

Standards, Objectives, and Approved Activities

DoD Core Curriculum

Science as Inquiry: As a result of activities in grades 5-8, all students should develop

- Understanding about scientific inquiry.
- Abilities necessary to do scientific inquiry: identify questions, design an investigation, collect and interpret data, use evidence, think critically, analyze and predict, communicate, and use mathematics.

Source: National Science Education Standards

<p>E3.1.1.1. Physics</p> <ul style="list-style-type: none"> A. Newton’s Three Laws of Motion B. Fluid Mechanics and Aerodynamics 	<p>3.5 hrs</p>
<p>E3.1.1.2. Chemistry Sciences</p> <ul style="list-style-type: none"> A. Building Blocks of Matter B. Physical and Chemical Changes C. Atmospheric Properties 	<p>3.5 hrs</p>
<p>E3.1.1.3. Technology</p> <ul style="list-style-type: none"> A. Innovations B. Navigation and Mapping 	<p>4.0 hrs</p>
<p>E3.1.1.4. Engineering</p> <ul style="list-style-type: none"> A. Engineering Design Process (EDP) B. 3-D Computer-Aided Design (3.0 hrs as mandated by OASD/RA) 	<p>4.0 hrs</p>
<p>E3.1.1.5. Mathematics Operations & Applications</p> <ul style="list-style-type: none"> A. Numbers and Number Relationships B. Measurement C. Geometry D. Data Analysis 	<p>2.0 hrs</p>
<p>E3.1.1.6. STEM Careers</p> <ul style="list-style-type: none"> A. STEM Careers on Military Facilities B. Personal Investigations 	<p>1.5 hrs</p>

Standards, Objectives, and Approved Activities

E3.1.1.1. Physics: A. Newton's Three Laws of Motion

Standards

National Science Education Standards (NSES)

Motions and Forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph.
- An object that is not being subjected to a force will continue to move at a constant speed and in a straight line.
- If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

Transfer of Energy

- Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.

National Council of Teachers of Mathematics (NCTM) Expectations:

- Investigate how a change in one variable relates to a change in a second variable.
- Identify and describe situations with constant or varying rates of change and compare them.
- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.
- Predict the probability of outcomes of simple experiments and test the predictions.

Objectives

A. Newton's Three Laws of Motion

- The learner will recognize examples of Newton's Laws in the physical world.
- The learner will demonstrate that an object in motion or at rest will stay in motion or at rest unless acted upon by an outside force.
(First Law)
- The learner will predict and determine the acceleration of an object when given the variables of mass and force.
(Second Law)
- The learner will conclude every action is followed by a reaction equal in magnitude and opposite in direction.
(Third Law)

Activities

Approved

1. Rocketry

Standards, Objectives, and Approved Activities

E3.1.1.1. Physics: B. Fluid Mechanics & Aerodynamics

Standards

National Science Education Standards (NSES)

Motions and Forces

- The motion of an object can be described by its position, direction of motion, and speed. That motion can be measured and represented on a graph. Unbalanced forces will cause changes in the speed or direction of an object's motion.

National Council of Teachers of

Mathematics (NCTM) Expectations:

- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.

Objectives

B. Fluid Mechanics & Aerodynamics

- The learner will specify the expected change in motion caused by unbalanced forces acting on an object.
- The learner will determine the faster fluids move, the less pressure they exert.

Activities

Approved

1. *Bernoulli's Principle Experiments*

Standards, Objectives, and Approved Activities

E3.1.1.2. Chemistry Sciences: A. Building Blocks of Matter

Standards

National Science Education Standards (NSES) Properties and Changes of Properties in Matter

- A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one of more of the characteristic properties.
- Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances are often placed in categories or groups if they react in similar ways; metals is an example of such a group.
- Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.

Objectives

A. Building Blocks of Matter

- The learner will conclude there are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for all living and non-living substances.
- The learner will demonstrate that atoms combine to form molecules and molecules formed from different atoms combine to form compounds.
- The learner will recognize a substance has characteristics, such as density, viscosity, boiling point, and solubility, all of which are independent of the amount of the sample.

