Franklin Lakes Public Schools

STEM Lab

Science Department Mission:

The Franklin Avenue Middle School Science department strives to create self-directed, enthusiastic, life-long learners. The science team wants to create scientists that have a desire to solve problems, question ideas, and actively engage in scientific inquiry.

STEM Lab Mission:

As an extension of the science department mission, the STEM Lab will provide Franklin Avenue Middle School students with opportunities to apply engineering and 21st century concepts and skills through collaborative, project-based learning experiences to enrich and extend the content of their core science courses. These experiences evolve in real time along with research and discoveries in the Sciences.

Grades 6-8 STEM Lab Curriculum

Contents

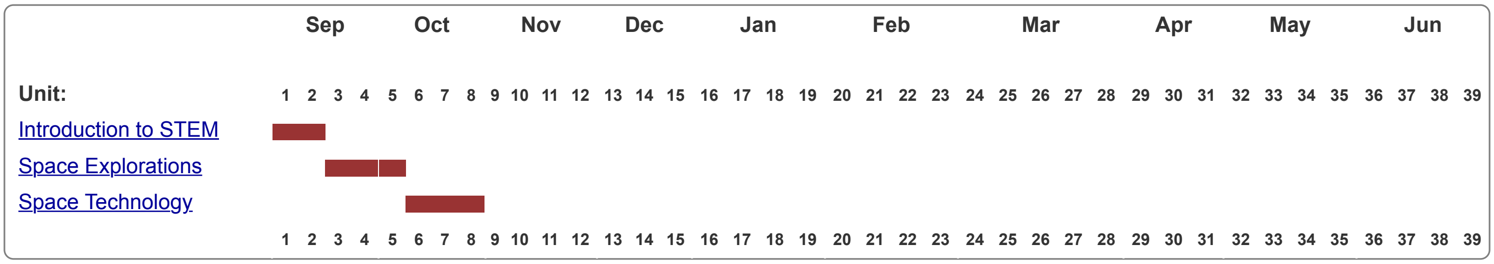
Franklin Lakes Public Schools

STEM 6 (D)

District Middle > Grade 6 > Science > STEM 6 (D)

Last Updated: Monday, September 14, 2015 by Eileen Antonison

Collaboration



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Unit Planner: Introduction to **STEM**
STEM 6

Tuesday, October 13, 2015, 8:33AM

Last Updated: Monday, August 31, 2015 by Eileen Antonison

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings
DDistrict Curriculum

- Engineers apply an engineering design process to develop solutions to a problem.
- Engineers use tools to communicate such as technical drawings, technical writing, coding, measurements and documentation.
- Accuracy and precision are very important in all fields of engineering and science.

Essential Questions
Samples
DDistrict Curriculum

How has technology affected the world around us?

How does the engineering design process apply to everyday life?

Content
DDistrict Curriculum

- Students will know that isometric sketches are for showing an engineer's thoughts in three dimensions.
- Students will know that orthographic sketches are for showing measurements.
- Students will know the engineering design process is the procedure used by engineers to assess and solve everyday problems.
- Students will know that although scientists and engineers work very closely together and apply similar processes, the content involved in science and engineering is different.

Skills - Standards Aligned and Critical Thinking
Bloom's Taxonomy
DDistrict Curriculum

• Students will be able to create scaled isometric and orthographic technical drawings with and without technology.

• Students will be able to recognize that engineers can use modern digital tools to create meaningful designs and communicate them effectively.

• Students will be able to describe the steps involved in creating a product using appropriate technical terminology.

• Students will be able to complete professional portfolio documentation following an engineering design process

• Students will be able to ask questions to define the parameters of an engineering problem.

Vocabulary/Key Terms
DDistrict Curriculum

Technology

Design principles

Engineering

System

Orthographic and Isometric sketches

Criteria

Constraints

Scale

Modifications: Support and Enrichment
DDistrict Curriculum

Planning and Preparing for Special Needs of Students

Needs of Special Education Students/ELL's

- Repeat and paraphrase directions
- Modify work, tests and quizzes
- Additional time to complete assigned tasks
- Allow student to respond to questions orally as needed
- Prompting and refocusing as needed
- Directions read and paraphrased as needed

Design Statement

Engineering Design Process

Coding

Innovation

Patent

Invention

- Extra time to process information
- Check for understanding of directions
- Frequent review and reinforcement
- Allow 50% additional time for the completion of written tasks, quizzes, and tests.
- Provide study guides
- Use visual cues
- Provide verbal praise
- Read the directions out loud
- Break down tasks into smaller more manageable parts
- Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager

Extensions for Gifted Students

Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the **STEM** and Humanities areas of study.

