STEAM

Content Area: **STEM**
Course(s): **Intro to Keyboarding**
Time Period: **Generic Time Period**
Length: **On Going**
Status: **Published**

Unit Overview

The goal of this unit is to introduce 5th grade students to the idea of S.T.E.A.M. education and begin to develop S.T.E.A.M. proficient students. By the end of fifth grade, students will master grade level science, technology, engineering, and mathematics content, practices, and processes, integrate STEM contents with other disciplines, answer complex questions, investigate global issues, solve real world problems, and meet real world challenges while engaging in meaningful, purposeful, and relevant hands-on inquiry-based, problem-based and/or project-based learning experiences. Students will work toward these S.T.E.A.M. goals in the 2 times per 6 day cycle as part of a Introduction to the Digital World year long course.

Transfer

Students will be able to independently use their learning to...

1. Ask questions (for science) and define problems (engineering)
2. Develop and use models
3. Plan and carry out investigations
4. Analyze and interpret data
5. Use mathematics and computational thinking
6. Construct explanations (for science) and design solutions (for engineering)
7. Engage in argue with evidence
8. Obtain, evaluate, and communicate information

For more information, read the following article by Grant Wiggins.

http://www.authenticeducation.org/ae_bigideas/article.lasso?artid=60

Meaning

Understandings

Students will understand...

1. There are multiple solutions to every problem using STEAM Elements
2. How to design and build a simple machine and use it to solve a problem.
3. How to manipulate engineering design to increase/decrease potential and kinetic energy.
4. The effect energy has on motion and stability.
5. The concept of action/reaction force, tension/compression force and the effects weight, balance and stability have on these forces.
6. The interactions of forces on one another.
7. Block coding methods and how variables input into code affect a real world object the code is controlling.
8. Structures and processes and the balance of objects by distributing weight.
9. The engineering design process and how to use the process to solve problems.

Essential Questions

Students will keep considering...

-What thought provoking questions will foster inquiry, meaning making and transfer?

01. How are pushes and pulls involved in the use of a catapult?
02. How is potential (stored) energy and kinetic (working) energy used in the use of a catapult?
03. How does one built structure differ from the anothers?
04. How can a structure designed to make it as sturdy and balance as possible?
05. How can horizontal and verticle lines be used to create a weight bearing structure?
06. What are the styles of weight bearing structures and how do they differ?
07. What kind of materials can be used to design and create a structure?
08. How does structural design effect balance and stability and how are buildings designed using these same concepts?
09. What three-dimensional shapes can be represented in the design of a tree tower?
10. How might wind power be used to power things in our world?
11. How do you think wind power works?
12. What are some problems that might come up with wind power?
13. What type of energy is used to push a marble through a maze?
14. How does friction affect movement of objects when under a force?
15. How does momentum affect movement of objects under force?

Application of Knowledge and Skill

Students will know...

Students will know...

1. What Potential and Kinetic energy is.
2. The effect Potential and Kinetic energy has on objects.
3. Built structures can differ and successfully perform their purpose.
4. Different design elements and materials can be used to create a weight bearing structure
5. How wind power can be used to power things in the world.
6. How wind power works.
7. What friction and momentum are and how they effect objects under force.

Students will be skilled at...

Students will be skilled at...

1. Using the engineering design process to develop solutions to problems.
2. Using different forms of force to manipulate objects.
3. Colaborate with classmates to compare and contrast ideas and determine the best solution to a problem.
4. Using technology and digital tools to develop ideas and create structures and devices to solve a problem.
5. Use Mathmatics to measure and calculate in the development of a project.
6. Visualizing their design through graphical drawing or other means.

Academic Vocabulary

push
pull
potential energy
kinetic energy
Horizontal
Vertical
Joint
Balance
Friction
Incline Plane
Speed
Distance
Obstacle
Nest
Shelter
Intersect
Balance

Gravity

Learning Goal 1

Students will use their knowledge of the engineering design process to create a simple machine in order to solve a problem. They will also be able to describe the key parts of their simple machine and how they work.

Proficiency Scale STEAM Simple Machines

MA.5.MD	Measurement and Data
MA.5.MD.B	Represent and interpret data.
SCI.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.
SCI.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.
SCI.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.
TECH.8.2.8.D.1	Design and create a product that addresses a real world problem using a design process under specific constraints.
TECH.8.2.8.D.2	Identify the design constraints and trade-offs involved in designing a prototype (e.g., how the prototype might fail and how it might be improved) by completing a design problem and reporting results in a multimedia presentation, design portfolio or engineering notebook.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
TECH.8.2.8.D.CS1	Apply the design process.
TECH.8.2.8.D.CS2	Use and maintain technological products and systems.
TECH.8.2.8.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.8.E.1	Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.
3-5-ETS1-1.1.1	Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost.
5-LS1-1.5.1	Matter is transported into, out of, and within systems.
5-PS2	Motion and Stability: Forces and Interaction
5-PS3	Energy
5-PS3-1.5.1	Energy can be transferred in various ways and between objects.

Target 1

Students will blueprint a design for their simple machine using, but not limited to paper STEM Journal, digital tools and software.

Target 2

Students will design and create a simple machine using supplied materials.

Learning Goal 2

Students will design three dimensional structure with specific design challenges presented.

