



Stafford Township School District

STEAM Curriculum Grade 6

Adopted: 08/06/2017
Updated: 10/17/2018. 01/06/2020

Philosophy

The Stafford Township Public Schools has integrated STEAM (Science, Technology, Engineering, Arts, and Math) into its elementary and intermediate school core curriculum. All Stafford students are exposed to STEAM concepts starting as early as Kindergarten and continuing throughout intermediate.

STEAM refers to the areas of Science, Technology, Engineering, Arts and Mathematics. However, STEAM initiatives are not these disciplines in isolation. Rather, STEAM is the integration of courses, programs or linked learning opportunities using an interdisciplinary approach through exploration, discovery and problem solving.

Learning by doing is inviting and exciting so students learn and remember more. Successful, hands-on experiences exploring engineering can have a major influence on motivation and confidence in learning. Ultimately, we hope to inspire students to challenge themselves and consider careers in STEAM fields. Students need STEAM project-based learning to build 21st century skills. Science and engineering jobs are growing 70 percent faster than other occupations. This means our students will be at an advantage when competing for the high-tech, high-wage jobs of the future.

Inclusivity/LGBTQ/Disabilities

New Jersey Legislation [C.18A:35-4.35](#) requires that the history of disabled and LGBT persons be included in middle and high school curriculum. Instruction shall focus on the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, in an appropriate place in the curriculum of middle school and high school students as part of the district's implementation of the New Jersey Student Learning Standards. In addition, policies, and procedures pertaining to inclusive instructional materials are outlined in Legislation C.18A:35-4.36. Schools shall adopt inclusive instructional materials that portray the cultural and economic diversity of society including the political, economic, and social contributions of persons with disabilities and lesbian, gay, bisexual, and transgender people, where appropriate. The instruction and materials of the course will be made inclusive and representative of all individuals and various groups of people. This course will:

- Address how students feel about the group(s) they identify with and if they are represented in the texts, visual/media representations, and materials used in math
- Create real world situations with rational numbers representing persons with disabilities and/or from the LGBTQ community
- Ensure that word problems are inclusive, and use this opportunity to highlight diversity in names, gender, and family structure. For example, "Anjelique and her moms bought fifteen apples from the market." or "Miguel and their dads love to draw with chalk."

- Incorporate inclusive language into real world math examples and word problems
- Analyze information from sources that represent the LGBTQ community and people with disabilities
- Avoid binary assumptive language and use appropriate gender inclusive language in the classroom.
- Use appropriate gender terms, preferred names, and inclusive language to ensure all students feel safe and represented in the educational process.
- Whose voice is missing from any of the course's texts/visual/media representations? Why?
- Modifications can be made to accommodate any students with specific needs, views and experiences

Unit: STEAM Lab Orientation		Duration: 2 Days (September)
Standards		
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
Interdisciplinary Connections		
ELA Standards		
RI.6.7	Integrate information presented in different media or formats as well as in words to develop a coherent understanding of a topic or issue.	
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	
Technology Standards		
8.1.4. E.2	Evaluate the accuracy, relevance, and appropriateness of print and non-print electronic information sources to complete a variety of tasks.	
21st Century Life and Careers		
<p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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.</p> <p>9.2 Career Awareness, Exploration, and 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.</p>		

<p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>	
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● Following established STEAM Lab rules and procedures ensures that students and faculty remain safe and increases the likelihood that challenges are met successfully. ● Engineers take on specific responsibilities in order to contribute to the success of the overall challenge. ● The Engineering Design Process involves asking questions, imagining possible solutions, planning a course of action, creating and testing a process or prototype, and analyzing results in order to make design improvements. 	<ul style="list-style-type: none"> ● How do we use the STEAM Lab equipment safely? ● How do we work together to meet our goals? ● What are the steps of the Engineering Design Process (EDP)?
Evidence of Student Learning	
Formative Assessments	Summative Assessments
<ul style="list-style-type: none"> ● Teacher Observation ● Question and Answer ● Conferencing 	<ul style="list-style-type: none"> ● STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Scientific Notebook Check with Scoring Rubric

	<p>Alternative Assessments</p> <ul style="list-style-type: none"> • Student Notebook Check with Teacher Scoring Rubric • Stop and Jot Activities with possible Sentence Starters • Teacher Observation Checklist based on Student Performance and Project Creation • Student Participation Rubric • Mystery Science Activities • Student Created Project with Teacher Scoring Rubric
Vocabulary	
Analyze, Constraints, Criteria, Engineering Design Process, Prototype, Redesign	
Knowledge and Skills	
Content	Skills
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> • Engineers describe a problem that can be solved through the development of an object, tool, process, or system. • Engineers identify which individuals or groups need this problem to be solved. • Engineers define constraints that must be taken into account in the solution. • Engineers identify how each solution would solve the problem. • Engineers compare solutions based on the results of their performance against the defined criteria and constraints. 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> • safely use the equipment, materials, and furniture in the STEAM Lab. • choose a job that allows them to contribute to the challenge activity. • apply the Engineering Design Process (EDP) to create a spaghetti tower capable of supporting a large marshmallow at the top.
Instructional Plan	
Suggested Activities	Resources
Discussion of Safety Rules and Lab Procedures - Students will be oriented on how materials should be used and stored, how to safely sit on the Hoky stools, and what jobs are available for cooperative learning.	<ul style="list-style-type: none"> • Rules, lab procedures, and team jobs are posted on bulletin boards. • https://www.nsf.gov/news/classroom/engineering.jsp