The teacher will provide applicable extension activities as needed which may include any or all of the following:

- Conduct research and provide presentation of cultural topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).
- Anchor Activities
- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources
DDistrict Curriculum Lesson 1:	DDistrict Curriculum http://mcms-pltw.weebly.com/sixth-grade.html

• Students will be introduced to the engineering design process as dictated by the district through a common pictorial representation. Lesson 2: • Students will learn to communicate as engineerings by learning and practicing creating engineering drawings in both orthographic and isometric formats. Lesson 3: • Students will participate in a coding challenge to further explore technical communication techniques. Lesson 4: • Students will participate in a mini design challenge chosen by the teacher to best meet the needs of the current students in her class.	https://sites.google.com/a/apps.district833.org/**stem**-1---mr-netteberg/7th-grade-**stem**/lesson-3---sketching-and-dimensioning-techniques http://www.uspto.gov/sites/default/files/kids/icreatm_guide_ms.pdf http://www.just-think-inc.com/documents/LessonGuide2012.pdf

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Evaluate limitations of a model for a proposed object or tool.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

D Plan an investigation individually and collaboratively, and in the design: identify independent and dependent variables and controls, what tools are needed to do the gathering, how measurements will be recorded, and how many data are needed to support a claim.

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts,

systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.1 Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Show details

D 8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

D 8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.

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

Show details

D 8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

D 8.2.8.C.2 Explain the need for optimization in a design process.

D 8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

D 8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.

D 8.2.8.C.5 Explain the interdependence of a subsystem that operates as part of a system. Create a technical sketch of a product with materials and measurements labeled.

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

Show details

D 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.

D 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.

E. Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Show details

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Skteching

Teacher: Formative: Performance: Skill Demonstration

Rubric for technical drawing

No Standards Assessed

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

Design Challenge Rubric

No Standards Assessed

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum	DDistrict Curriculum

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Unit Planner: Space Explorations STEM 6

Wednesday, October 14, 2015, 1:00PM

District Middle > 2015-2016 > Grade 6 > Science > STEM 6 (**D**) > Week 3 - Week 5

Last Updated: Monday, August 31, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum Advancements in aerospace engineering enable scientists to further explore the universe and beyond. Engineers must be prepared to create solutions to unforeseen problems under multiple constraints including time and available resources. Exploring or living on another planet raises the need for new technology.	Samples DDistrict Curriculum What challenges do engineers in space related careers face? How has space exploration advanced our understanding of Earth and the universe?

Content	Skills - Standards Aligned and Critical Thinking
DDistrict Curriculum • Students will know that space engineers face many challenges. • Students will know that a rover is a space exploration vehicle designed to move across the surface of a planet or other celestial body. • Students will	Bloom's Taxonomy DDistrict Curriculum • Students will be able to apply an engineering design process to complete a design challenge regarding space exploration. • Students will be able to identify parameters and constraints of a space challenge • Students will be able to ask questions to define a problem. • Students will be able to identify challenges faced by engineers in space. • Students will be able to explore resources provided by the space station and communicate findings using appropriate science and engineering terminology. • Students will be able to describe the power system utilized by space probes. • Students will be able to compare and contrast conditions in space to conditions on Earth.

know that a space station provides a place where long term observations and experiments can be carried out in space. • Students will know that some rovers are designed for human passengers while others are robotic. • Students will know that there are many obstacles in designing functional space craft for travel and traversing various terrains. • Students will know that space probes contain a power system to produce electricity, a communication system to send and receive signals, and scientific instruments to collect data and perform experiments. • Students will know that conditions in space that differ from those on Earth	

include near vacuum, temperature extremes and microgravity.	
Vocabulary/Key Terms DDistrict Curriculum Rover Terrain Space station Atmosphere Thermal Radiation Astronomy Propulsion Space Shuttle Space probe Vacuum Microgravity Orbital Velocity Altitude	Modifications: Support and Enrichment DDistrict Curriculum ***Planning and Preparing for Special Needs of Students*** ***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions • Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed • Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: • Conduct research and provide presentation of cultural topics. • Design surveys to generate and analyze data to be used in discussion. • Debate topics of interest / cultural importance. • Authentic listening and reading sources that provide data and support for speaking and writing prompts. • Exploration of art and/or artists to understand society and history. • Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic). • Anchor Activities • Use of Higher Level Questioning Techniques • Provide assessments at a higher level of thinking
District Learning Plan	
District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources DDistrict Curriculum