Activities

Approved

1. *Creating/Building Molecular Models*

Standards, Objectives, and Approved Activities

E3.1.1.2. Chemistry Sciences: B. Physical and Chemical Changes

Standards

National Science Education Standards (NSES) Properties and Changes of Properties in Matter

- A substance has characteristic properties, such as density, a boiling point, and solubility, all of which are independent of the amount of the sample. A mixture of substances often can be separated into the original substances using one of more of the characteristic properties.
- Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties. In chemical reactions, the total mass is conserved. Substances are often placed in categories or groups if they react in similar ways; metals is an example of such a group.
- Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.

Transfer of Energy

- Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, nuclei, and the nature of a chemical. Energy is transferred in many ways.
- Heat moves in predictable ways, flowing from warmer objects to cooler ones, until both reach the same temperature.
- In most chemical and nuclear reactions, energy is transferred into or out of a system. Heat, light, mechanical motion, or electricity might all be involved in such transfers.

Objectives

B. Physical and Chemical Changes

- The learner will differentiate between a physical change in which matter changes state or form and a chemical change in which one or more new substances are formed.
- The learner will conclude a change in the state of matter of a substance is the result of a change in kinetic energy.
- The learner will conclude that energy in a system is conserved and may change from one form to another.

Activities

Approved

1. Warm Ups & Cool Downs

National Council of Teachers of Mathematics (NCTM) Expectations:

- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.
- Identify and describe situations with constant or varying rates of change and compare them.
- Collect data using observations, surveys, and experiments.
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.
- Describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed.
- Compare different representations of the same data and evaluate how well each representation shows important aspects of the data.
- Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

Standards, Objectives, and Approved Activities

E3.1.1.2. Chemistry Sciences: C. Atmospheric Properties

Standards

National Science Education Standards (NSES)

Structure of the Earth System

- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.

National Council of Teachers of Mathematics (NCTM) Expectations:

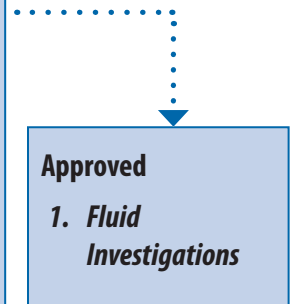
- Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and when possible, symbolic rules.
- Solve problems involving scale factors, using ratio and proportion.

Objectives

C. Atmospheric Properties

- The learner will determine there are a number of characteristic properties of air including mass, weight, density, volume, and pressure.
- The learner will discover air pressure is not constant, varies with altitude, is inversely proportionate to velocity, and varies with changes in kinetic energy.
- The learner will identify gases and their proportions that make up the Earth's atmosphere.
- The learner will categorize air as a fluid, similar to the ocean, based on observable properties.

Activities



Standards, Objectives, and Approved Activities

E3.1.1.3. Technology: A. Innovations

Standards

International Society of Technology in Education (ISTE)

Critical Thinking, Problem Solving, and Decision Making

Students:

- Identify and define authentic problems and significant questions for investigation.
- Plan and manage activities to develop a solution or complete a project.
- Collect and analyze data to identify solutions and/or make informed decisions.
- Use multiple processes and diverse perspectives to explore alternative solutions.

National Science Education Standards (NSES)

Science & Technology in Society

- Technology influences society through its products and processes. Technology influences the quality of life and the ways people act and interact. Technology changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society. Social needs, attitudes, and values influence the direction of technological development.
- Technology solutions have intended benefits and unintended consequences. Some consequences can be predicted, others cannot.

Objectives

A. Innovations

- The learner will identify and define authentic problems and significant questions for investigation.
- The learner will plan and manage activities to develop a solution or complete a project.
- The learner will collect and analyze data to identify solutions and/or make informed decisions.
- The learner will use multiple processes and diverse perspectives to explore alternative solutions.

Activities

Approved

1. *Intro to Nanotechnology*

National Council of Teachers of Mathematics (NCTM) Expectations:

- Understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals
- Understand the need for measuring with standard units and become familiar with standard units in the customary and metric systems
- Carry out simple unit conversions, such as from centimeters to meters, within a system of measurement
- Represent, analyze, and generalize a variety of patterns with tables, graphs, words, and when possible, symbolic rules.

Standards, Objectives, and Approved Activities

E3.1.1.3. Technology: B. Navigation and Mapping

Standards

International Society of Technology in Education (ISTE)

Technology Operations and Concepts

Students:

- Understand and use technology systems.
- Select and use applications effectively and productively.
- Troubleshoot systems and applications.
- Transfer current knowledge to learning of new technologies.