<p>Spaghetti Tower Challenge - Students will work together to build a pasta tower strong enough to support a large marshmallow.</p>	<ul style="list-style-type: none"> • ITEEA Card • http://stem-works.com/
<p>Literature</p>	
<ul style="list-style-type: none"> • <i>Hidden Worlds: Looking Through a Scientist's Microscope</i> by Stephen P. Kramer • <i>Technology: A Byte-sized World!</i> by Dan Green • <i>The Kids' Invention Book</i> by Arlene Erlbach 	
<p>Suggested Inclusivity Materials and Resources:</p> <ul style="list-style-type: none"> • Use word problems to incorporate inclusivity examples • Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html • Math article from GLSEN with examples on how to be inclusive with math https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities • Website for LGBTQ mathematicians and history http://lgbtmath.org/ • Trevor Project • Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- https://makeitbetter4youth.org/resources/ • BrainPop Inclusivity List • STEAM for Everyone • LGBTQ Video Game Creators • Nepris 	
<p>Websites</p>	
<ul style="list-style-type: none"> • https://www.teachengineering.org/ (resource for engineering projects and activities) 	
<ul style="list-style-type: none"> • w.nsf.gov/news/classroom/engineering.jsp (National Science Foundation engineering classroom resources) 	
<ul style="list-style-type: none"> • http://stemcollaborative.org/additionalResources.html (resource of STEM activities) 	
<p>Accommodations & Modifications</p>	
<p>English Language Learners</p> <ul style="list-style-type: none"> • Shorten or simplify directions • Alternative assessment • Flexible/cooperative grouping • Graphic organizers 	

<ul style="list-style-type: none"> • Native Language Support and Resources • Modified classwork and homework assignments
<p>Special Education/504 Plans</p> <ul style="list-style-type: none"> • Provide differentiated instruction as needed • Follow all IEP modifications/504 plan • Provide manipulatives or the opportunity to draw solution strategies • Modify for varying proficiency levels, multiple intelligences, and grade levels • Use visuals and gestures • Use sentence starters • Build background knowledge • Highlight key words • Graphic organizers • Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time
<p>Basic Skills</p> <ul style="list-style-type: none"> • Modified Assignment • Teacher Modeling • Partner Work • Teacher Prompts
<p>Economically Disadvantaged</p> <ul style="list-style-type: none"> • Extra set of materials for home • Study guides • Modified Assignment
<p>Gifted and Talented</p> <ul style="list-style-type: none"> • Higher Level Text • Provide Multisyllabic Words • Choice Board to extend learning • Integrate a variety of activities to meet all types of multiple intelligences
<p>Students at Risk of School Failure</p> <ul style="list-style-type: none"> • Alternative assessment • Flexible/cooperative grouping • Graphic organizers • Parent-teacher communication • Integrate a variety of activities to meet all types of multiple intelligences • Modified classwork and homework assignments

Unit 2: Waves and Electromagnetic Radiation		Duration: 2 days (September)
Standards		
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
MS-PS4-1	Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.	
MS-PS4-2	Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.	
MS-PS4-3	Integrate qualitative scientific and technical information to support the claim that digitized signals are a more reliable way to encode and transmit information than analog signals.	
Interdisciplinary Connections		
ELA Standards		
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	
Technology Standards		
8.2.8.B.3	Solve a science-based design challenge and build a prototype using science and math principles throughout the design process.	
21st Century Life and Careers		
<p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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.</p>		

	<p>9.2 Career Awareness, Exploration, and 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.</p> <p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>
<p>Essential Understandings</p>	<p>Essential Questions</p>
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● Engineers take on specific responsibilities in order to contribute to the success of the overall challenge. ● Following the steps of the EDP helps engineers to work in an organized fashion to better understand failures and correct them. ● Two main types of waves are mechanical and electromagnetic. ● The understanding of waves has led to technological advancements in areas such as communications, medicine, and military defense systems. ● Knowing how waves interact with different types of matter leads to innovative ways of using wave energy. 	<ul style="list-style-type: none"> ● How do we work together to meet our goals? ● How do we apply the EDP to solve problems? ● What are the different types of waves? ● How does the knowledge of waves help us to better understand our world and improve our lives? ● What materials absorb sound waves and which materials reflect them?

Evidence of Student Learning	
Formative Assessments	Summative Assessments
<ul style="list-style-type: none"> ● Teacher Observation ● Question and Answer ● Conferencing 	<ul style="list-style-type: none"> ● STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> ● Student Notebook Check with Teacher Scoring Rubric ● Stop and Jot Activities with possible Sentence Starters ● Teacher Observation Checklist based on Student Performance and Project Creation ● Student Participation Rubric ● Mystery Science Activities ● Student Created Project with Teacher Scoring Rubric
Vocabulary	
Amplitude, Electromagnetic Radiation, Frequency, Mechanical waves, Medium, Transmit, Wavelength	
Knowledge and Skills	
Content	Skills
<p><i>Students will know...</i></p> <ul style="list-style-type: none"> ● Engineers describe a problem that can be solved through the development of an object, tool, process, or system. ● Engineers identify which individuals or groups need this problem to be solved. ● Engineers define constraints that must be taken into account in the solution. ● Engineers identify how each solution would solve the problem. ● Engineers compare solutions based on the results of their performance against the defined criteria and constraints. ● A simple wave has a repeating pattern with a specific wavelength, frequency, and amplitude. 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> ● collaborate on a team that applies the EDP to devise a method of using sound or light wave energy to send a signal to another team they cannot see. (The sound message must travel through a medium other than air.) ● collaborate on a team that applies the EDP to design and create headphones that reduce sound.