DDistrict Curriculum **Lesson 1:** Students will complete a Lego Mindstorms Space Challenge to introduce space science, technology, engineering and math. Through this challenge students will gain a basic understanding of robotics as well as interdisciplinary STEM problem solving knowledge and skills. **Lesson 2:** Students will follow an engineering design process to create either Mars or moon Rovers to solve a teacher-developed problem regarding most recent space exploration. **Lesson 3:** Students will create an engineering design of a space settlement. To communicate their ideas to the class and community, students will create a model based on specific parameters and constraints. **Lesson 4:** Students will complete an engineering design challenge regarding heat shield or thermal protection to obtain a deeper understanding of the earth's atmosphere and conditions in	http://pbskids.org/designsquad/build/roving-moon/ https://marsed.asu.edu/stem-lesson-plans http://www.nasa.gov/audience/foreducators/spacelife/explorationdesign/overview/#.Vcsza9NzekK http://www.youthrover.com

space.	

Teacher Learning Plan

Weekly Learning Plan / Diary Map
View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

D RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

D RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

2014 CCSS: Mathematics

2014 CCSS: Grade 6

Ratios & Proportional Relationships

6.RP.A. Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.

D Show details

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

D Show details

MP.3. Construct viable arguments and critique the reasoning of others.

D Show details

MP.4. Model with mathematics.

D Show details

MP.5. Use appropriate tools strategically.

D Show details

MP.6. Attend to precision.

D Show details

MP.7. Look for and make use of structure.

D Show details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

D Ask questions to determine relationships between independent and dependent variables and relationships in models.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

D Ask questions that require sufficient and appropriate empirical evidence to answer.

D Ask questions that can be investigated within the scope of the classroom, outdoor environment, and museums and other public facilities with available resources and, when appropriate, frame a hypothesis based on observations and scientific principles.

D Ask questions that challenge the premise(s) of an argument or the interpretation of a data set.

D Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Evaluate limitations of a model for a proposed object or tool.

D Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.

D Use and/or develop a model of simple systems with uncertain and less predictable factors.

D Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.

D Develop and/or use a model to predict and/or describe phenomena.

D Develop a model to describe unobservable mechanisms.

D Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

D Construct, analyze, and/or interpret graphical displays of data and/or large data sets to identify linear and nonlinear relationships.

D Use graphical displays (e.g., maps, charts, graphs, and/or tables) of large data sets to identify temporal and spatial relationships.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

ESS1: Earth's Place in the Universe

ESS1.B: Earth and the Solar System

D The solar system consists of the sun and a collection of objects, including planets, their moons, and asteroids that are held in orbit around the sun by its gravitational pull on them. (MS-ESS1-2),(MSESS1-3)

ETS1: Engineering Design

ETS1.A: Defining and Delimiting an Engineering Problem

D The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-ETS1-1) (secondary to MS-PS3-3)

ETS1.B: Developing Possible Solutions

D A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) (secondary to MS-PS1-6)

D There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. MS-ETS1-2), (MS-ETS1-3) (secondary to MS-PS3-3) (secondary to MS-LS2-5)

D Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

D Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

D Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (MS-ETS1-3 (secondary to MS-PS1-6)

D The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4) (secondary to MS-PS1-6)

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

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

Show details

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

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Show details

D 8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

D 8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.

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

Show details

D 8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

D 8.2.8.C.2 Explain the need for optimization in a design process.

D 8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

D 8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.

D 8.2.8.C.5 Explain the interdependence of a subsystem that operates as part of a system. Create a technical sketch of a product with materials and measurements labeled.

D 8.2.8.C.6 Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.

D 8.2.8.C.7 Collaborate with peers and experts in the field to research and develop a product using the design process, data analysis and trends, and maintain a design log with annotated sketches to record the developmental cycle.

D 8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

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

Show details

D 8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

D 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.

D 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.

E. Computational Thinking: Programming: Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Show details

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Skill Demonstration

Rubric

7 Standards Assessed

-

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum	DDistrict Curriculum

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Unit Planner: Space Technology
STEM 6

Tuesday, October 13, 2015, 8:56PM

District Middle > 2015-2016 > Grade 6 > Science > STEM 6 (**D**) > Week 6 - Week 8

Last Updated: Monday, September 14, 2015 by Eileen Antonison

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings

DDistrict Curriculum

- Advancements in space technology have driven modern discoveries and enabled scientists to gather information about our solar system and universe.
- New technologies need to be created to fulfill newly created needs of the 21st century.

