

CreositySpace – Contagion Crushers Activity Descriptions and Standards Alignment

General Activity Descriptions:

Below you will find brief descriptions of the hands on science activities associated with the *Contagion Crushers* Technology Entrepreneurship Curriculum module.

Activity 1 – Polarizing films

Objective:

To become familiar with the wave nature of light and how polarizers work to block some but not all light.

Materials:

Ambient light source, polarized films, polarized film worksheet

General Description:

The students will work in small groups to do some experiments with the polarizing film and then answer some questions.

Approximate materials cost for a class of 30 students: \$10 – 15

Activity 2 – Light as a mixture

Objective:

To become familiar with the idea that visible light is a mixture of different types (wavelengths) of light.

Materials:

Ambient light source (?), spectrophotometers, worksheet

General Description:

The students use a variety of ambient light sources (classrooms lights, windows, etc.) and look at them through spectrophotometers to draw out what they see.

Approximate materials cost for a class of 30 students: \$60 – 70 (one time cost for spectrometers)

Activity 3 – Petri dish of life

(note – this experiment will happen over the course of the week after the presentation)

Objective:

To visualize all the bacteria around us.

Materials:

Q-tips, Petri dishes with agar growing media

General Description:

In this experiment the students will take swabs from different surfaces around the room and then rub the q-tips on the petri dishes. The growing media will be added and the students will watch their bacteria grow over the course of the following week.

Approximate materials cost for a class of 30 students: \$15 - 20

Education Standards

Don't see the standards for your school district? Contact us at kath@creosityspace.com and we will determine the appropriate standards alignment for your district.

Common Core ELA Standards:

Grade 3

Reading Informational Text:

[CCSS.ELA-LITERACY.RI.3.1](#) Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers.

[CCSS.ELA-LITERACY.RI.3.2](#) Determine the main idea of a text; recount the key details and explain how they support the main idea.

[CCSS.ELA-LITERACY.RI.3.4](#) Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 3 topic or subject area*.

Writing:

[CCSS.ELA-Literacy.W.3.2](#) Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

[CCSS.ELA-Literacy.W.3.2.a](#) Introduce a topic and group related information together; include illustrations when useful to aiding comprehension.

[CCSS.ELA-Literacy.W.3.2.b](#) Develop the topic with facts, definitions, and details.

[CCSS.ELA-Literacy.W.3.2.c](#) Use linking words and phrases (e.g., *also, another, and, more, but*) to connect ideas within categories of information.

[CCSS.ELA-Literacy.W.3.2.d](#) Provide a concluding statement or section.

[CCSS.ELA-Literacy.W.3.1](#) Write opinion pieces on topics or texts, supporting a point of view with reasons.

[CCSS.ELA-Literacy.W.3.1.a](#) Introduce the topic or text they are writing about, state an opinion, and create an organizational structure that lists reasons.

[CCSS.ELA-Literacy.W.3.1.b](#) Provide reasons that support the opinion.

[CCSS.ELA-Literacy.W.3.1.c](#) Use linking words and phrases (e.g., *because, therefore, since, for example*) to connect opinion and reasons.

[CCSS.ELA-Literacy.W.3.1.d](#) Provide a concluding statement or section.

[CCSS.ELA-Literacy.W.3.4](#) With guidance and support from adults, produce writing in which the development and organization are appropriate to task and purpose. (Grade-specific expectations for writing types are defined in standards 1-3 above.)

[CCSS.ELA-Literacy.W.3.5](#) With guidance and support from peers and adults, develop and strengthen writing as needed by planning, revising, and editing.

[CCSS.ELA-Literacy.W.3.6](#) With guidance and support from adults, use technology to produce and publish writing (using keyboarding skills) as well as to interact and collaborate with others.

[CCSS.ELA-Literacy.W.3.7](#) Conduct short research projects that build knowledge about a topic.

[CCSS.ELA-Literacy.W.3.8](#) Recall information from experiences or gather information from print and digital sources; take brief notes on sources and sort evidence into provided categories.

