Southmoreland School District
6-8 STEM Overviews

Sixth Grade STEM Overview:

STEM at this grade goes hand in hand with earth science, aerospace engineering, and space exploration. Students will be involved in focusing on real-world issues and problems, using the engineering design process, immersing students in hands-on inquiry and open-ended exploration, involving students in productive teamwork, applying math and science content students are learning, and allowing for multiple right answers and failure as a necessary part of learning.

Module Titles:

Module 1: Using Tinkercad to make a simple keychain/zipper pull
Module 2: Making and testing a Maglev car
Module 3: Using solar power to create a solar car
Module 4: Mission to the Moon (Vivify STEM Curriculum)

Module Overviews:

Module 1: Using Tinkercad to make a simple keychain/zipper pull
Students discover the design process as they complete a design challenge to learn how to make a keychain using Tinkercad. Students use measurement systems and apply measurement skills while creating their keychains. This is their first foray into 3d printing. The students will print their keychains after they are finished.

Module 2: Making and testing a Maglev car
Students will develop the abilities necessary to do scientific inquiry by using appropriate tools and techniques to gather, analyze, and interpret data. Students will think critically and logically to make the relationships between evidence and explanations. Math is used to calculate acceleration and modeling is used to evaluate and redesign their car so that it has the fastest acceleration possible, all the while students develop abilities for technological and engineering design. They also learn that modeling, testing, evaluating, and modifying are used to transform ideas into practical solutions. Students will further learn where this technology is used throughout the world both now and in the future.

Module 3: Using solar power to create a solar car
Building a solar-powered car will introduce students to alternative energy concepts while incorporating problem-solving, design, and modeling. In addition, students will experience using hand tools as they construct their solar vehicle. Students will be using measuring and math skills as they figure out where to put the axles as well as learn about how gears and motors work. We may never drive cars covered in photovoltaic cells, but building a miniature solar car is a fun way to see how solar energy can be used for power.

Module 4: Mission to the Moon (Vivify STEM Curriculum)
Through interactive sessions, Space Club students become a team of astronauts challenged to complete missions centered around a Journey to the Moon. Each mission, students will read a message or watch a video from Mission Control, who will introduce the activity and provide background context. Students will then engage in hands-on activities centered around the engineering design process.

Students learn what it takes to land a spacecraft on a target by making a zip line that carries their spacecraft down the line and the students must figure out how to deploy the spacecraft so that it hits their target. Information about the Artemis program and earlier space flight is referenced and used as part of the background for this project.

The engineering design process and Newton's first law of motion is introduced with the roller coaster challenge. Connect to the Mission to the Moon with the vomit comet that uses changes in acceleration to prepare humans for space travel. How can the roller coaster cause changes in acceleration to a ping pong ball? Students will learn how acceleration affects astronauts as they go into space as well as see the effects of potential and kinetic energy firsthand in this fun project.

Students will next learn the challenges of living in space and explore ways to grow food in order to stay alive in the Plant Device Engineering Challenge. Students will design a hydroponic greenhouse to grow plants including comparing two different seed types.

Finally, students will design a robotic arm to help astronauts collect rock samples from deep inside a crater. How will students build a robotic arm that can not only move but be strong enough to pick up an object? This mission might be difficult, and it will teach resilience as students encounter challenges. Students will need to use iterations to test and redesign their device and try again!

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6-8 STEM Overviews

Seventh grade STEM Overview:

Seventh grade STEM focuses on electricity and electrical engineering as well as how machines and gears work. Students will be involved in the focusing on real-world issues and problems, using the engineering design process, immersing students in hands-on inquiry and open-ended exploration, involving students in productive teamwork, applying math and science content students are learning, allowing for multiple right answers and failure as a necessary part of learning, and using good time and project management skills.

Module Titles:

Module 1: Using Tinkercad to make a cookie cutter
Module 2: Electricity basics and making series and parallel circuits
Module 3: Using electricity to design and make a house (based on season) with light up windows, door bell, and motorized object
Module 4: Using Snap Circuits to learn more in-depth about electricity
Module 5: Programming a robot to follow a path with various functions

Module Overviews:

Module 1: Using Tinkercad to make a cookie cutter
Students continue learning about the design process as they complete a design challenge to make a cookie cutter using Tinkercad. Students use measurement systems and apply measurement skills while creating their cookie cutter. This is a continuation into 3d printing on a more difficult project. The students will print their cookie cutters after they are finished.

