard 1:
Students will use mathematical analysis, scientific inquiry, and engineering design, as appropriate, to pose questions, seek answers, and develop solutions.

Performance Indicators: Description of the levels of student achievement pertaining to standard.

STANDARD 1:

SCIENTIFIC INQUIRY: 1. The central purpose of scientific inquiry is to develop explanations of natural phenomena in a continuing, creative process.

- Formulate questions independently with the aid of references appropriate for guiding the search for explanations of everyday observations.
- Construct explanations independently for natural phenomena, especially by proposing preliminary visuals of phenomena.
- Represent, present, and defend their proposed explanations of everyday observations so that they can be understood and assessed by others.
- Seek to clarify, to assess critically, and to reconcile with their own thinking the ideas presented by others, including peers, teachers, authors, and scientists.

SCIENTIFIC INQUIRY: 2. Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity.

- Use conventional techniques and those of their own design to make further observations and refine their explanations, guided by a need for more information.
- Develop, present, and defend formal research proposals for testing their own explanations of common phenomena, including ways of obtaining needed observations and ways of conducting simple controlled experiments.
- Carry out research proposals, recording observations and measurements to help assess the explanation.

SCIENTIFIC INQUIRY: 3. The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into phenomena.

- Design charts, tables, graphs and other representations of observations in conventional and creative ways to help them address their research question or hypothesis.
- Interpret the organized data to answer the research question or hypothesis and to gain insight into the problem.
- Modify their personal understanding of phenomena based on evaluation of their hypothesis.

ENGINEERING DESIGN: 1. Engineering design is an iterative process involving modeling and optimization finding the best solution within given constraints which is used to develop technological solutions to problems within given constraints.

Students engage in the following steps in a design process:

- Identify needs and opportunities for technical solutions from an investigation of situations of general or local interest.
- Locate and utilize a range of printed, electronic, and human information resources to obtain ideas.
- Consider constraints and generate several ideas for alternative solutions using group and individual ideation techniques (group discussion, brainstorming, forced connections, role play); defer judgment until a number of ideas have been generated; evaluate ideas; and explain why the chosen solution is optimal.
- Develop plans, including drawings with measurements and details of construction, and construct a model of the solution exhibiting a degree of craftsmanship.
- In a group setting, test their solution against design specifications, present and evaluate results, describe how the solution might have been modified for different or better results, and discuss tradeoffs that might have to be made.

STANDARD 2:
Students will access, generate, process, and transfer information using appropriate technologies.

1. Information technology is used to retrieve, process, and communicate information and as a tool to enhance learning.

- Use a variety of equipment and software packages to enter, process, display, and communicate information in different forms using audio, video, graphic and text-based presentations.
- Use spreadsheets and data based software to collect, process, display, and analyze information.
- Systmatically obtain accurate information pertaining to a particular topic from a range of sources, including local and national media, libraries, museums, governmental agencies, industries, and individuals.
- Collect data from probes to measure events and phenomena.
- Use simple modeling programs to make predictions.

2. Knowledge of the impacts and limitations of information systems is essential to its effective and ethical use.

- Understand the need to question the accuracy of information displayed on a computer because the results produced by a computer maybe affected by incorrect data entry.
- Identify advantages and limitations of date-handling programs and graphic programs.
- Understand why electronically stored personal information has greater potential for misuse than record kept in conventional form.

2. Information technology can have positive and negative impacts on society, depending upon how it is used.

- Use graphical, statistical, and presentation software to present projects to fellow classmates.
- Describe applications on information technology in mathematics, science, and other technologies that address needs and solve problems in the community.
- Explain the impact of the use and abuse of electronically generated information on individuals and families.

Standard 4:
Students will understand and apply scientific concepts, principles, and theories pertaining to the physical setting and living environment and recognize the historical development of ideas in science.

Standard 4:

1. **The Earth and celestial phenomena can be described by principles of relative motion and perspective.**

- Students explain daily, monthly, and seasonal changes on earth.