<ul style="list-style-type: none"> • Mechanical waves transfer energy from particle to particle in matter. Electromagnetic waves transfer energy through either matter or empty space. • Some materials will absorb sound waves while others will reflect them. 	
Instructional Plan	
Suggested Activities	Resources
Signal Transmission Challenge - Students will design a method of transmitting a message using sound or light waves. Sound messages cannot use spoken words.	<ul style="list-style-type: none"> • http://www.discoveryeducation.com/teachers/free-lesson-plans/the-electromagnetic-spectrum-waves-of-energy.cfm • http://sciencenetlinks.com/lessons/light-1-making-light-of-science/
Sound-absorbing Headphones - Students will use a variety of materials to create headphones that absorb sound.	<ul style="list-style-type: none"> • http://www.teachengineering.org/activities/view/cub_soundandlight_lesson5_activity1
Literature	
<ul style="list-style-type: none"> • <i>The Attractive Story of Magnetism with Max Axiom, Super Scientist</i> by Andrea Gianopoulos • <i>Adventures in Sound with Max Axiom, Super Scientist</i> by Emily Sohn • <i>Experimenting with Sound Science Projects</i> by Robert Gardner 	
<p>Suggested Inclusivity Materials and Resources:</p> <ul style="list-style-type: none"> • Use word problems to incorporate inclusivity examples • Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html • Math article from GLSEN with examples on how to be inclusive with math https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities • Website for LGBTQ mathematicians and history http://lgbtmath.org/ • Trevor Project • Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- https://makeitbetter4youth.org/resources/ • BrainPop Inclusivity List • STEAM for Everyone • LGBTQ Video Game Creators • Nepris 	

Websites

- <http://sciencenetlinks.com/lessons/light-1-making-light-of-science/> (exploration of visible light)
- http://www.ducksters.com/science/light_spectrum.php (background information on light spectrum)
- https://www.teachengineering.org/view_lesson.php?url=collection/cub_/lessons/cub_soundandlight/cub_soundandlight_less_on7.xml (lesson on visible light and the electromagnetic spectrum)

Accommodations & Modifications

English Language Learners

- Shorten or simplify directions
- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Native Language Support and Resources
- Modified classwork and homework assignments

Special Education/504 Plans

- Provide differentiated instruction as needed
- Follow all IEP modifications/504 plan
- Provide manipulatives or the opportunity to draw solution strategies
- Modify for varying proficiency levels, multiple intelligences, and grade levels
- Use visuals and gestures
- Use sentence starters
- Build background knowledge
- Highlight key words
- Graphic organizers
- Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time

Basic Skills

- Modified Assignment
- Teacher Modeling
- Partner Work
- Teacher Prompts

Economically Disadvantaged

- Extra set of materials for home

- Study guides
- Modified Assignment

Gifted and Talented

- Higher Level Text
- Provide Multisyllabic Words
- Choice Board to extend learning
- Integrate a variety of activities to meet all types of multiple intelligences

Students at Risk of School Failure

- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Parent-teacher communication
- Integrate a variety of activities to meet all types of multiple intelligences
- Modified classwork and homework assignments

Unit 3: Structure, Function, and Information Processing (Cells)	Duration: 8 Days (October-November)
Standards	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-LS1-2	Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
MS-LS1-3	Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.
Interdisciplinary Connections	
ELA Standards	
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
SL.6.2	Interpret information presented in diverse media and formats and explain how it contributes to a topic, text, or issue under study.
Technology Standards	
8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.
<p style="text-align: center;">21st Century Life and Careers</p> <p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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.</p> <p>9.2 Career Awareness, Exploration, and 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.</p>	

<p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>	
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● Cells have specialized structures that perform specific functions allowing the cells to grow, repair, and reproduce. ● The DNA of a cell determines what type of tissue it will create. Different tissues create different structures that allow organisms to adapt to their environments. ● Cancer cells replicate without stopping, damaging healthy cells in the process. 	<ul style="list-style-type: none"> ● How do the structures of organisms contribute to life's functions? ● How does cell specification help an organism to survive in its habitat? ● How do cancer cells differ from normal cells?
Evidence of Student Learning	
Formative Assessments.	Summative Assessments
<ul style="list-style-type: none"> ● Teacher Observation ● Question and Answer ● Conferencing 	<ul style="list-style-type: none"> ● STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> ● Student Notebook Check with Teacher Scoring Rubric ● Stop and Jot Activities with possible Sentence Starters

	<ul style="list-style-type: none"> • Teacher Observation Checklist based on Student Performance and Project Creation • Student Participation Rubric • Mystery Science Activities • Student Created Project with Teacher Scoring Rubric
Vocabulary	
Adaptations, Cancer, Cell, Functions, Membrane, Oncologist, Organ, Organism, Specialization, Structures, Tissue	
Knowledge and Skills	
Content	Skills
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> • Engineers describe a problem that can be solved through the development of an object, tool, process, or system. • Engineers identify which individuals or groups need this problem to be solved. • Engineers define constraints that must be taken into account in the solution. • Engineers identify how each solution would solve the problem. • Engineers compare solutions based on the results of their performance against the defined criteria and constraints. • In multicellular organisms, the body is a system of multiple interacting subsystems. These subsystems are groups of cells that work together to form tissues and organs that are specialized for particular body functions. • Mutations in the DNA of normal cells cause them to reproduce too quickly and cause damage to surrounding healthy cells. 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> • collaborate on a team that applies the EDP to devise a model that mimics how maple trees disperse their seeds • participate on a team that applies the EDP to create a coating that will protect a candy “pill” from stomach acids (clear soda). • contribute to a team that applies the EDP to design a model surgical tool for removing “cancerous” cells from a group of “healthy” cells.
Instructional Plan	
Suggested Activities	Resources
Whirlybird Challenge - Students will improve a prototype of a maple tree seed model, getting it to hover in the air for as long as possible.	<ul style="list-style-type: none"> • <i>Hands-On Engineering: Real-World Projects for the Classroom</i> by Beth L. Andrews (p.107)

