Verona Public School District
Curriculum Overview

3rd Grade Science

Supervisor:
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Curriculum Developed:
Fall/Winter 2011-12
Summer 2017

Board Approval Date:
February 14, 2012
August 29, 2017

Verona Public Schools
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Verona Public Schools Mission Statement:

The mission of the Verona Public Schools, the center of an engaged and supportive community, is to empower students to achieve their potential as active learners and productive citizens through rigorous curricula and meaningful, enriching experiences.

Course Description:

The Motion and Design unit combines the physics of forces and motion with technological design. Students use plastic construction materials, weights, rubber bands, and propellers to design and build vehicles, then test how those vehicles respond to different forces of motion, like pushes, pulls, or rubber band energy. They explore, through experiments and multiple trials, how forces like friction, gravity, and air resistance work against motion to slow their vehicles down. Students must apply the concepts they learn to a design challenge, designing a vehicle that can perform to certain specifications, but also meets certain “cost” requirements. Collaboratively, student teams must design a vehicle, calculate the cost, test it, and refine their design. This unit develops skills in recording design through drawing, making accurate measurements, completing and analyzing data tables, making and testing predictions, and communicating results and experimental data.

Students plant their own seeds to begin an eight-week inquiry into the life cycle of a simple plant, the Brassica rapa, in Plant Growth and Development. Using plants that complete their life cycle in 35 days, students are able to watch germination and maturation while learning about the specific parts of a plant and the function each serves. Because they care or their own seedlings, students learn that plants need light, soil, nutrients from soil, and water to survive. In addition, students use dried bees to simulate the pollination process to understand the interdependence of bees and flowers. These activities deepen their understanding of the characteristics of living organisms and their relationship with, and dependence on the environment in general. Throughout this unit, students are asked to use their observation and recording skills, complete and analyze data tables, use simple tools, draw diagrams, and apply scientific vocabulary.

Prerequisite(s):

Grade 2 Science

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Standard 8: Technology Standards

8.1: Educational Technology: *All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.*	**8.2: Technology Education, Engineering, Design, and Computational Thinking - Programming:** *All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.*
A. Technology Operations and Concepts B. Creativity and Innovation **X** C. Communication and Collaboration D. Digital Citizenship **X** E. Research and Information Fluency **X** F. Critical thinking, problem solving, and decision making	A. The Nature of Technology: Creativity and Innovation **X** B. Technology and Society **X** C. Design D. Abilities for a Technological World E. Computational Thinking: Programming

SEL Competencies and Career Ready Practices

Social and Emotional Learning Core Competencies: *These competencies are identified as five interrelated sets of cognitive, affective, and behavioral capabilities*	**Career Ready Practices:** *These practices outline the skills that all individuals need to have to truly be adaptable, reflective, and proactive in life and careers. These are researched practices that are essential to career readiness.*
Self-awareness: The ability to accurately recognize one's emotions and thoughts and their influence on behavior. This includes accurately assessing one's strengths and limitations and possessing a well-grounded sense of confidence and optimism.	**X** CRP2. Apply appropriate academic and technical skills. CRP9. Model integrity, ethical leadership, and effective management. CRP10. Plan education and career paths aligned to personal goals.
Self-management: The ability to regulate one's emotions, thoughts, and behaviors effectively in different situations. This includes managing stress, controlling impulses, motivating oneself, and setting and working toward achieving personal and academic goals.	CRP3. Attend to personal health and financial well-being. CRP6. Demonstrate creativity and innovation. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP11. Use technology to enhance productivity.
Social awareness: The ability to take the perspective of and empathize with others from diverse backgrounds and cultures, to understand social and ethical norms for behavior, and to recognize family, school, and community resources and supports.	**X** CRP1. Act as a responsible and contributing citizen and employee. CRP9. Model integrity, ethical leadership, and effective management.
Relationship skills: The ability to establish and maintain healthy and rewarding relationships with diverse individuals and groups. This includes communicating clearly, listening actively, cooperating, resisting inappropriate social pressure, negotiating conflict constructively, and seeking and offering help when needed.	**X** CRP4. Communicate clearly and effectively and with reason. CRP9. Model integrity, ethical leadership, and effective management. CRP12. Work productively in teams while using cultural global competence.
Responsible decision making: The ability to make constructive and respectful choices about personal behavior and social interactions based on consideration of ethical standards, safety concerns, social norms, the realistic evaluation of consequences of various actions, and the well-being of self and others.	CRP5. Consider the environmental, social, and economic impact of decisions. CRP7. Employ valid and reliable research strategies. **X** CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership, and effective management.