2. Many of the phenomena that we observe on Earth involve interactions among components of air, water, and land.

- Explain how the atmosphere (air), hydrosphere (water), and lithosphere (land) interact, evolve, and change.
- Describe volcano and earthquake patterns, the rock cycle, and weather and climate changes.

3. **Matter is made up of particles whose properties determine the observable characteristics of matter and its reactivity**.
   - Observe and describe properties of materials, such as density, conductivity, and solubility.
   - Distinguish between chemical and physical changes.
   - Develop their own mental models to explain common chemical reactions and changes in states of matter.

4. **Energy exists in many forms, and when these forms change, energy is conserved.**
   - Describe the sources and identify the transformations of energy observed in everyday life.
   - Observe and describe heating and cooling events.
   - Observe and describe energy changes as related to chemical reactions.
   - Observe and describe the properties of light, sound, magnetism, and electricity.
   - Describe situations that support the principle of conservation of energy.

5. **Energy and matter interact through forces that result in changes of matter.**
   - Describe different patterns of motion of objects.
   - Observe, describe, and compare effects of forces (gravity, electric current, and magnetism) on the motion of objects.

THE LIVING ENVIRONMENT:

1. **Living things are both similar to and different from each other and nonliving things.**
   - Compare and contrast the parts of plants, animals, and one-celled organisms.
   - Explain the functioning of the major human organ systems and their interactions.

2. **Organisms inherit genetic information in a variety of ways that result in continuity of structure and function between parents and offspring.**
   - Describe sexual and asexual mechanisms for passing genetic materials from generation to generation.
   - Describe simple mechanisms related to the inheritance of some physical traits in offspring.

3. **Individual organisms and species change over time.**
    - Describe factors responsible for competition within species and the significance of that competition.
    - Describe sources of variation in organisms and their structures and relate the variations to survival.

4. **The continuity of life is sustained through reproduction and development.**
    - Observe and describe the variations in reproductive patterns of organisms, including asexual and sexual reproduction.
    - Explain the role of sperm and egg cells in sexual reproduction.
    - Observe and describe developmental patterns in selected plants and animals (e. g., insects, frogs, humans, seed-bearing plants).
    - Observe and describe cell division at the microscopic level and its macroscopic effects.

5. **Organisms maintain a dynamic equilibrium that sustains life.**
    - Compare the way a variety of living specimens carry out basic life functions and maintain dynamic equilibrium.
    - Describe the importance of major nutrients, vitamins, and minerals in maintaining health and promoting growth and explain the need for a constant input of energy for living organisms.
6. **Plants and animals depend on each other and their physical environment.**
    - Describe the flow of energy and matter through food chains and food webs.
    - Provide evidence that green plants make food and explain the significance of this process to other organisms.
7. **Human decisions and activities have had a profound impact on the physical and living environment.**
    - Describe how living things, including humans, depend upon the living and nonliving environment for their survival.
    - Describe the effects of environmental changes on humans and other populations.

Standard 6:
Students will understand the relationships and common themes that connect mathematics, science, and technology and apply the themes to these and other areas of learning.

SYSTEMS THINKING:

1. **Through systems thinking, people can recognize the commonalities that exist among all systems and how parts of a system interrelate and combine to perform specific functions.**

- Describe the differences between dynamic systems and organizational systems.
- Describe the differences and similarities between engineering systems, natural systems, and social systems.

- Describe the differences between open and closed loop systems.
- Describe how the output from one system can become the input to others.

MODELS:

2. **Models are simplified representations of objects, structures, or systems use in analysis, explanation. Interpretation, or design**.
    - Select an appropriate model to begin the search for answers or solutions to a question or problem.
    - Use models to study the processes that cannot be studied directly (e.g. when the process is too slow, too fast, or too dangerous for direct observation).
    - Demonstrate the effectiveness of different models to represent the same thing and the same model to represent different things.