<p>Protect That Pill Challenge - Students will develop a pill coating that can withstand stomach acids. The pill is a piece of candy, like skittles, and the stomach acid is clear soda.</p>	<ul style="list-style-type: none"> • Teachengineering.org • http://ed.ted.com/lessons/the-wacky-history-of-cell-theory
<p>Curing Cancer - Students will create a “surgical tool” that can remove “cancer” cells from “healthy” cells before they can multiply too quickly to be treated.</p>	<ul style="list-style-type: none"> • www.teachengineering.org/activities/view/cub_curingcancer_activity1 • National Cancer Institute @ www.cancer.gov/about-cancer/treatment/types
<p>Literature</p>	
<ul style="list-style-type: none"> • <i>The Life Cycles of Plants</i> by Rebecca Hirsch • <i>The Basics of Cell Life with Max Axiom, Super Scientist</i> by Amber J. Keyser • <i>Genetic Modification: Should Humans Control Nature?</i> by Leon Gray 	
<p><u>Suggested Inclusivity Materials and Resources:</u></p>	
<ul style="list-style-type: none"> • Use word problems to incorporate inclusivity examples • Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html • Math article from GLSEN with examples on how to be inclusive with math https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities • Website for LGBTQ mathematicians and history http://lgbtmath.org/ • Trevor Project • Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- https://makeitbetter4youth.org/resources/ • BrainPop Inclusivity List • STEAM for Everyone • LGBTQ Video Game Creators • Nepris 	
<p>Websites</p>	
<ul style="list-style-type: none"> • http://ed.ted.com/lessons/the-wacky-history-of-cell-theory (history of how cell theory evolved) 	
<ul style="list-style-type: none"> • http://science-class.net/archive/science-class/Biology/Cell_Division.htm (cell division lesson) 	
<ul style="list-style-type: none"> • http://www.nclark.net/Biology (biology teacher resources) 	
<p>Accommodations & Modifications</p>	
<p>English Language Learners</p> <ul style="list-style-type: none"> • Shorten or simplify directions • Alternative assessment 	

<ul style="list-style-type: none"> • Flexible/cooperative grouping • Graphic organizers • Native Language Support and Resources • Modified classwork and homework assignments
<p>Special Education/504 Plans</p> <ul style="list-style-type: none"> • Provide differentiated instruction as needed • Follow all IEP modifications/504 plan • Provide manipulatives or the opportunity to draw solution strategies • Modify for varying proficiency levels, multiple intelligences, and grade levels • Use visuals and gestures • Use sentence starters • Build background knowledge • Highlight key words • Graphic organizers • Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time
<p>Basic Skills</p> <ul style="list-style-type: none"> • Modified Assignment • Teacher Modeling • Partner Work • Teacher Prompts
<p>Economically Disadvantaged</p> <ul style="list-style-type: none"> • Extra set of materials for home • Study guides • Modified Assignment
<p>Gifted and Talented</p> <ul style="list-style-type: none"> • Higher Level Text • Provide Multisyllabic Words • Choice Board to extend learning • Integrate a variety of activities to meet all types of multiple intelligences
<p>Students at Risk of School Failure</p> <ul style="list-style-type: none"> • Alternative assessment • Flexible/cooperative grouping • Graphic organizers • Parent-teacher communication

- Integrate a variety of activities to meet all types of multiple intelligences
- Modified classwork and homework assignments

Unit 4: Matter and Energy in Organisms & Ecosystems		Duration: 12 Days (December-February)
Standards		
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
MS-LS1-6	Construct a scientific explanation based on evidence for the role of photosynthesis in the cycling of matter and flow of energy into and out of organisms.	
MS-LS2-1	Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem.	
MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	
Interdisciplinary Connections		
ELA Standards		
RI.6.7	Integrate information presented in different media or formats as well as in words to develop a coherent understanding of a topic or issue.	
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	
Technology Standards		
8.1.4. E.2	Evaluate the accuracy, relevance, and appropriateness of print and non-print electronic information sources to complete a variety of tasks.	
21st Century Life and Careers		
<p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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.</p>		

<p>9.2 Career Awareness, Exploration, and 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.</p> <p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>	
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Energy can change forms and be transferred from one material to the next, but it is never lost. Energy can be transferred through living and nonliving things. • Organisms and their ecosystems are interconnected. Human actions can contribute to ecosystem imbalance and species decline. 	<ul style="list-style-type: none"> • How is matter transformed and energy transferred/transformed in living systems? • How can change in one part of an ecosystem affect change in other parts of that ecosystem?
Evidence of Student Learning	
Formative Assessments.	Summative Assessments
<ul style="list-style-type: none"> • Teacher Observation • Question and Answer • Conferencing 	<ul style="list-style-type: none"> • STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> • Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> • Student Notebook Check with Teacher Scoring Rubric

	<ul style="list-style-type: none"> • Stop and Jot Activities with possible Sentence Starters • Teacher Observation Checklist based on Student Performance and Project Creation • Student Participation Rubric • Mystery Science Activities • Student Created Project with Teacher Scoring Rubric
Vocabulary	
Absorbent, Boom, Cellular Respiration, Chemical Reaction, Consumers, Decomposers, Food Web, Invasive Species, Interdependence, Oil Spill, Photosynthesis, Producers, Resources, Transpiration	
Knowledge and Skills	
Content	Skills
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> • Plants, algae, and many microorganisms use energy from light to make sugars from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. • Transpiration is part of the photosynthesis process which results in the release of water. • Different plant species undergo transpiration at different rates. • Engineers describe a problem that can be solved through the development of an object, tool, process, or system. • Engineers identify which individuals or groups need this problem to be solved. • Engineers define constraints that must be taken into account in the solution. • Engineers identify how each solution would solve the problem. • Engineers compare solutions based on the results of their performance against the defined criteria and constraints. • Organisms, and populations of organisms, are dependent on their environmental interactions both with other living things and with nonliving factors. 	<p>Students will be able to ...</p> <ul style="list-style-type: none"> • collaborate on a team to create an experiment to explore the transpiration rates of different plant species. • contribute to a team that applies the EDP to create a toad trap. • collaborate on a team that applies the EDP to create a model boom to contain an ocean oil spill.