Speaking & Listening:

[CCSS.ELA-LITERACY.SL.3.1](#) Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 3 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.3.1.A](#) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.3.1.B](#) Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).

[CCSS.ELA-Literacy.SL.3.1.c](#) Ask questions to check understanding of information presented, stay on topic, and link their comments to the remarks of others.

[CCSS.ELA-Literacy.SL.3.1.d](#) Explain their own ideas and understanding in light of the discussion.

[CCSS.ELA-Literacy.SL.3.3](#) Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.

[CCSS.ELA-Literacy.SL.3.4](#) Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.

[CCSS.ELA-Literacy.SL.3.6](#) Speak in complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

Language:

[CCSS.ELA-LITERACY.L.3.1](#) Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[CCSS.ELA-LITERACY.L.3.1.A](#) Explain the function of nouns, pronouns, verbs, adjectives, and adverbs in general and their functions in particular sentences.

[CCSS.ELA-LITERACY.L.3.2](#) Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

[CCSS.ELA-LITERACY.L.3.4](#) Determine or clarify the meaning of unknown and multiple-meaning word and phrases based on grade 3 reading and content, choosing flexibly from a range of strategies.

Grade 4

Reading Informational Text:

[CCSS.ELA-LITERACY.RI.4.1](#) Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text.

[CCSS.ELA-LITERACY.RI.4.2](#) Determine the main idea of a text and explain how it is supported by key details; summarize the text.

[CCSS.ELA-LITERACY.RI.4.4](#) Determine the meaning of general academic and domain-specific words or phrases in a text relevant to a *grade 4 topic or subject area*.

[CCSS.ELA-LITERACY.RI.4.5](#) Describe the overall structure (e.g., chronology, comparison, cause/effect, problem/solution) of events, ideas, concepts, or information in a text or part of a text.

[CCSS.ELA-LITERACY.RI.4.7](#) Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

Writing:

[CCSS.ELA-LITERACY.W.4.1](#) Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

[CCSS.ELA-LITERACY.W.4.1.A](#) Introduce a topic or text clearly, state an opinion, and create an organizational structure in which related ideas are grouped to support the writer's purpose.

[CCSS.ELA-LITERACY.W.4.1.B](#) Provide reasons that are supported by facts and details.

[CCSS.ELA-LITERACY.W.4.1.C](#) Link opinion and reasons using words and phrases

[CCSS.ELA-LITERACY.W.4.1.D](#) Provide a concluding statement or section related to the opinion presented.

[CCSS.ELA-LITERACY.W.4.2](#) Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

[CCSS.ELA-LITERACY.W.4.2.A](#) Introduce a topic clearly and group related information in paragraphs and sections; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

[CCSS.ELA-LITERACY.W.4.2.B](#) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

[CCSS.ELA-LITERACY.W.4.2.C](#) Link ideas within categories of information using words and phrases.

[CCSS.ELA-LITERACY.W.4.2.D](#) Use precise language and domain-specific vocabulary to inform about or explain the topic.

[CCSS.ELA-LITERACY.W.4.2.E](#) Provide a concluding statement or section related to the information or explanation presented.

[CCSS.ELA-LITERACY.W.4.4](#) Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

[CCSS.ELA-LITERACY.W.4.8](#) Recall relevant information from experiences or gather relevant information from print and digital sources; take notes and categorize information, and provide a list of sources.

Speaking & Listening:

[CCSS.ELA-LITERACY.SL.4.1](#) Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 4 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.4.1.A](#) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.4.1.B](#) Follow agreed-upon rules for discussions and carry out assigned roles.

[CCSS.ELA-LITERACY.SL.4.1.C](#) Pose and respond to specific questions to clarify or follow up on information, and make comments that contribute to the discussion and link to the remarks of others.

[CCSS.ELA-LITERACY.SL.4.1.D](#) Review the key ideas expressed and explain their own ideas and understanding in light of the discussion.

