

**COURSE TITLE**

STEM- Grade 4

**LENGTH**

One Quarter

**DEPARTMENT**

STEM Department

**SCHOOL**

Pierrepont Elementary School

**DATE**

September 10, 2018

## STEM- Grade 4

### I. Introduction/Overview/Philosophy

In this course, students will explore a variety of science concepts with a STEM focus. Students will use problem-solving skills to explore grade level Next Generation Science Standards. Students will explore concepts including Earth's Systems, Earth and Human Activity and Engineering Design skills. Students will be introduced to various science concepts, including practical skills, lab report writing, and problem solving skills and applications.

### II. Objectives

#### *Course Outline:*

1. Science/Engineering Design Skills
2. Plate Tectonics and Large Scale Interactions
  - i. Natural Disasters
  - ii. Earthquakes
3. Engineering Design Process

#### *Student Outcomes:*

After successfully completing this course, the student will:

- Generate and compare multiple solutions that use patterns to transfer information
- Identify evidence from patterns in rock formations and fossils in rock layers to support an explanation for changes in landscape over time.
- Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.
- Analyze and interpret data from maps to describe patterns of Earth's features.
- Generate and compare multiple solutions to reduce the impacts of natural Earth processes on humans.
- Use problem solving and engineering design skills to solve a global problem.
- Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- 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.
- 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.

### *New Jersey Student Learning Standards*

#### *CAREER READY PRACTICES*

#### *CRPI Act as a responsible and contributing citizen and employee.*

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the

near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

***CRP2 Apply appropriate academic and technical skills.***

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

***CRP4 Communicate clearly and effectively and with reason.***

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

***CRP5. Consider the environmental, social and economic impacts of decisions.***

Career-ready individuals understand the interrelated nature of their actions and regularly make decisions that positively impact and/or mitigate negative impact on other people, organization, and the environment. They are aware of and utilize new technologies, understandings, procedures, materials, and regulations affecting the nature of their work as it relates to the impact on the social condition, the environment and the profitability of the organization.

***CRP6. Demonstrate creativity and innovation.***

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

***CRP7. Employ valid and reliable research strategies.***

Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

***CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.***

Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

***CRP11. Use technology to enhance productivity.***

Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

***CRP12. Work productively in teams while using cultural global competence.***

Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

***TECHNOLOGY***

**Standard 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.

***Strand A. Technology Operations and Concepts:*** Students demonstrate a sound understanding of technology concepts, systems and operations.

8.1.5.A.1- Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.

***Strand E: Research and Information Fluency:*** Students apply digital tools to gather, evaluate, and use information.

8.1.8.E.1- Effectively use a variety of search tools and filters in professional public databases to find information to solve a real world problem.

***Strand F: Critical thinking, problem solving, and decision making:*** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.1.5.F.1- Apply digital tools to collect, organize, and analyze data that support a scientific finding.

**Standard 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.

***Strand A. The Nature of Technology: Creativity and Innovation*** Technology systems impact every aspect of the world in which we live.

8.2.5.A.1- Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.

8.2.5.A.2- Investigate and present factors that influence the development and function of a product and a system.

8.2.5.A.3- Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

8.2.5.A.5- Identify how improvement in the understanding of materials science impacts technologies.

***Strand C. Design:*** The design process is a systematic approach to solving problems.

8.2.5.C.1- Collaborate with peers to illustrate components of a designed system.

8.2.5.C.2- Explain how specifications and limitations can be used to direct a product's development.

8.2.5.C.3- Research how design modifications have led to new products.

8.2.5.C.4- Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

8.2.5.C.5- Explain the functions of a system and subsystems.

8.2.5.C.6- Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.

8.2.5.C.7- Work with peers to redesign an existing product for a different purpose.

***Strand D. Abilities for a Technological World:*** The designed world is the product of a design process that provides the means to convert resources into products and systems.

8.2.5.D.3- Follow step by step directions to assemble a product or solve a problem.

## ***21ST CENTURY LIFE AND CAREERS***

### ***9.1 Personal Financial Literacy***

#### ***Strand B: Money Management***

9.1.4.B.3 Explain what a budget is and why it is important.

### ***9.2 Career Awareness, Exploration, and Preparation***

#### ***Strand A: Career Awareness***

9.2.4.A.4 Explain why knowledge and skills acquired in the elementary grades lay the foundation for future academic and career success.

## ***NEW JERSEY STUDENT LEARNING STANDARDS- SCIENCE***

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.

3-5-ETS1-3. 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.

4-ESS2-1. Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

## **III. Proficiency Levels**

This is a cycle course for Grade 4.

## **IV. Methods of Assessment**

### **Student Assessment**

The teacher will provide a variety of assessments during the course of the year. The assessment may include but is not limited to: report writing, teacher observation, student journals, tests, quizzes, and projects.

### **Curriculum/Teacher Assessment**

The teacher will provide the subject area supervisor with suggestions for changes on an ongoing basis.

## **V. Grouping**

This is a required Grade 4 cycle course.

## **VI. Articulation/Scope & Sequence/Time Frame**

Course length is one quarter.

## VII. Resources

### *Texts/Supplemental Reading/References*

1. Next Generation Science Standards
2. Science World Magazine
3. Online STEM Resources
4. Various Videos, may include but not limited to
  - A. [www.brainpop.com](http://www.brainpop.com)
  - B. [www.pbs.org](http://www.pbs.org)
  - C. [www.teachertube.org](http://www.teachertube.org)
  - D. [www.howstuffworks.com](http://www.howstuffworks.com)

## VIII. Suggested Activities

Appropriate activities are listed in the curriculum map.