<ul style="list-style-type: none"> Engineers are exploring physical, chemical, and biological ways of containing and cleaning up oil spills. 	
Instructional Plan	
Suggested Activities	Resources
Measuring Transpiration Rates - Students will collect water from “breathing” plants and then calculate the rate of transpiration for different plant species.	<ul style="list-style-type: none"> Teachengineering.org/activities/view/usf_stormwater_lesson02_activity1 https://www.learner.org/courses/envsci/unit/pdfs/unit4.pdf
Invasive Species Challenge (Toad Traps) - Students will design and build a trap from shoe boxes to catch a small mechanical frog.	<ul style="list-style-type: none"> <i>Engineering is Elementary</i> printout (Museum of Science, Boston, MA)
Oil in the Ocean - Students will design and build an oil boom to prevent the spread of oil in a small bin of water.	<ul style="list-style-type: none"> www.teachengineering.org/activities/view/cub_enveng_lesson01_activity2
Literature	
<ul style="list-style-type: none"> <i>Wind Energy</i> by David and Patricia Armentrout <i>12 Things You Should Know About Invasive Species</i> by Jamie Kallio <i>You Wouldn't Want to Live Without Bacteria</i> by Roger Canavan <i>Food Chains and Webs</i> by Andrew Solway <p>Suggested Inclusivity Materials and Resources:</p> <ul style="list-style-type: none"> Use word problems to incorporate inclusivity examples Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html Math article from GLSEN with examples on how to be inclusive with math https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities Website for LGBTQ mathematicians and history http://lgbtmath.org/ Trevor Project Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- https://makeitbetter4youth.org/resources/ BrainPop Inclusivity List STEAM for Everyone LGBTQ Video Game Creators Nepriis 	
Websites	

- https://www.learner.org/courses/envsci/interactives/ecology/producers_1.php (simulation of a newly forming ecosystem)
- <https://www.learner.org/courses/envsci/unit/pdfs/unit4.pdf> (ecosystems lesson)
- <https://www.learner.org/courses/envsci/unit/pdfs/unit4pdf> (information on ecosystems and links)

Accommodations & Modifications

English Language Learners

- Shorten or simplify directions
- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Native Language Support and Resources
- Modified classwork and homework assignments

Special Education/504 Plans

- Provide differentiated instruction as needed
- Follow all IEP modifications/504 plan
- Provide manipulatives or the opportunity to draw solution strategies
- Modify for varying proficiency levels, multiple intelligences, and grade levels
- Use visuals and gestures
- Use sentence starters
- Build background knowledge
- Highlight key words
- Graphic organizers
- Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time

Basic Skills

- Modified Assignment
- Teacher Modeling
- Partner Work
- Teacher Prompts

Economically Disadvantaged

- Extra set of materials for home
- Study guides
- Modified Assignment

Gifted and Talented

- Higher Level Text
- Provide Multisyllabic Words

- Choice Board to extend learning
- Integrate a variety of activities to meet all types of multiple intelligences

Students at Risk of School Failure

- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Parent-teacher communication
- Integrate a variety of activities to meet all types of multiple intelligences
- Modified classwork and homework assignments

Unit 5: Weather and Climate	Duration: 8 Days (March-April)
Standards	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
ESS2.C	Develop a conceptual model to explain the mechanisms for the Sun’s energy to drive wind and the hydrologic cycle.
MS-ESS2-5	Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.
MS-ESS3-5	Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
Interdisciplinary Connections	
Technology Standards	
8.1.8.F.1	Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
ELA Standards	
W.6.7	Conduct short research projects to answer a question, drawing on several sources and refocusing the inquiry when appropriate.
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
	<p style="text-align: center;">21st Century Life and Careers</p> <p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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</p>

	<p>student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.</p> <p>9.2 Career Awareness, Exploration, and 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.</p> <p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● Earth's systems are interconnected. A change in one system can affect another. ● Technology allows scientists, such as meteorologists and geologists, to better understand Earth's systems and how and when they may change. ● Scientists and engineers are studying the effects of global climate change and developing new technologies for coping with these changes. 	<ul style="list-style-type: none"> ● How do changes in one part of an Earth system affect other parts of the system? ● How does technology extend human senses and understanding of Earth? ● How can mankind cope with global climate change?
Evidence of Student Learning	
Formative Assessments.	Summative Assessments
<ul style="list-style-type: none"> ● Teacher Observation 	<ul style="list-style-type: none"> ● STEAM Lab Rubric

<ul style="list-style-type: none"> • Question and Answer • Conferencing 	<p>Benchmark Assessment</p> <ul style="list-style-type: none"> • Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> • Student Notebook Check with Teacher Scoring Rubric • Stop and Jot Activities with possible Sentence Starters • Teacher Observation Checklist based on Student Performance and Project Creation • Student Participation Rubric • Mystery Science Activities • Student Created Project with Teacher Scoring Rubric
<p>Vocabulary Altitude, Atmosphere, Chlorofluorocarbons (CFC's), Climate, Currents, Landforms, Latitude. Ozone Technology, Weather</p>	
<p>Knowledge and Skills</p>	
<p>Content</p>	<p>Skills</p>
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> • The earth has a protective layer of ozone that helps to prevent global warming. • Meteorologists use a variety of instruments to forecast weather and track trends in global temperatures. • Geographic factors affect six major climate zones. • Scientists and engineers are working on various measures to cope with global climate change. 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> • understand how CFC's can deplete Earth's protective ozone layer and how man can reverse that damage. • cooperate on a team that applies the EDP to create a tool or process to cope with the effects of global climate change.
<p>Instructional Plan</p>	
<p>Suggested Activities</p>	<p>Resources</p>
<p>Battling for Oxygen (Simulation) - Using gumdrops and toothpicks, students conduct a large-group, interactive ozone depletion model.</p>	<ul style="list-style-type: none"> • teachengineering.org/activities/view/cub_air_lesson08_activity1
<p>Global Warming Challenge - Students will design a tool or process for counteracting or coping with climate change. This is a multiple-session project.</p>	<ul style="list-style-type: none"> • http://www.education.noaa.gov/tweather.html
<p>Literature</p>	