[CCSS.ELA-LITERACY.SL.4.3](#) Identify the reasons and evidence a speaker provides to support particular points.

Language:

[CCSS.ELA-LITERACY.L.4.1](#) Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[CCSS.ELA-LITERACY.L.4.1.A](#) Use relative pronouns (*who, whose, whom, which, that*) and relative adverbs (*where, when, why*).

[CCSS.ELA-LITERACY.L.4.2](#) Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

[CCSS.ELA-LITERACY.L.4.3](#) Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[CCSS.ELA-LITERACY.L.4.3.A](#) Choose words and phrases to convey ideas precisely.

[CCSS.ELA-LITERACY.L.4.4](#) Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 4 reading and content, choosing flexibly from a range of strategies.

Grade 5

Reading Informational Text:

[CCSS.ELA-LITERACY.RI.5.2](#) Determine two or more main ideas of a text and explain how they are supported by key details; summarize the text.

[CCSS.ELA-LITERACY.RI.5.3](#) Explain the relationships or interactions between two or more individuals, events, ideas, or concepts in a historical, scientific, or technical text based on specific information in the text.

[CCSS.ELA-LITERACY.RI.5.4](#) Determine the meaning of general academic and domain-specific words and phrases in a text relevant to a *grade 5 topic or subject area*.

Writing:

[CCSS.ELA-LITERACY.W.5.1](#) Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

[CCSS.ELA-LITERACY.W.5.1.A](#) Introduce a topic or text clearly, state an opinion, and create an organizational structure in which ideas are logically grouped to support the writer's purpose.

[CCSS.ELA-LITERACY.W.5.1.B](#) Provide logically ordered reasons that are supported by facts and details.

[CCSS.ELA-LITERACY.W.5.1.C](#) Link opinion and reasons using words, phrases, and clauses

[CCSS.ELA-LITERACY.W.5.1.D](#) Provide a concluding statement or section related to the opinion presented.

[CCSS.ELA-LITERACY.W.5.2](#) Write informative/explanatory texts to examine a topic and convey ideas and information clearly.

[CCSS.ELA-LITERACY.W.5.2.A](#) Introduce a topic clearly, provide a general observation and focus, and group related information logically; include formatting (e.g., headings), illustrations, and multimedia when useful to aiding comprehension.

[CCSS.ELA-LITERACY.W.5.2.B](#) Develop the topic with facts, definitions, concrete details, quotations, or other information and examples related to the topic.

[CCSS.ELA-LITERACY.W.5.2.C](#) Link ideas within and across categories of information using words, phrases, and clauses (e.g., *in contrast*, *especially*).

[CCSS.ELA-LITERACY.W.5.2.D](#) Use precise language and domain-specific vocabulary to inform about or explain the topic.

[CCSS.ELA-LITERACY.W.5.2.E](#) Provide a concluding statement or section related to the information or explanation presented.

[CCSS.ELA-LITERACY.W.5.4](#) Produce clear and coherent writing in which the development and organization are appropriate to task, purpose, and audience.

[CCSS.ELA-LITERACY.W.5.8](#) Recall relevant information from experiences or gather relevant information from print and digital sources; summarize or paraphrase information in notes and finished work, and provide a list of sources.

Speaking & Listening:

[CCSS.ELA-LITERACY.SL.5.1](#) Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 5 topics and texts*, building on others' ideas and expressing their own clearly.

[CCSS.ELA-LITERACY.SL.5.1.A](#) Come to discussions prepared, having read or studied required material; explicitly draw on that preparation and other information known about the topic to explore ideas under discussion.

[CCSS.ELA-LITERACY.SL.5.1.B](#) Follow agreed-upon rules for discussions and carry out assigned roles.

[CCSS.ELA-LITERACY.SL.5.1.C](#) Pose and respond to specific questions by making comments that contribute to the discussion and elaborate on the remarks of others.

[CCSS.ELA-LITERACY.SL.5.1.D](#) Review the key ideas expressed and draw conclusions in light of information and knowledge gained from the discussions.