## IX. Methodologies

The following methods of instruction are suggested: lecture, group projects, demonstrations, hands-on applications and class presentations.

## X. Interdisciplinary Connections

At this grade level, connections to many other disciplines are appropriate and natural. Reading and writing become an integral part of the STEM process. Connections with mathematics are frequent throughout the curricula. Technology plays an important role in the STEM classroom.

## XI. Differentiating Instruction for Students with Special Needs: Students with Disabilities, Students at Risk, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students.

Differentiating in this course includes but is not limited to:

### *Differentiation for Support (ELL, Special Education, Students at Risk)*

- Peer mentoring on problems
- Differentiated teacher feedback on assignments
- Modeling out problems on whiteboard
- Visual aids as we project problems on whiteboard
- Study guides

- Tiered assignments
- Scaffolding of materials and assignments
- Re-teaching and review
- Guided note taking
- Exemplars of varied performance levels
- Multi-media approach to accommodating various learning styles

*Differentiation for Enrichment*

- Supplemental reading material for independent study
- Flexible grouping
- Tiered assignments
- Topic selection by interest
- Enhanced expectations for independent study
- Elevated questioning techniques using Webb's Depth of Knowledge matrix

## **XII. Professional Development**

The teacher will continue to improve expertise through participation in a variety of professional development opportunities.

## XII. Curriculum Map/Pacing Guide

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Science/Engineering Design Skills	2 weeks	<p><i>For Support:</i></p> <ul style="list-style-type: none"> <li>Teacher modeling</li> <li>Pairing students with beginning English language skills with students who have more advanced English language skills.</li> </ul> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> <li>Inquiry based instruction</li> <li>Critical/Analytical thinking tasks</li> <li>Higher-order thinking skills</li> </ul>	3-5 ETS1-1 3-5 ETS1-2 3-5 ETS1-3 8.1.5.A.1 8.1.5.E.1 8.1.5.F.1 8.2.5.A.1, 2, 3, 5 8.2.5.C.1,2,3,4,5,6,7 8.2.5.D.3 9.1.4.B.3 9.2.4.A.4 CRP1,4,7,9,11,12	<p><i>Formative Assessment:</i></p> <ul style="list-style-type: none"> <li>Exit Tickets</li> <li>Group/Cooperative Work</li> <li>Classwork</li> <li>Questioning</li> </ul> <p><i>Summative Assessment</i></p> <ul style="list-style-type: none"> <li>Projects: the final design challenges and write-ups using technology (google docs, google drawing)</li> <li>Quizzes (Google Forms)</li> </ul>
Plate Tectonics and Large Scale Interactions - includes Natural Disasters (Earthquakes)	2 weeks	<p><i>For Support:</i></p> <ul style="list-style-type: none"> <li>Allow errors</li> <li>Rephrase Questions, directions, explanations</li> </ul> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> <li>Scaffolding</li> <li>Critical/Analytical thinking tasks</li> <li>Real World Problems and scenarios</li> <li>Student driven projects</li> </ul>	3-5 ETS1-1 3-5 ETS1-3 3-5 ETS1-2 8.1.5.A.1 8.1.5.E.1 8.1.5.F.1 8.2.5.A.1, 2, 3, 5 8.2.5.C.1,2,3,4,5,6,7 8.2.5.D.3 9.1.4.B.3 9.2.4.A.4 CRP1,4,7,9,11,12	<p><i>Formative Assessment:</i></p> <ul style="list-style-type: none"> <li>Group and Cooperative Work</li> <li>Entry/Exit Tickets</li> </ul> <p><i>Summative Assessment</i></p> <ul style="list-style-type: none"> <li>Engineering Design Project/ Design Piece and Writing Pieces</li> </ul>
Engineering Design Process	6 weeks	<p><i>For Support:</i></p> <ul style="list-style-type: none"> <li>Cooperative Learning Groups</li> </ul>	3-5 ETS1-1 3-5 ETS1-2 3-5 ETS1-3	<p>Formative Assessments</p> <ul style="list-style-type: none"> <li>Group and Cooperative Work</li> </ul>

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
		<ul style="list-style-type: none"> <li>• Think/Pair Share</li> </ul> <p><i>For Enhancement:</i></p> <ul style="list-style-type: none"> <li>• Adjusting the Pace of Lessons</li> <li>• Inquiry Based Instruction</li> <li>• Higher Order Thinking Skills</li> <li>• Internet-Based Content</li> <li>• Student Driven Projects</li> <li>• Real-World Problems Scenarios</li> </ul>	8.1.5.A.1 8.1.5.E.1 8.1.5.F.1 8.2.5.A.1, 2, 3, 5 8.2.5.C.1,2,3,4,5,6,7 8.2.5.D.3 9.1.4.B.3 9.2.4.A.4 CRP1,4,7,9,11,12	<ul style="list-style-type: none"> <li>• Blog Entries and Reflection Wrap-ups Google Forms</li> </ul> <p><i>Summative Assessment</i></p> <ul style="list-style-type: none"> <li>• Engineering Design Project – Earthquake Towers (design and write-ups)</li> </ul>