National Science Education Standards (NSES) Science & Technology in Society

- Technology influences society through its products and processes. Technology influences the quality of life and the ways people act and interact. Technology changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society. Social needs, attitudes, and values influence the direction of technological development.
- Science and technology have advanced through contributions of many different people in different cultures, at different times in history. Science and technology have contributed enormously to economic growth and productivity among societies and groups within societies.
- Scientists and engineers work in many different settings, including colleges and universities, businesses and industries, specific research institutes, and government agencies.

Objectives

B. Navigation and Mapping

- The learner will use technological tools to gather, evaluate, and use information.
- The learner will recognize the benefits of advancements in technology tools which provide information relating to location and distance.
- The learner will use coordinate points of latitude and longitude to specify locations and navigate from one point to another.

Activities

Approved

1. *National Geospatial-Intelligence Agency (NGA): Maps; Imaging*

National Council of Teachers of Mathematics (NCTM) Expectations:

- Describe location and movement using common language and geometric vocabulary.
- Make and use coordinate systems to specify locations and to describe paths.
- Find the distance between points along horizontal and vertical lines of a coordinate system.
- Solve problems involving scale factors, using ratio and proportion.

Standards, Objectives, and Approved Activities

E3.1.1.4. Engineering: A. Engineering Design Process (EDP)

Standards

International Society of Technology in Education (ISTE)

Critical Thinking, Problem Solving, and Decision Making

Students:

- Identify and define authentic problems and significant questions for investigation.
- Plan and manage activities to develop a solution or complete a project.
- Collect and analyze data to identify solutions and/or make informed decisions.
- Use multiple processes and diverse perspectives to explore alternative solutions.

National Science Education Standards (NSES)

Science & Technology in Society

- Technology influences society through its products and processes. Technology influences the quality of life and the ways people act and interact. Technology changes are often accompanied by social, political, and economic changes that can be beneficial or detrimental to individuals and to society. Social needs, attitudes, and values influence the direction of technological development.
- Science and technology have advanced through contributions of many different people in different cultures, at different times in history. Science and technology have contributed enormously to economic growth and productivity among societies and groups within societies.
- Scientists and engineers work in many different settings, including colleges and universities, businesses and industries, specific research institutes, and government agencies.

Objectives

A. Engineering Design Process (EDP)

- The learner will recognize the engineering design process is a method of problem solving used to create a system, a product, or a process that meets an identified need.

Activities

Approved

1. Eggbert

National Council of Teachers of Mathematics (NCTM) Expectations

- Solve problems that arise in mathematics and in other contexts.
- Apply and adapt a variety of appropriate strategies to solve problems.
- Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.
- Select appropriate methods and tools for computing with fractions and decimals from among mental computation, estimation, calculators, and paper and pencil according to the context and nature of the computation and use the selected method or tools.

Standards, Objectives, and Approved Activities

E3.1.1.4. Engineering: B. 3-D Computer-Aided Design (CAD)

Standards

International Society of Technology in Education (ISTE)

Technology Operations and Concepts

Students:

- Understand and use technology systems.
- Select and use applications effectively and productively.
- Transfer current knowledge to learning of new technologies.

National Council of Teachers of Mathematics (NCTM) Expectations:

- Understand relationship among the angles, side lengths, perimeter, areas, and volumes of similar objects.
- Use coordinate geometry to represent and examine the properties of geometric shapes.
- Examine congruence, similarity, and line or rotational symmetry of objects using transformations.
- Draw geometric objects with specified properties, such as side lengths or angle measures.
- Identify, compare, and analyze attributes of two- and three-dimensional shapes and develop vocabulary to describe the attributes.
- Describe location and movement using common language and geometric vocabulary.
- Describe sizes, positions, and orientations of shapes under informal transformations such as flips, turns, slides, and scaling.
- Draw geometric objects with specified properties, such as side lengths or angle measures.

Objectives

B. 3-D Computer-Aided Design (CAD) (3.0 hrs)

- The learner will construct a 3-D scale model based on geometric relationships using engineering design software and computer technology as required by OASD/RA.
- The learner will use engineering design software to demonstrate basic CAD operation and skills in the areas of :
 - sketching (2-D geometry creation and modification)
 - geometric and dimensional constraints (applying appropriate constraints)
 - modeling (3-D modeling skills and modifications)
 - assemblies (understanding and creating simple assemblies)
- The learner will relate geometric relationships and mathematical applications to parameters of CAD.
- The learner will apply basic computer skills such as mouse dexterity, keyboarding, data entry, and folder navigation.