Proficiency Scale STEAM 3D Structures

MA.5.OA.A.2	Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
MA.5.NF.B.6	Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
MA.5.NF.B.7	Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.
TECH.8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.2.8.C.4	Identify the steps in the design process that would be used to solve a designated problem.
TECH.8.2.8.C.5b	Create a technical sketch of a product with materials and measurements labeled.
TECH.8.2.8.C.CS2	The application of engineering design.
TECH.8.2.8.D.3	Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.
TECH.8.2.8.D.CS2	Use and maintain technological products and systems.
TECH.8.2.8.E.4	Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).
5-ESS1-2	Represent data in graphical displays to reveal patterns of daily changes in length and direction of shadows, day and night, and the seasonal appearance of some stars in the night sky.
5-ESS1-2.4.1	Represent data in graphical displays (bar graphs, pictographs and/or pie charts) to reveal patterns that indicate relationships.
5-ESS3-1.4.1	A system can be described in terms of its components and their interactions.
5-LS1-1.7.1	Support an argument with evidence, data, or a model.

5-PS1-4.2.1	students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
5-PS1-3.3	Planning and Carrying Out Investigations
5-PS1-2.3.1	Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
5-PS1-3.3.1	Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume.
5-PS1-3.3.1	Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon.
5-PS1-2.5.1	Measure and graph quantities such as weight to address scientific and engineering questions and problems.
5-PS2-1	Support an argument that the gravitational force exerted by Earth on objects is directed down.
5-PS2	Motion and Stability: Forces and Interaction
5-PS3-1.5.1	Energy can be transferred in various ways and between objects.

Target 1

Students will blueprint a design for the three dimensional structure using, but not limited to paper STEM Journal, digital tools and software.

Target 2

Students will collaborate to create a three dimensional structure that is balanced and strong.

Learning Goal 3

Student will problem solve using the Engineering Design Process to create a simple design.

Proficiency Scale STEAM Simple Machines & Problem Solving

TECH.8.1.5.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.5.A.1	Select and use the appropriate digital tools and resources to accomplish a variety of tasks including solving problems.
TECH.8.1.5.B.CS1	Apply existing knowledge to generate new ideas, products, or processes.
TECH.8.1.5.B.CS2	Create original works as a means of personal or group expression.
TECH.8.1.5.E.1	Use digital tools to research and evaluate the accuracy of, relevance to, and

	appropriateness of using print and non-print electronic information sources to complete a variety of tasks.
TECH.8.1.5.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.5.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.
TECH.8.1.8	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.
TECH.8.2.5.C.1	Collaborate with peers to illustrate components of a designed system.
TECH.8.2.5.C.2	Explain how specifications and limitations can be used to direct a product's development.
TECH.8.2.5.C.3	Research how design modifications have lead to new products.
TECH.8.2.5.C.CS1	The attributes of design.
TECH.8.2.5.C.CS2	The application of engineering design.
TECH.8.2.5.D.2	Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.
TECH.8.2.5.D.3	Follow step by step directions to assemble a product or solve a problem.
TECH.8.2.5.D.CS1	Apply the design process.
5-PS1-4.2.1	students routinely identify and test causal relationships and use these relationships to explain change. They understand events that occur together with regularity might or might not signify a cause and effect relationship.
5-PS2	Motion and Stability: Forces and Interaction
5-PS2-1.2.1	Cause and effect relationships are routinely identified and used to explain change.
5-PS2-1.PS2.B.1	The gravitational force of Earth acting on an object near Earth's surface pulls that object toward the planet's center.

Target 1

Students will blueprint a design for a simple design using, but not limited to paper STEM Journal, digital tools and software.

Target 2

Students will collaborate, measure and design to traverse a problem successfully. Students will calculate methods and collect data to develop methods for solving a problem.

Learning Goal 4

Students will developing coding skills.

Proficiency Scale STEAM Coding

TECH.8.2.5.E	Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.
TECH.8.2.5.E.1	Identify how computer programming impacts our everyday lives.
TECH.8.2.5.E.2	Demonstrate an understanding of how a computer takes input of data, processes and stores the data through a series of commands, and outputs information.
TECH.8.2.5.E.3	Using a simple, visual programming language, create a program using loops, events and procedures to generate specific output.
TECH.8.2.5.E.4	Use appropriate terms in conversation (e.g., algorithm, program, debug, loop, events, procedures, memory, storage, processing, software, coding, procedure, and data).
TECH.8.2.5.E.CS1	Computational thinking and computer programming as tools used in design and engineering.

Target 1

Students will understand and apply coding terminology such as blockly, variable, function, call, command, conditional, etc.

Target 2

Students will complete a level appropriate coding projects and assignments independently.

Summative Assessment

Pre-Test
STEM Journal
Rubric

21st Century Life and Careers

CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP2.1	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.

CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP4.1	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.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP6.1	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.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP8.1	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.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP11.1	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.
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Formative Assessment and Performance Opportunities

Differentiation/Enrichment

1. IEP/504 Modifications
2. Self and peer reflections and collaboration
3. Small Group Instruction
4. Independent review of Video Instruction
5. Review and Practice

Unit Resources

Chromebooks
Internet
Google Classroom and Google Docs
Teacher Handouts
Typing Agent
Nitro Type
Code Combat
Code.org
Sphero Edu

- Code.org
- Google Classroom
- Google Docs
- Hour of Code
- How Stuff Works
- Internet
- Microsoft Office
- Quiz Games
- Teacher Handouts
- Typing Agent