Standard 9: 21st Century Life and Careers

9.1: Personal Financial Literacy: *This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.*	**9.2: Career Awareness, Exploration & Preparation:** *This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.*	**9.3: Career and Technical Education:** *This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.*
X A. Income and Careers B. Money Management C. Credit and Debt Management D. Planning, Saving, and Investing E. Becoming a Critical Consumer F. Civic Financial Responsibility G. Insuring and Protecting	**X** A. Career Awareness (K-4) B. Career Exploration (5-8) C. Career Preparation (9-12)	A. Agriculture, Food & Natural Res. B. Architecture & Construction C. Arts, A/V Technology & Comm. D. Business Management & Admin. E. Education & Training F. Finance G. Government & Public Admin. H. Health Science I. Hospital & Tourism J. Human Services K. Information Technology L. Law, Public, Safety, Corrections & Security M. Manufacturing N. Marketing **X** O. Science, Technology, Engineering & Math P. Transportation, Distribution & Log.

Course Materials

Core Instructional Materials: *These are the board adopted and approved materials to support the curriculum, instruction, and assessment of this course.*	**Differentiated Resources**: *These are teacher and department found materials, and also approved support materials that facilitate differentiation of curriculum, instruction, and assessment of this course.*
● STC Kits: o Motion and Design o Plant Growth and Development	● Trade books

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Unit Title / Topic: Motion and Design	Unit Duration:

Stage 1: Desired Results

Established Goals:

3-PS2-1. Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object. [Clarification Statement: Examples could include an unbalanced force on one side of a ball can make it start moving; and, balanced forces pushing on a box from both sides will not produce any motion at all.] [Assessment Boundary: Assessment is limited to one variable at a time: number, size, or direction of forces. Assessment does not include quantitative force size, only qualitative and relative. Assessment is limited to gravity being addressed as a force that pulls objects down.]

3-PS2-2. Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion. [Clarification Statement: Examples of motion with a predictable pattern could include a child swinging in a swing, a ball rolling back and forth in a bowl, and two children on a see-saw.] [Assessment Boundary: Assessment does not include technical terms such as period and frequency.]

Science and Engineering Practices

Planning and Carrying Out Investigations

- Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (3-PS2-1)
- Make observations and/or measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon or test a design solution. (3-PS2-2)

Connections to Nature of Science

Science Knowledge is Based on Empirical Evidence

- Science findings are based on recognizing patterns. (3-PS2-2)

Scientific Investigations Use a Variety of Methods

- Science investigations use a variety of methods, tools, and techniques. (3-PS2-1)

Disciplinary Core Ideas

PS2.A: Forces and Motion

- Each force acts on one particular object and has both strength and a direction. An object at rest typically has multiple forces acting on it, but they add to give zero net force on the object. Forces that do not sum to zero can cause changes in the object's speed or direction of motion. (Boundary: Qualitative and conceptual, but not quantitative addition of forces are used at this level.) (3-PS2-1)
- The patterns of an object's motion in various situations can be observed and measured; when that past motion exhibits a regular pattern, future motion can be predicted from it. (Boundary: Technical terms, such as magnitude, velocity, momentum, and vector quantity, are not introduced at this level, but the concept that some quantities need both size and direction to be described is developed.) (3-PS2-2)

Crosscutting Concepts

Patterns

- Patterns of change can be used to make predictions. (3-PS2-2)

Cause and Effect

- Cause and effect relationships are routinely identified. (3-PS2-1)

Common Core State Standards Connections:

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. (3-PS2-1)

W.3.7 Conduct short research projects that build knowledge about a topic. (3-PS2-1),(3-PS2-2)

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. (3-PS2-1),(3-PS2-2)

Mathematics –

MP.2 Reason abstractly and quantitatively. (3-PS2-1)

MP.5 Use appropriate tools strategically. (3-PS2-1)

3.MD.A.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. (3-PS2-1)

Transfer Goal:

Students will be able to <u>independently</u> use their learning choose a design challenge and engage in the engineering design process to meet the challenge.

Students will understand that:

- The success of technological products depends on the scientific characteristics of their design and their value in application.
- Successful vehicle design requires an understanding of energy, force, and friction, as well as of the properties of materials and cost considerations.
- Models may be used to test and adapt the variables and components that affect the efficiency of a design.

Essential Questions:

- How can the engineering design process make for better solutions or products?
- How do forces act on objects to put them in motion, or make them stop moving?
- How can I make fair tests?

Students will know:

- The products of technological design must meet certain specifications, which are set forth in technical drawings.
- The position and motion of an object may be changed by a force, such as pushing or pulling.
- The forces acting on a vehicle include different forms of energy that act as driving forces and resisting forces.
- Technological designs and products may be evaluated in terms of their cost, as well as their scientific and technological efficiency.