Activities

Mandatory: Choose a minimum of 1

1. *DoD Lab Module (LM) and DoD Satellite*
2. *DoD Life Support Module (LSM) and DoD Submersible*
3. *DoD Life Support Module (LSM) and DoD Unmanned Aerial Vehicle (UAV)*
4. *DoD Life Support Module (LSM) and DoD Rover*

Approved

1. *Submit suggestions for approval*

Standards, Objectives, and Approved Activities

E3.1.1.5. Mathematics Operations & Applications: A. Numbers and Number Relationships

Standards

National Council of Teachers of Mathematics (NCTM) Expectations:

- Understand numbers, ways of representing numbers, relationships among numbers, and number systems.

Objectives

A. Numbers and Number Relationships

- The learner will solve problems using fractions, decimals, and percents.

Activities

Approved
1. Math Mysteries

Standards, Objectives, and Approved Activities

E3.1.1.5. Mathematics Operations & Applications: B. Measurement

Standards

National Council of Teachers of Mathematics (NCTM) Expectations:

- Understand measurable attributes of objects and the units, systems, and processes of measurement.
- Apply appropriate techniques, tools, and formulas to determine measurement.

Objectives

B. Measurement

- The learner will select and apply appropriate standard units and tools to measure length, area, volume, mass, and degree of angles.

Activities

Approved
1. Metric Mission

Standards, Objectives, and Approved Activities

E3.1.1.5. Mathematics Operations & Applications: C. Geometry

Standards

National Council of Teachers of Mathematics (NCTM) Expectations:

- Specify locations and describe spatial relationships using coordinate geometry and other representational systems.
- Apply transformations and use symmetry to analyze mathematical situations.
- Use visualization, spatial reasoning, and geometric modeling to solve problems.

Objectives

C. Geometry

- The learner will recognize geometric properties and relationships and apply them to other disciplines and to problems that arise in the classroom or in everyday life.

Activities

Approved

- 1. Circuit Board Geometry**

Standards, Objectives, and Approved Activities

E3.1.1.5. Mathematics Operations & Applications: D. Data Analysis

Standards

National Council of Teachers of Mathematics (NCTM) Expectations:

- Develop fluency in adding, subtracting, multiplying, and dividing whole numbers.
- Represent and analyze patterns and functions using words, tables, and graphs.
- Model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.
- Investigate how a change in one variable relates to a change in a second variable.
- Collect data using observations, surveys, and experiments.
- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angles.

Objectives

D. Data Analysis

- The learner will collect data using observations and experiments.
- The learner will represent data using tables and graphs.

Activities

Approved

1. *Pop Goes the Fizz*

Standards, Objectives, and Approved Activities

E3.1.1.6. STEM Careers: A. STEM Careers on Military Facilities

Standards

National Science Education Standards (NSES) Science & Technology in Society

- Science and technology have advanced through contributions of many different people in different cultures, at different times in history. Science and technology have contributed enormously to economic growth and productivity among societies and groups within societies.
- Scientists and engineers work in many different settings, including colleges and universities, businesses and industries, specific research institutes, and government agencies.

Objectives

- #### A. STEM Careers on Military Facilities
- The learner will develop an awareness that scientists, technicians, engineers and mathematicians work on military facilities.

Activities

Approved

1. *Military Facility Tours*
2. *Military Facility Museum Tours*
3. *Military Facility Virtual Tours*
4. *Military Facility STEM Speakers*

Standards, Objectives, and Approved Activities

E3.1.1.6. STEM Careers: B. Personal Investigations

Standards

National Science Education Standards (NSES) Science as a Human Endeavor

- Women and men of various social and ethnic backgrounds—and with diverse interests, talents, qualities, and motivations—engage in the activities of science, engineering, and related fields such as the health professions. Some scientists work in teams, and some work alone, but all communicate extensively with others.
- Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity—as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas.

Objectives

- #### B. Personal Investigations
- The learner will correlate their academic endeavors in STEM areas to real-world applications in career fields.

Activities

- Approved**
1. *STEM Speakers*