Essential Questions

Samples

DDistrict Curriculum

What new and improved technology do engineers in space-related careers need?

How has technology advanced our understanding of Earth and the universe?

Content

DDistrict Curriculum

- Students will know various aspects of space technology that have influenced modern life.
- Students will know the process applied to allow satellites to transmit information.
- Students will know that thousands of artificial, or man-made, satellites orbit Earth for various reasons and purposes.
- Students will know that satellites come in many shapes and sizes, but most have at least two parts in common - an antenna and a power source.
- Students will know that NASA has used space shuttles to perform many important tasks including putting satellites in orbit and repairing damaged satellites.
- Students will know that communications satellites can relay signals, allowing the exchange of information worldwide.
- Students will know that the Earth's atmosphere can interfere with signals.
- Students will know that NASA satellites help scientists study Earth and space.
- Students will know that the interdependence of science, engineering, and technology affect the design process.

Skills - Standards Aligned and Critical Thinking

Bloom's Taxonomy

DDistrict Curriculum

- Students will be able to apply an engineering design process to complete a design challenge regarding space technology
- Students will be able to identify how satellite technology affects their lives
- Students will be able to model how scientists and engineers design and build tools to collect, store, and transmit data to earth
- Students will be able to design a system to store and transmit topographic data of the Moon and then analyze that data and compare it to data sets
- Students will be able to use reasoning, planning, and evidence to support inferences.

Vocabulary/Key Terms

DDistrict Curriculum

Communication

Waves

Gravity

Electromagnetic spectrum

Modifications: Support and Enrichment

DDistrict Curriculum

Planning and Preparing for Special Needs of Students

Needs of Special Education Students/ELL's

- Repeat and paraphrase directions
- Modify work, tests and quizzes

Remote sensing Transmit Digital Orbit Elliptical Satellite Antenna	· Additional time to complete assigned tasks · Allow student to respond to questions orally as needed · Prompting and refocusing as needed · Directions read and paraphrased as needed · Extra time to process information · Check for understanding of directions · Frequent review and reinforcement · Allow 50% additional time for the completion of written tasks, quizzes, and tests. · Provide study guides · Use visual cues · Provide verbal praise · Read the directions out loud · Break down tasks into smaller more manageable parts · Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: · Conduct research and provide presentation of cultural topics. · Design surveys to generate and analyze data to be used in discussion. · Debate topics of interest / cultural importance. · Authentic listening and reading sources that provide data and support for speaking and writing prompts. · Exploration of art and/or artists to understand society and history. · Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).

	· Anchor Activities · Use of Higher Level Questioning Techniques · Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources
DDistrict Curriculum Lesson 1: Students will participate in a mini lesson regarding communication, the importance of providing details and engineering communication specifically. Lesson 2: Students will participate in a satellite activity explaining the importance of information regarding satellite orbits. Lesson 3: Students will participate in NASA challenges such as Maker Mars, Astrobound and the Satellite Design Challenge. These lessons may be substituted for additional lessons and units of study provided by NASA as most current from relevant companies involved in space exploration.	DDistrict Curriculum http://sciencenetlinks.com/lessons/satellite-orbits/ http://www.discoveryeducation.com/teachers/free-lesson-plans/reading-satellite-images.cfm http://nasawavelength.org/resource/nw-000-000-003-656 http://nasawavelength.org/resource/nw-000-000-003-668 http://nasawavelength.org/resource/nw-000-000-003-649 http://aura.gsfc.nasa.gov/outreach/engineerAsatellite.html

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

D They demonstrate independence.
Show details

D They build strong content knowledge.
Show details

D They respond to the varying demands of audience, task, purpose, and discipline.
Show details