- vehicle, motion, design, requirement, three-view drawing, technical drawing, blueprint force, unbalanced force, friction, falling weight system, mean, median, mode, load, line plot, load energy, motion energy, kinetic energy, stored energy, potential energy, stored energy, friction, hub, axle, sail, hypothesize, air resistance, drag, aerodynamic, propeller, potential energy, friction, surface, clockwise, counterclockwise, action, reaction, angle, cost-effective, trade-offs, performance, standards engineer, aerospace engineer, computer scientist, mechanical engineer, electrical engineer, budget, aerodynamic, cost effective, recursive testing, engineer, design and testing, cost

Students will be able to:

- Build a vehicle according to design specifications.
- Make technical drawings.
- Conduct an investigation about applied forces and resulting motion.
- Conduct an investigation on the effect of load on motion.
- Conduct an investigation to evaluate different energy sources to drive their vehicles.
- Conduct an investigation to evaluate the effect of variable amounts of energy on the motion of the vehicle.
- Analyze data to determine how their design variable reduce or increase the force of friction in their vehicles.
- Construct an explanation for the effect of air resistance on their vehicle.
- Use evidence to compare the designs of propeller driven vehicles with axle-driven vehicles.
- Perform a cost analysis and modify vehicle design to reduce cost.
- Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Stage 2: Acceptable Evidence

Transfer Task -

Motion and Design Design challenges

Students will plan, build, refine and present their design challenge solutions.

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Unit Title / Topic: Plant Growth and Development	Unit Duration: 60 days

Stage 1: Desired Results

Established Goals:

2-LS2-1. Plan and conduct an investigation to determine if plants need sunlight and water to grow. [Assessment Boundary: Assessment is limited to testing one variable at a time.]
2-LS2-2. Develop a simple model that mimics the function of an animal in dispersing seeds or pollinating plants.*
2-LS4-1. Make observations of plants and animals to compare the diversity of life in different habitats. [Clarification Statement: Emphasis is on the diversity of living things in each of a variety of different habitats.] [Assessment Boundary: Assessment does not include specific animal and plant names in specific habitats.]
3-LS1-1. Develop models to describe that organisms have unique and diverse life cycles but all have in common birth, growth, reproduction, and death. [Clarification Statement: Changes organisms go through during their life form a pattern.] [Assessment Boundary: Assessment of plant life cycles is limited to those of flowering plants. Assessment does not include details of human reproduction.]
3-LS3-1. Analyze and interpret data to provide evidence that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms. [Clarification Statement: Patterns are the similarities and differences in traits shared between offspring and their parents, or among siblings. Emphasis is on organisms other than humans.] [Assessment Boundary: Assessment does not include genetic mechanisms of inheritance and prediction of traits. Assessment is limited to non-human examples.]
3-LS3-2. Use evidence to support the explanation that traits can be influenced by the environment. [Clarification Statement: Examples of the environment affecting a trait could include normally tall plants grown with insufficient water are stunted; and, a pet dog that is given too much food and little exercise may become overweight.]

Science and Engineering Practices

Constructing Explanations and Designing Solutions
- Use materials to design a device that solves a specific problem or a solution to a specific problem. (1-LS1-1)

Obtaining, Evaluating, and Communicating Information
- Read grade-appropriate texts and use media to obtain scientific information to determine patterns in the natural world. (1-LS1-2)

Planning and Carrying Out Investigations
- Make observations (firsthand or from media) to collect data which can be used to make comparisons. (2-LS4-1)

Developing and Using Models
- Develop models to describe phenomena. (3-LS1-1)

Connections to Nature of Science
Scientific Knowledge is Based on Empirical Evidence
- Scientists look for patterns and order when making observations about the world. (1-LS1-2), (2-LS4-1)
- Science findings are based on recognizing patterns. (3-LS1-1)

Disciplinary Core Ideas

LS1.A: Structure and Function
- All organisms have external parts. Different animals use their body parts in different ways to see, hear, grasp objects, protect themselves, move from place to place, and seek, find, and take in food, water and air. Plants also have different parts (roots, stems, leaves, flowers, fruits) that help them survive and grow. (1-LS1-1)

LS1.B: Growth and Development of Organisms
- Adult plants and animals can have young. In many kinds of animals, parents and the offspring themselves engage in behaviors that help the offspring to survive. (1-LS1-2)
- Reproduction is essential to the continued existence of every kind of organism. Plants and animals have unique and diverse life cycles. (3-LS1-1)

LS1.D: Information Processing
- Animals have body parts that capture and convey different kinds of information needed for growth and survival. Animals respond to these inputs with behaviors that help them survive. Plants also respond to some external inputs. (1-LS1-1)