MAGNITUDE AND SCALE:

3. **The grouping of magnitudes of size, time, frequency, and pressures or other units of measurement into a series of relative order provides a useful way to deal with the immense range and the changes in scale that affect the behavior and design of systems.**
    - Cite examples of how different aspects of natural and designed systems change at different rates with changes in scale.
    - Use powers of ten notation to represent very small and very large numbers.

EQUILIBRIUM AND STABILITY:

4. **Equilibrium is a state of stability due either to a lack of changes (static equilibrium) or a balance between opposing forces (dynamic equilibrium).**
    - Describe how feedback mechanisms are used in both designed and natural systems to keep changes within desired limits.
    - Describe changes within equilibrium cycles in terms of frequency or cycle length and determine the highest and lowest values and when they occur

PATTERNS OF CHANGE:

5. **Identifying patterns of change is necessary for making predictions about future behavior and conditions.**
    - Use simple linear equations to represent how a parameter changes with time.
    - Observe patterns of change in trends or cycles and make predictions on what might happen in the future.

OPTIMIZATION:

6. **In order to arrive at the best solution that meets criteria within constraints, it is often necessary to make trade-offs.**
    - Determine the criteria and constraints and make trade-offs to make the best decision.
    - Use graphs of information for a decision-making problem to determine the optimum solution.

Standard 7:
Students will apply the knowledge and thinking skills of mathematics, science, and technology to address real-life problems and make decisions.
Performance Indicators:
CONNECTIONS:

1. **The knowledge and skills of mathematics, science, and technology are used together to make informed decisions and solve problems, especially those relating to issues of science/technology/society, consumer decision-making, design, and inquiry into phenomena.**
    - Analyze science/technology/ society problems and issues at the local level and plan and carry out a remedial course of action.
    - Make informed consumer decisions by seeking answers to appropriate questions about products, services, and systems; determining the cost/benefit and risk/benefit tradeoffs; and applying this concept to a potential purchase.
    - Design solutions to real-world problems of general social interest related to home, school, or community using scientific experimentation to inform a solution and applying mathematical concepts and reasoning to assist in developing a solution.
    - Describe and explain phenomena by designing and conducting investigations involving systematic observations, accurate measurements, and the identification and control of variables; by inquiring into relevant mathematical ideas; and by using mathematical and technological tools and procedures to assist in the investigation.

STRATEGIES:

2. **Solving interdisciplinary problems involves a variety of skills and strategies, including effective work habits; gathering and processing information; generating and analyzing ideas; realizing ideas; making connections among the common themes of mathematics, science, and technology; and presenting results.**

Students participate in an extended, culminating mathematics, science, and technology project. The project would require students to:

- Work effectively
- Gather and process information
- Generate and analyze ideas
- Observe common themes
- Realize ideas
- Present results

SKILLS AND STRATEGIES FOR INTERDISCIPLINARY PROBLEM SOLVING:

Working effectively: Contributing to the work of a brainstorming group, laboratory partnership, cooperative learning group, or project team; planning procedures, identify and managing responsibilities of team members; and staying on task, whether working alone or as part of a group.

Gathering and processing information: Accessing information from printed media, electronic data bases, and community resources and using the information to develop a definition of the problem and to research possible solutions.

Generating and analyzing ideas: Developing ideas for proposed solutions, investigating ideas, collecting data, and showing relationships and patterns in the data.

Common themes: Observing examples of common unifying themes applying them to the problem, and using them to better understand the dimensions of the problem.

Realizing Ideas: Constructing components or models, arriving at a solution, and evaluating the result.

Presenting results: Using a variety of media to present the solution and to communicate the results.