[CCSS.ELA-LITERACY.SL.5.3](#) Summarize the points a speaker makes and explain how each claim is supported by reasons and evidence.

Language:

[CCSS.ELA-LITERACY.L.5.1](#) Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.

[CCSS.ELA-LITERACY.L.5.1.A](#) Explain the function of conjunctions, prepositions, and interjections in general and their function in particular sentences.

[CCSS.ELA-LITERACY.L.5.2](#) Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.

[CCSS.ELA-LITERACY.L.5.3](#) Use knowledge of language and its conventions when writing, speaking, reading, or listening.

[CCSS.ELA-LITERACY.L.5.4](#) Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grade 5 reading and content, choosing flexibly from a range of strategies.

Common Core Math Standards (Grades 3 – 5):

Grade 3

- MP.1** Make sense of problems and persevere in solving them.
- MP.2** Reason abstractly and quantitatively.
- 3.OA.1-3** Represent and solve problems involving multiplication and division.
- 3.OA.7** Multiply and divide within 100.
- 3.NBT.3** Use place value understanding and properties of operations to perform multi-digit arithmetic.
- 3.MD.2** Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
- 3.MD.5-7** Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

Grade 4

- MP.1** Make sense of problems and persevere in solving them.
- MP.2** Reason abstractly and quantitatively.
- 4.OA.1-3** Use the four operations with whole numbers to solve problems.
- 4.MD.2** Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.
- 4.G.2** Draw and identify lines and angles, and classify shapes by properties of their lines and angle.

Grade 5

- MP.1** Make sense of problems and persevere in solving them.
- MP.2** Reason abstractly and quantitatively.
- 5.MD.1** Convert like measurement units within a given measurement system
- 5.MD.3-4** Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Next Generation Science Standards Grades 3 - 5:

Performance Expectations

- 3-LS4-3.** Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- 3-LS4-4.** Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change
- 3-LS3-2.** Use evidence to support the explanation that traits can be influenced by the environment.
- 4-PS3-2.** Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.
- 4-PS4-2.** Develop a model to describe that light reflecting from objects and entering the eye allows objects to be seen.
- 5-LS2-1.** Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- 3-5-ETS1-1.** Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 3-5-ETS1-2.** Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

Example NGSS “Big Idea” and Topic Bundle: How does the environment affect organisms and how can energy be transferred from the environment to the organisms within it? The discussion can extend to how different environmental factors affect various organisms differently and how we can use that to help and protect our communities.

<u>Science and Engineering Practices</u>	<u>Disciplinary Core Ideas</u>	<u>Cross Cutting Concepts</u>
<p>Asking questions / defining problems; Planning and carrying out investigations; Analyzing and interpreting data Experiments with bacteria growing and investigations into the properties of light have students asking questions and investigating why and how things work.</p> <p>Using math & computational thinking Math word problems give students a chance to think how math is used in S&E.</p> <p>Constructing explanations/designing solutions; Engaging in argument from evidence; Obtaining, evaluating, and communicating information Challenge extensions and innovation prompts in the <i>Book of Ideas</i> - Young Inventors Journal enable students to design and support their solutions to a variety of challenges.</p> <hr/> <p>Connections to Nature of Science</p> <p>Scientific investigations use a variety of methods; Scientific knowledge is based on empirical evidence Entrepreneur story/presentation and hands on activities illustrate how scientific investigations are conducted and how that information is put to use.</p>	<p>LS1.A Structure and function; LS1.B Growth and development of organisms; LS1.C Organization for matter and energy flow in organisms; Suggested videos, bacteria growing activity, coupled with introduction text, Entrepreneur video illustrate how some organisms thrive and circumstances where they don't thrive.</p> <p>PS1. A Structure of matter; PS2.B Types of interactions Investigations into cells and light highlight the structure of matter and how things interact.</p> <p>PS3.A Definitions of energy PS3.D Energy in chemical processes and everyday life All activities highlight different types of energy (light, food).</p> <p>PS4. A Wave properties PS4.B Electromagnetic radiation Hands on activities demonstrate various properties of light. These concepts are supported with the vocabulary list, introduction text and technology historical timeline</p> <p>ETS1.A: Defining and Delimiting Engineering Problems ETS1.B: Developing Possible Solutions ETS1.C: Optimizing the Design Solution Science and technology based writing prompts, challenge questions and group activities support the three phases of Engineering Design. The Book of Idea, along with the Design Challenge lesson plan take students through the full cycle of concept to design.</p>	<p>Patterns Activities 1&2 illustrate patterns in light and can be used to explain/predict behavior.</p> <p>Cause and effect Activities, timelines, videos and introduction text highlight how certain situations and properties result in specific outcomes.</p> <p>Systems and system models; Stability and change Bacteria growing activity demonstrates both system and how things change over time.</p> <p>Structure and function Entrepreneurs highlight how the structure and properties of materials can be used to perform specific functions.</p> <hr/> <p>Connections to Nature of Science Science is a way of knowing; Science addresses questions about the natural and material world Activities give firsthand experience in questioning, observing and concluding.</p> <p>Science is a human endeavor Entrepreneur story and historical timeline highlight the human aspect of science and engineering.</p> <p>Connections to Engineering, Technology, and Applications of Science</p> <p>Interdependence of Science, Engineering, and Technology; Influence of Engineering, Technology and Science on Society and the Natural World Introduction text, historical timeline and entrepreneur story highlight above interactions and interdependencies.</p>