LS3.A: Inheritance of Traits
- Many characteristics of organisms are inherited from their parents. (3-LS3-1)
- Other characteristics result from individuals' interactions with the environment, which can range from diet to learning. Many characteristics involve both inheritance and environment. (3-LS3-2)

LS3.B: Variation of Traits
Different organisms vary in how they look and function because they have different inherited information. (3-LS3-1)
The environment also affects the traits that an organism develops. (3-LS3-2)

LS4.D: Biodiversity and Humans
- There are many different kinds of living things in any area, and they exist in different places on land and in water. (2-LS4-1)

Crosscutting Concepts

Cause and Effect
- Events have causes that generate observable patterns. (2-LS2-1)
- Cause and effect relationships are routinely identified and used to explain change. (3-LS3-2)

Structure and Function
- The shape and stability of structures of natural and designed objects are related to their function(s). (2-LS2-2)

Patterns
- Patterns of change can be used to make predictions. (3-LS1-1)
- Similarities and differences in patterns can be used to sort and classify natural phenomena. (3-LS3-1)

Common Core State Standards Connections:
ELA/Literacy –
W.2.7 Participate in shared research and writing projects (e.g., read a number of books on a single topic to produce a report; record science observations). (2-LS2-1), (2-LS4-1)
W.2.8 Recall information from experiences or gather information from provided sources to answer a question. (2-LS2-1), (2-LS4-1)
SL.2.5 Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings. (2-LS2-2)
RI.3.7 Use information gained from illustrations (e.g., maps, photographs) and the words in a text to demonstrate understanding of the text (e.g., where, when, why, and how key events occur). (3-LS1-1)
SL.3.5 Create engaging audio recordings of stories or poems that demonstrate fluid reading at an understandable pace; add visual displays when appropriate to emphasize or enhance certain facts or details. (3-LS1-1)
Mathematics –
MP.2 Reason abstractly and quantitatively. (2-LS2-1), (2-LS4-1)
MP.4 Model with mathematics. (2-LS2-1),(2-LS2-2), (2-LS4-1)
MP.5 Use appropriate tools strategically. (2-LS2-1)
2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems. (2-LS2-2), (2-LS4-1)
3.NBT Number and Operations in Base Ten (3-LS1-1) 3.NF Number and Operations—Fractions (3-LS1-1)

Transfer Goal:

Students will be able to <u>independently</u> use their learning to model the interrelationship of plants and bees.

Students will understand that:

- Plants can grow and develop only in environments in which their needs are met.
- Plants and other organisms are part of an organized system that regulates their life cycles and their interactions with the environment.
- To move through their life cycle, plants need light, water, and nutrients from the soil. To reproduce, plants must be pollinated.
- Models can be used to identify the structures, functions, and behaviors of living organisms.

Essential Questions:

- What is mutualism?
- How are plants and bees mutualistically related?
- How can the life cycle of a plant be modeled?

Students will know:

- Organisms go through distinct stages as part of a process known as the life cycle.
- Living things are interdependent; for example, plants depend on bees for pollination.
- Records, notes, and graphs help people understand how plants move through the life cycle and what factors affect their growth and development.

seed, texture, odor, predictions, observations, magnify, embryo, cotyledon, *Brassica* seeds (Wisconsin Fast Plants™), forceps, fertilizer pellets, quad, transplant, transit, class plots, centimeter, monitor, measurement, comparison, life cycle, cotyledon, embryonic, seedling data, analyze, growth spurt, honey stomach, honey bees, pollination, fertilization, hives, interdependent, dependent queen, abdomen, worker, antenna, drone, colony, pollination, pollen, thorax petal, stigma, structure, anther, pistil, cross-pollination, plant reproduction, fertilization, stamen , pistil , flowers, nectar, pollen, pods, mature, life cycle petals, sepals, pistil, stem, anthers, stigma, leaves antenna, stinger, simple eyes, legs, compound eyes, pollen baskets, tongues, bar graph, axis, unit of measurement, interpretation, application harvest, thresh, profit, loss

Students will be able to:

- Conduct an investigation of bean seeds.
- Conduct an investigation of the life cycle of *Brassica rapa*
- Record, represent data in graphs, and analyze data about growth of *Brassica rapa*
- Conduct an investigation of the seed productivity of *Brassica rapa*
- Conduct an investigation of the structure bees
- Conduct an investigation of pollination.
- Construct models of *Brassica rapa* and of a bee that clearly show the ways in which they interact in a mutually beneficial relationship.

Stage 2: Acceptable Evidence

Transfer Task -

Student models and presentation.

Research and presentation of another mutualistic relationship.