National Standards:

Science as Inquiry

As a result of activities in grades 5-8, all students should develop

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Physical Science

As a result of their activities in grades 5-8, all students should develop an understanding

- Properties and changes of properties in matter
- Motions and forces
- Transfer of energy

Life Science

As a result of their activities in grades 5-8, all students should develop understanding

- Structure and function in living systems
- Reproduction and heredity
- Regulation and behavior
- Populations and ecosystems
- Diversity and adaptations of organisms

Earth and Space Science

As a result of their activities in grades 5-8, all students should develop an understanding

- Structure of the earth system
- Earth's history
- Earth in the solar system

Science and Technology

As a result of activities in grades 5-8, all students should develop

- Abilities of technological design
- Understandings about science and technology

Personal and Social Perspectives

As a result of activities in grades 5-8, all students should develop understanding

- Personal health
- Populations, resources, and environments
- Natural hazards
- Risks and benefits
- Science and technology in society

History and Nature of Science

As a result of activities in grades 5-8, all students should develop understanding of

- Science as a human endeavor
- Nature of science
- History of science

Assessment:	**Acceptable Performance Level**
Unit level homework, quizzes, and tests	Passing grade of 70% or better
Science controlled study labs	Scores of 14 or higher (out of a possible 20) on the controlled study rubric

Scope: fifth grade science is organized into six units of study, with a focus on inquiry, analysis and design. A major goal for fifth grade science students is for them to develop scientific process skills and apply those skills within each of the content areas. Students will develop concepts and content of the life sciences, earth sciences, and physical sciences while simultaneously utilizing the scientific method and controlled studies.

Sequence:

Scientific Processes

Classifying,
Communicating,
Comparing and contrasting,
Creating models,
Gathering and organizing data,
Generaizing

Identifying variables
Inferring
Interpreting data
Making decisions
Manipulating matrials
Measuring

Energy ,Work, and Machines

- Energy is needed to do work.
- Energy, which is the ability to cause change, can be transferred and can change form.
- Simple machines, which can be classified into 6 basic types, make work easier.

Light and Sound

- Light and Sound are forms of energy that travel in waves and can be described by their speed, wavelength, frequency, and amplitude.
- Light , a form of electromagnetic radiation, travels in waves and can be reflected and refracted.
- Lenses, which change the direction of light, have many uses; the color of objects depends on how they absorb and reflect light.
- Sound, a form of energy that travels in waves, can be described by its wavelength, frequency, amplitude, speed, and pitch.
- Controlling sounds can protect the ear and auditory nerve; various inventions have changed how sound is recorded.

The Solar System and Beyond

- Earth is a part of a solar system of planets circling a star in one of the many galaxies of stars in the universe.
- The nightly and yearly movement of stars in the sky results from Earth's rotation and revolution; scientists use different tools to study a variety of objects visible in the night sky.
- Earth is part of a solar system that consists of one star- the Sun- and a variety of planets and other objects that revolve around that star.
- Stars are huge balls of gas that produce heat and light, that vary over time and from star to star, and that cluster together over great distances into groups called galaxies.
- Humans can live in space if they take into account the different conditions they encounter in space; astronomers speculate about the existence of extraterrestrial forms of life

Properties of Matter

- The properties of any sample of matter are determined by the kinds and arrangements of its particles – atoms and molecules.
- Matter can be described by its properties, many of which can be measured.
- Matter, which is made up of particles in constant motion, can change state when heat is gained or lost.

- Matter can be described by physical and chemical properties; it can change physically in size, shape, or state, and it can change chemically to form some other kind of matter.
  Growing Up Healthy – Human Sexuality
- Healthy growth and development is largely influenced by the traits you inherit, your endocrine system and immune system, and the lifestyle choices you make.
- The reproductive system and the endocrine system play major roles in the events in the human life cycle.
- The body's immune system, which has several lines of defense in preventing and combating pathogens, is occasionally overcome, resulting in disease.
- Some health risk factors can be reduced by making informed lifestyle choices.
- DARE program concepts.

Methodology:
Best Practices
Scientific Inquiry Methods
Scientific Analysis Methods
Six Traits of Writing
Elements of Instruction