- *The Most Beautiful Roof in the World* by Kathryn Lasky
- *Storm Chaser* by Susan H. Gray
- *Lightning* by Seymour Simon
- *Anatomy of a Tornado* by Terri Dougherty

Suggested Inclusivity Materials and Resources:

- Use word problems to incorporate inclusivity examples
- Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html
- Math article from GLSEN with examples on how to be inclusive with math <https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities>
- Website for LGBTQ mathematicians and history <http://lgbtmath.org/>
- [Trevor Project](#)
- Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- <https://makeitbetter4youth.org/resources/>
- [BrainPop Inclusivity List](#)
- [STEAM for Everyone](#)
- [LGBTQ Video Game Creators](#)
- [Nepris](#)

Websites

- http://www.projectsharetx.org/resource-index?field_resource_keywords_tid=&sort_by=title&sort_order=ASC&items_per_page=50&page=1 (online resources from the Texas Education Agency)
- <http://www.education.noaa.gov/tweather.html> (weather and atmosphere education resources)
- <http://climatekids.nasa.gov/science-standards/> (climate education resources)
- <http://www.earthsciweek.org/classroom-activities/ngss> (resource of NGSS classroom activities)

Accommodations & Modifications

English Language Learners

- Shorten or simplify directions
- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Native Language Support and Resources

<ul style="list-style-type: none"> • Modified classwork and homework assignments
<p>Special Education/504 Plans</p> <ul style="list-style-type: none"> • Provide differentiated instruction as needed • Follow all IEP modifications/504 plan • Provide manipulatives or the opportunity to draw solution strategies • Modify for varying proficiency levels, multiple intelligences, and grade levels • Use visuals and gestures • Use sentence starters • Build background knowledge • Highlight key words • Graphic organizers • Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time
<p>Basic Skills</p> <ul style="list-style-type: none"> • Modified Assignment • Teacher Modeling • Partner Work • Teacher Prompts
<p>Economically Disadvantaged</p> <ul style="list-style-type: none"> • Extra set of materials for home • Study guides • Modified Assignment
<p>Gifted and Talented</p> <ul style="list-style-type: none"> • Higher Level Text • Provide Multisyllabic Words • Choice Board to extend learning • Integrate a variety of activities to meet all types of multiple intelligences
<p>Students at Risk of School Failure</p> <ul style="list-style-type: none"> • Alternative assessment • Flexible/cooperative grouping • Graphic organizers • Parent-teacher communication • Integrate a variety of activities to meet all types of multiple intelligences • Modified classwork and homework assignments

Unit 6: Space Systems		Duration: 8 Days (May-June)
Standards		
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
MS-ESS1-1	Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.	
MS-ESS1-2	Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.	
Interdisciplinary Connections		
ELA Standards		
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	
Technology Standards		
8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.	
21st Century Life and Careers		
<p>Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/</p> <p>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.</p> <p>9.2 Career Awareness, Exploration, and 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.</p> <p>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.</p>		

Career Ready Practices	
<p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>	
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Observable, predictable patterns of movement in the sun-Earth-moon system occur because of gravitational interaction and energy from the sun. • The universe is made up of galaxies, each of which is composed of solar systems, having the same elements and governed by the same laws. • Aerospace and mechanical engineers are developing solar sails to convert light energy into mechanical energy that propel satellites and probes through space, eliminating the need for rockets that have limited fuel capacity. 	<ul style="list-style-type: none"> • What predictable, observable patterns occur as a result of the interaction between the earth, moon, and sun? • What types of celestial bodies encompass our Universe? • What new energy sources will allow spacecraft to travel further into space?
Evidence of Student Learning	
Formative Assessments.	Summative Assessments
<ul style="list-style-type: none"> • Teacher Observation • Question and Answer • Conferencing 	<ul style="list-style-type: none"> • STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> • Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> • Student Notebook Check with Teacher Scoring Rubric • Stop and Jot Activities with possible Sentence Starters

	<ul style="list-style-type: none"> • Teacher Observation Checklist based on Student Performance and Project Creation • Student Participation Rubric • Mystery Science Activities • Student Created Project with Teacher Scoring Rubric
Vocabulary	
Acceleration, Aerospace Engineer, Axis, Celestial Body, Eclipse, Galaxy, Gravitational Pull, Orbit, Propulsion, Seasons, Solar Sail, Universe	
Knowledge and Skills	
Content	Skills
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> • The motion of an object is determined by the sum of the forces acting upon it. • All objects have a gravitational force. The more mass an object has, the greater its gravitational force. • Shock-absorbers help to reduce the effects of gravity on a falling object. • Solar sails convert light energy into mechanical energy propelling spacecraft farther into space than rockets, because rockets have limited fuel capacity. 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> • collaborate on a team that applies the EDP to create a lunar landing model capable of protecting a raw egg when dropped from a height of 10 feet. • contribute to a team that applies the EDP to create a moving model to explain the movement of at least two celestial bodies as they relate to one another. • participate on a team that applies the EDP to create a solar sail model.
Instructional Plan	
Suggested Activities	Resources
Lunar Landing Challenge - Students will design a shock-absorbing system and a parachute to slow the descent of a lunar landing module that contains a raw egg “astronaut.”	<ul style="list-style-type: none"> • http://www-tc.pbskids.org/designsquad/pdf/parentseducators/DSN_NASA_MissionSolarSystem_SoftLanding.pdf • <i>STEM Labs for Middle Grades</i> by Schyrlet Cameron and Carolyn Craig, p. 19.
Celestial Motion Model - Students will use a variety of materials to design a moving model illustrating how two or more celestial objects move through space in relation to one another.	<ul style="list-style-type: none"> • http://www.nasa.gov/pdf/630754main_NASAsBESTActivityGuide6-8.pdf
Solar Sails - Students will design and test small-scale solar sails for satellites and space probes.	<ul style="list-style-type: none"> • www.teachengineering.org/activities/view/cub_space8_lesson01_activity2