Connections to Common Core State Standards

See previous Common Core Standards section for the ELA and Math standards addressed by these activities.

NY State Science Standards:

Grades 3 & 4

STANDARD 1 - SCIENTIFIC INQUIRY:

S1.1 Ask "why" questions in attempts to seek greater understanding concerning objects and events they have observed and heard about.

STANDARD 1 - ENGINEERING DESIGN:

T1.1 Describe objects, imaginary or real, that might be modeled or made differently and suggest ways in which the objects can be changed, fixed, or improved.

T1.1a Identify a simple/common object which might be improved and state the purpose of the improvement

T1.1b Identify features of an object that help or hinder the performance of the object

T1.1c Suggest ways the object can be made differently, fixed, or improved within given constraints

T1.2 Investigate prior solutions and ideas from books, magazines, family, friends, neighbors, and community members.

T1.2a Identify appropriate questions to ask about the design of an object

T1.2b Identify the appropriate resources to use to find out about the design of an object

STANDARD 6 – INTERCONNECTEDNESS:

Models - Key Idea 2: Models are simplified representations of objects, structures, or systems, used in analysis, explanation, or design.

SCIENCE STANDARD - LIVING ENVIRONMENT:

1.2a Living things grow, take in nutrients, breathe, reproduce, eliminate waste, and die.

5.1b An organism's external physical features can enable it to carry out life functions in its particular environment.

7.1a Humans depend on their natural and constructed environments.

7.1b Over time humans have changed their environment by cultivating crops and raising animals, creating shelter, using energy, manufacturing goods, developing means of transportation, changing populations, and carrying out other activities.

7.1c Humans, as individuals or communities, change environments in ways that can be either helpful or harmful for themselves and other organisms.

SCIENCE STANDARD - PHYSICAL SETTING:

4.2b Humans utilize interactions between matter and energy.

Grade 5

STANDARD 1 – SCIENTIFIC INQUIRY:

S2.1 Use conventional techniques and those of their own design to make further observations and refine their explanations, guided by a need for more information.

S2.1a demonstrate appropriate safety techniques

S2.1b conduct an experiment designed by others

S2.1c design and conduct an experiment to test a hypothesis

S2.1d use appropriate tools and conventional techniques to solve problems about the natural world, including: measuring, observing, and describing.

S3.2 Interpret the organized data to answer the research question or hypothesis and to gain insight into the problem.

STANDARD 1 – ENGINEERING DESIGN:

T1.1 Identify needs and opportunities for technical solutions from an investigation of situations of general or social interest.