Module 2: Electricity basics and making series and parallel circuits
The science of electricity is covered with how to make a basic series and parallel circuit. Students actually see behind the scenes of a wall on how their home is wired and safety measures with electricity are discussed. Then students make their circuits using diodes before they begin their bigger challenge.

Module 3: Using electricity to design and make a house (based on season) with light up windows, door bell, and motorized object

Students will work in groups of two or three to design and make a house (haunted, Santa's workshop, leprechaun village, and summer beach house) and light it up using series and parallel circuits. The students will be using Circuit Playground Express to program more lights, a speaker for sound, and a servo motor to have something motorized on their house. This project really brings together all aspects of engineering—design, electricity, motors, measuring, troubleshooting, art, math, and teamwork.

Module 4: Using Snap Circuits to learn more in-depth about electricity

Snap Circuits teaches basic engineering, electronics and circuitry concepts by using building components with snaps to assemble electronic circuits on a simple "rows-and-columns" base grid. The resulting projects function like the printed circuit board found in most electronic products. Students learn more about resistors and capacitors as they make several games as well as sounds and projects.

Module 5: Programming a robot to follow a path with various functions

In this module, students work with our Cue robots to program them to race a certain path, then create a dance around the table given certain parameters and directions. Students work together as a team to accomplish this, bringing in the all-important team work, communication skills, and coding together.

Eighth grade STEM Overview:

Eighth grade STEM focuses on elements of design and technology, prototyping, and creation. Students will be involved in focusing on real-world issues and problems, using the engineering design process, immersing students in hands-on inquiry and open-ended exploration, involving students in productive teamwork, applying math and science content students are learning, allowing for multiple right answers and failure as a necessary part of learning, using good time and project management skills, and assessing client needs and building a working prototype to match those needs.

Module Titles:

Module 1: Using Tinkercad to make a box with a sliding lid
Module 2: Making a dye sublimation substrate
Module 3: Making a tshirt and learning about printing methods/possibilities
Module 4: Using decomposition to make a lantern out of cardstock on the laser
Module 5: Making a prototype of a wooden lantern in 2D and 3D
Module 6: Creating a Rube Goldberg machine using the six basic machines

Module Overviews:

Module 1: Using Tinkercad to make a box with a sliding lid
Students continue learning about 3d design as they complete a design challenge to make a sliding lid box using Tinkercad. Students use measurement systems and apply measurement skills while creating their sliding lid box. This is a much more challenging project than any attempted before . The students will print their boxes after they are finished.

Module 2: Making a dye sublimation substrate
In this module, students experience for the first time dye sublimation printing along with how it works, when to use it, and limitations of the printing science. Students make a keychain using the heat press and must use correct dimensions in the design in order for this to turn out correctly.

Module 3: Making a tshirt and learning about printing methods/possibilities
The science of printing and various methods are covered as students explore the most requested item to make. Various printing techniques are covered to make a tshirt, including when to use what method, how each method works, and the limitations of each process. Students leave the class with a tshirt they have made.

Module 4: Using decomposition to make a lantern out of cardstock on the laser
Students are given the task of looking at an object and with their team, figuring out how to make it. This takes the much needed skill of decomposition to figure it out, along with trial and error and perseverance given several constraints. Once they are able to turn in a sketch of how to make the lantern, then students are shown how to create it using the laser cutter and leave with a beautiful card stock lantern.

Module 5: Making a prototype of a wooden lantern in 2D and 3D
Once again students will build upon the skills learned previously to help them decompose and prototype a small wooden lantern in both 2D and 3D. Students will work together in this project and once designed in 2D, will take their measurements and recreate in 3D before we create the lantern on the laser cutter. Students will leave with a small wooden lantern that they have designed given certain constraints.

Module 6: Creating a Rube Goldberg machine using the six basic machines
The culminating activity this year will be the design of a Rube Goldberg machine, using all six basic machines. First the students will need to research and assign each of the six basic machines to a teammate, then each team member will design their part of the RB machine. Students are to each work on their section, then as a team put the entire design together. This reinforces teamwork, communication, and good planning.