Literature

- *STEM Guides to Space* by Kay Robertson
- *Planet Earth: What Planet Are You On?* by Dan Gilpin
- *Astronomy: Out of This World!* by Dan Green
- *Stars and Planets* by Margot Channing

Suggested Inclusivity Materials and Resources:

- Use word problems to incorporate inclusivity examples
- Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html
- Math article from GLSEN with examples on how to be inclusive with math <https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities>
- Website for LGBTQ mathematicians and history <http://lgbtmath.org/>
- [Trevor Project](#)
- Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- <https://makeitbetter4youth.org/resources/>
- [BrainPop Inclusivity List](#)
- [STEAM for Everyone](#)
- [LGBTQ Video Game Creators](#)
- [Nepris](#)

Websites

- <http://astro.unl.edu/> (resources for astronomy education from the University of Nebraska-Lincoln)
- http://www.nasa.gov/pdf/630754main_NASAsBESTActivityGuide6-8.pdf (NASA's best beginning engineering challenges)
- <http://www.sciencecourseware.org/eec/GlobalWarming/Tutorials/Seasons/> (seasons tutorial)

Accommodations & Modifications

English Language Learners

- Shorten or simplify directions
- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Native Language Support and Resources
- Modified classwork and homework assignments

<p>Special Education/504 Plans</p> <ul style="list-style-type: none"> • Provide differentiated instruction as needed • Follow all IEP modifications/504 plan • Provide manipulatives or the opportunity to draw solution strategies • Modify for varying proficiency levels, multiple intelligences, and grade levels • Use visuals and gestures • Use sentence starters • Build background knowledge • Highlight key words • Graphic organizers • Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time
<p>Basic Skills</p> <ul style="list-style-type: none"> • Modified Assignment • Teacher Modeling • Partner Work • Teacher Prompts
<p>Economically Disadvantaged</p> <ul style="list-style-type: none"> • Extra set of materials for home • Study guides • Modified Assignment
<p>Gifted and Talented</p> <ul style="list-style-type: none"> • Higher Level Text • Provide Multisyllabic Words • Choice Board to extend learning • Integrate a variety of activities to meet all types of multiple intelligences
<p>Students at Risk of School Failure</p> <ul style="list-style-type: none"> • Alternative assessment • Flexible/cooperative grouping • Graphic organizers • Parent-teacher communication • Integrate a variety of activities to meet all types of multiple intelligences • Modified classwork and homework assignments

Unit 7: Math and Art Projects		Duration: 6 days (Ongoing)
Standards		
MS-LS2-4	Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.	
MS-LS2-5	Evaluate competing design solutions for maintaining biodiversity and ecosystem services.	
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.	
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.	
MS-ETS1-4	Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.	
Interdisciplinary Connections		
ELA Standards		
SL.6.1.B	Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.	
Math Standards		
6.NS.N.3	Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.	
6.RP.A.3	Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.	
Technology Standards		
8.1.8.A.1	Demonstrate knowledge of a real world problem using digital tools.	
Visual and Performing Arts		
1.1.8.D.1	Describe the intellectual and emotional significance conveyed by the application of elements of art and principles of design in different historical eras and cultures.	
21st Century Life and Careers		
Century Life and Career Skills: 21st century life and career skills enable students to make informed decisions that prepare them to engage as active citizens in a dynamic global society and to successfully meet the challenges and opportunities of the 21st century global workplace. http://www.state.nj.us/education/aps/cccs/career/		
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		

	<p>student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.</p> <p>9.2 Career Awareness, Exploration, and 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.</p> <p>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.</p> <p style="text-align: center;">Career Ready Practices</p> <p>CRP1. Act as a responsible and contributing citizen and employee. CRP2. Apply appropriate academic and technical skills. CRP4. Communicate clearly and effectively and with reason. CRP5. Consider the environmental, social and economic impacts of decisions. CRP6. Demonstrate creativity and innovation. CRP7. Employ valid and reliable research strategies. CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP10. Plan education and career paths aligned to personal goals. CRP11. Use technology to enhance productivity. CRP12. Work productively in teams while using cultural global competence.</p>
Essential Understandings	Essential Questions
<p><i>Students will understand that...</i></p> <ul style="list-style-type: none"> ● The special properties and relationships of numbers can be used for specific purposes. ● Mathematical patterns appear in nature. ● Man's understanding of these patterns can help us to develop new technologies. ● Camouflage is one adaptation some living things have to help them thrive in their ecosystem. ● Ratio can be used to find missing dimensions. ● Proportional reasoning helps to determine the appropriate scale for models. 	<ul style="list-style-type: none"> ● How do we recognize and use number patterns? ● How may we use number patterns and properties to create art? ● How does an organism's physical appearance help it to survive in its ecosystem? ● How do we create scale drawings?
Evidence of Student Learning	

Formative Assessments.	Summative Assessments
<ul style="list-style-type: none"> ● Teacher Observation ● Question and Answer ● Conferencing 	<ul style="list-style-type: none"> ● STEAM Lab Rubric <p>Benchmark Assessment</p> <ul style="list-style-type: none"> ● Scientific Notebook Check with Scoring Rubric <p>Alternative Assessments</p> <ul style="list-style-type: none"> ● Student Notebook Check with Teacher Scoring Rubric ● Stop and Jot Activities with possible Sentence Starters ● Teacher Observation Checklist based on Student Performance and Project Creation ● Student Participation Rubric ● Mystery Science Activities ● Student Created Project with Teacher Scoring Rubric
Vocabulary	
Algorithm, Camouflage, Enlargement, Fractal, Patterns, Proportion, Ratio, Reduction, Scale, Size-change Factor	
Knowledge and Skills	
Content	Skills
<p><i>Students will know that...</i></p> <ul style="list-style-type: none"> ● Algorithms can help us accurately compute whole numbers and decimals. ● Patterns in numbers help us to better understand the natural world and lead to the discovery of new technologies. ● We can also use these patterns to create magic tricks. ● Fractals are never-ending, infinitely complex patterns that are self-similar across different scales. ● Fractals are found in nature and can also be created with computer programs. ● The study of fractals has led to new technologies. Cell phones are based on fractal technology. ● Camouflage is used by animals and humans to blend into their backgrounds. Camouflage fabric designers study 	<p><i>Students will be able to ...</i></p> <ul style="list-style-type: none"> ● perform operations with whole numbers and decimals. ● create a fractal doodle. ● give an example of a practical application of fractals. ● collaborate on a team that applies the EDP to create camouflage fabrics for different kinds of environments. ● create a scale drawing of an ocean animal appropriate for a specific piece of paper.