T1.1a Identify a scientific or human need that is subject to a technological solution which applies scientific principles

T1.3 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 (critique) ideas; and explain why the chosen solution is optimal.

T1.3a Generate ideas for alternative solutions

STANDARD 6 – INTERCONNECTEDNESS:

Systems Thinking - Key Idea 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.

Models - Key Idea 2: Models are simplified representations of objects, structures, or systems, used in analysis, explanation, or design.

STANDARD 7 – INTERDISCIPLINARY PROBLEM SOLVING:

Connections – Key Idea 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.

SCIENCE STANDARD - LIVING ENVIRONMENT:

Key Idea 1 – Living things are both similar and different from each other and from nonliving things

1.1a Living things are composed of cells. Cells provide structure and carry on major functions to sustain life. Cells are usually microscopic in size.

Key Idea 5 - Organisms maintain a dynamic equilibrium that sustains life.

5.1c All organisms require energy to survive. The amount of energy needed and the method for obtaining this energy vary among cells. Some cells use oxygen to release the energy stored in food.

SCIENCE STANDARD - PHYSICAL SETTING:

Key Idea 4 - Energy exists in many forms, and when these forms change energy is conserved

4.4a Different forms of electromagnetic energy have different wavelengths. Some examples of electromagnetic energy are microwaves, infrared light, visible light, ultraviolet light, X-rays, and gamma rays.

4.4b Light passes through some materials, sometimes refracting in the process. Materials absorb and reflect light, and may transmit light. To see an object, light from that object, emitted by or reflected from it, must enter the eye.

Texas Essential Knowledge and Skills:

General

Knowledge and skills.

(1) Scientific investigation and reasoning. The student conducts classroom and outdoor investigations following school and home safety procedures and environmentally appropriate practices. The student is expected to:

- (A) demonstrate safe practices as described in the Texas Safety Standards during classroom and outdoor investigations, including observing a schoolyard habitat; and
- (B) make informed choices in the use and conservation of natural resources by recycling or reusing materials such as paper, aluminum cans, and plastics.

(2) Scientific investigation and reasoning. The student uses scientific inquiry methods during laboratory and outdoor investigations. The student is expected to:

- (A) plan and implement descriptive investigations, including asking and answering questions, making inferences, and selecting and using equipment or technology needed, to solve a specific problem in the natural world;
- (B) collect data by observing
- (D) analyze and interpret patterns in data to construct reasonable explanations based on evidence from investigations;
- (F) communicate valid conclusions supported by data in writing, by drawing pictures, and through verbal discussion.

(3) Scientific investigation and reasoning. The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to:

- (A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;
- (D) connect grade-level appropriate science concepts with the history of science, science careers, and contributions of scientists.

Grade 3

(4) Scientific investigation and reasoning. The student knows how to use a variety of tools and methods to conduct science inquiry. The student is expected to:

- (A) collect, record, and analyze information using tools.

(9) Organisms and environments. The student knows that organisms have characteristics that help them survive and can describe patterns, cycles, systems, and relationships within the environments.

Grade 4

(6) Force, motion, and energy. The student knows that energy exists in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

- (A) differentiate among forms of energy, including mechanical, sound, electrical, light, and heat/thermal;

(9) Organisms and environments. The student knows and understands that living organisms within an ecosystem interact with one another and with their environment. The student is expected to:

- (A) investigate that most producers need sunlight, water, and carbon dioxide to make their own food, while consumers are dependent on other organisms for food; and

Grade 5

(6) Force, motion, and energy. The student knows that energy occurs in many forms and can be observed in cycles, patterns, and systems. The student is expected to:

- (A) explore the uses of energy, including mechanical, light, thermal, electrical, and sound energy;
- (C) demonstrate that light travels in a straight line until it strikes an object or travels through one medium to another and demonstrate that light can be reflected such as the use of mirrors or other shiny surfaces and refracted such as the appearance of an object when observed through water