<p>the colors, patterns, shades, and highlights of natural camouflage to help them create effective designs.</p> <ul style="list-style-type: none"> Using a ratio of length to width, the width of an animal can be determined when only the length is given. Proportional reasoning is used to convert measurements from one unit to another. Proportional reasoning is used to determine the appropriate size-scale factor for models. 	
Instructional Plan	
Suggested Activities	Resources
Magical Math - Students will perform operations with whole numbers and decimals as they participate in mathematical magic tricks.	<ul style="list-style-type: none"> <i>Mathemusements</i> by Raymond Blum <i>101 Cool Magic Tricks with Glen Singleton</i> <i>Math: Tricks, Puzzles, and Games</i> by Raymond Blum
Fractal Art Doodles - Students will draw and color their choice of a fractal doodle.	<p>YouTube Videos:</p> <ul style="list-style-type: none"> <i>What is a Fractal and What is it Good For?</i> (from MIT) <i>Fun with Fractals</i> (MIT) <i>ARTducation Drawing Lesson 17 - Fractals</i> <i>Hand Drawing Fractals</i>
Camouflage Challenge - Students will compete for a design “contract” to create a new camouflage fabric allowing customers to blend into a specific natural background.	<ul style="list-style-type: none"> <i>STEM Labs for Middle Grades</i> by Schyrlet Cameron and Carolyn Craig, p.32.
Scale Drawing of a Sea Animal - Students will use proportional reasoning to find the appropriate size-change factor for creating a scale drawing of an ocean animal.	<ul style="list-style-type: none"> <i>Go Math! Grade Six, Chapter 4</i> Houghton Mifflin Harcourt Publishing Company (2015) <i>Everyday Mathematics Grade 6 Student Reference Book</i> McGraw-Hill (2007) www.enchantedlearning.com/coloring/oceanlife.shtml
Literature	
<ul style="list-style-type: none"> <i>Raspberry Pi</i> by Charles R. Severance and Kristin Fontichiaro <i>Eye Sore</i> by Melanie Jackson <i>John Muir</i> by Kathryn Lasky <p>Suggested Inclusivity Materials and Resources:</p> <ul style="list-style-type: none"> Use word problems to incorporate inclusivity examples 	

- Incorporate studies/ examples in ADA such as wheelchair accessibility- https://www.ada.gov/restriping_parking/restriping2015.html
- Math article from GLSEN with examples on how to be inclusive with math <https://www.glsen.org/blog/how-do-we-make-math-class-more-inclusive-trans-and-non-binary-identities>
- Website for LGBTQ mathematicians and history <http://lgbtmath.org/>
- [Trevor Project](#)
- Make it Better for Youth- Monmouth County Consortium for LGBTQ Youth- <https://makeitbetter4youth.org/resources/>
- [BrainPop Inclusivity List](#)
- [STEAM for Everyone](#)
- [LGBTQ Video Game Creators](#)
- [Nepris](#)

Websites

- <https://www.ciese.org/materials/k12/> (resource for STEM based lessons and projects)
- <http://stemcoolaborative.org/additionalResources.html> (STEM resources readily available on the web)
- <https://www.brainpop.com> (resource for collaborative lessons, games, and projects)

Accommodations & Modifications

English Language Learners

- Shorten or simplify directions
- Alternative assessment
- Flexible/cooperative grouping
- Graphic organizers
- Native Language Support and Resources
- Modified classwork and homework assignments

Special Education/504 Plans

- Provide differentiated instruction as needed
- Follow all IEP modifications/504 plan
- Provide manipulatives or the opportunity to draw solution strategies
- Modify for varying proficiency levels, multiple intelligences, and grade levels
- Use visuals and gestures
- Use sentence starters
- Build background knowledge
- Highlight key words
- Graphic organizers

<ul style="list-style-type: none"> ● Basic Skills- Pre-teach vocabulary, Preview lesson, Accountable Talk stems, Chunk text, Provide extra time
<p>Basic Skills</p> <ul style="list-style-type: none"> ● Modified Assignment ● Teacher Modeling ● Partner Work ● Teacher Prompts
<p>Economically Disadvantaged</p> <ul style="list-style-type: none"> ● Extra set of materials for home ● Study guides ● Modified Assignment
<p>Gifted and Talented</p> <ul style="list-style-type: none"> ● Higher Level Text ● Provide Multisyllabic Words ● Choice Board to extend learning ● Integrate a variety of activities to meet all types of multiple intelligences
<p>Students at Risk of School Failure</p> <ul style="list-style-type: none"> ● Alternative assessment ● Flexible/cooperative grouping ● Graphic organizers ● Parent-teacher communication ● Integrate a variety of activities to meet all types of multiple intelligences ● Modified classwork and homework assignments

Stafford Township School District
STEAM
Pacing Guide
Grade 6

Unit 1 Orientation	2 Days September
Unit 2 Waves and Electromagnetic Radiation	2 Days September
Unit 3 Structure, Function, and Information Processing	8 Days October-November
Unit 4 Matter and Energy	12 Days December-February
Unit 5 Weather and Climate	8 Days March-April
Unit 6 Space Systems	8 Days May-June
Unit 7 Math and Art	6 Days Ongoing