D They comprehend as well as critique.
Show details

Franklin Lakes Public Schools

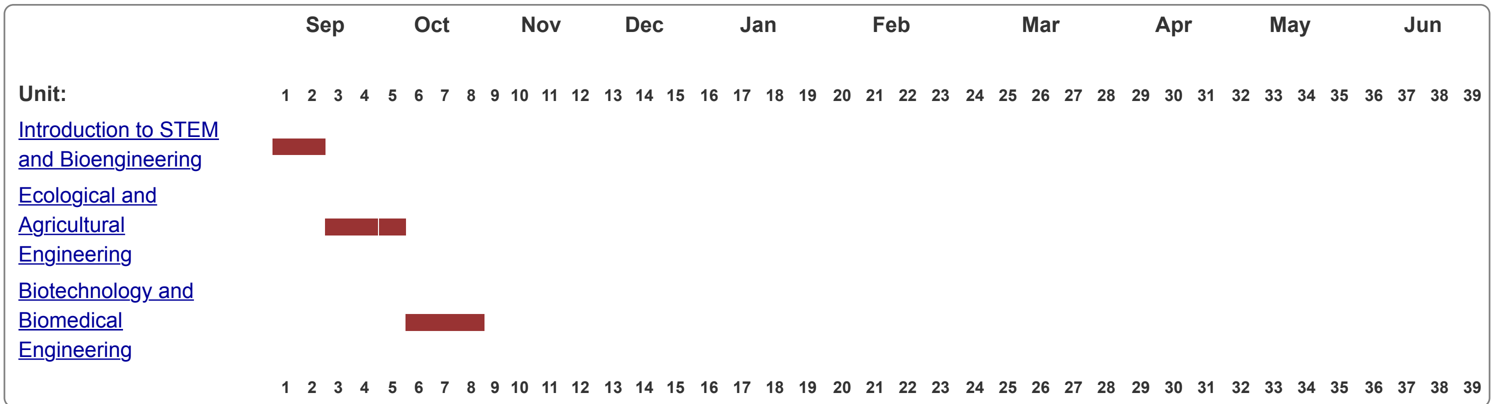
STEM 7 (D)

In order to publish changes to this District Map, there must be Teacher Maps associated to the same Course Title.

District Middle > Grade 7 > Science > STEM 7 (**D**)

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

Collaboration



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Unit Planner: Introduction to STEM and Bioengineering
STEM 7

Wednesday, October 14, 2015, 1:04PM

District Middle > 2015-2016 > Grade 7 > Science > STEM 7 (**D**) > Week 1 - Week 2

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Efforts to solve biological problems have persisted throughout history; advances in technology continue to affect these efforts. • Bioengineering has expanded beyond prosthetics and hospital equipment to include engineering at the molecular and cellular level.	Samples DDistrict Curriculum What challenges do engineers in life science related fields face? How has engineering in the life sciences changed in the 21st century?
Content	**Skills - Standards Aligned and Critical Thinking**
DDistrict Curriculum • Students will know that bioengineers are focused on advancing human health and promoting environmental sustainability. • Students will know that bioengineering is engineering in a biological context such as the human body, an ecosystem, or a bioreactor. • Students will know the the relationship and connections between technology and life science. • Students will know that the engineering design process is the procedure used by engineers to asses and solve everyday problems.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to demonstrate the process of research and design • Students will be able to examine engineering design attributes. • Students will be able to provide suggested improvements to existing engineering designs. • Students will be able to apply an engineering design process to solve technology/engineering problem. • Students will be able to apply scientific concepts across life science topics to develop conceptual understanding. • Students will be able to draw conclusions based on data or evidence presented in tables or graphs, and make • Students will be able to make inferences based on patterns or trends in the data.
Vocabulary/Key Terms	**Modifications: Support and Enrichment**
DDistrict Curriculum Technology Engineering System Orthographic and Isometric sketches Criteria	DDistrict Curriculum ***Planning and Preparing for Special Needs of Students*** ***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions • Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed

Constraints Scale Engineering Design Process Bioengineering Genetic engineering Biotechnology	• Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: • Conduct research and provide presentation of cultural topics. • Design surveys to generate and analyze data to be used in discussion. • Debate topics of interest / cultural importance. • Authentic listening and reading sources that provide data and support for speaking and writing prompts. • Exploration of art and/or artists to understand society and history. • Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic). • Anchor Activities • Use of Higher Level Questioning Techniques • Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources
DDistrict Curriculum **Lesson 1:** Students will complete a basic design challenge with loose ties to bio-engineering as an review of the engineering design process/scientific method. This lesson should additionally review classroom procedures as they relate to the STEM classroom (safety, problem solving, communication, acting as an active member of a group). This lesson should be completed in small groups. This lesson may be repeated with different topics as is required to differentiate based on the skill level of a particular class.	DDistrict Curriculum

Lesson 2:

Students will review technical sketches to promote best STEM-gineer practices. The teacher will review methodology and then require students to complete basic sketches both by hand and using the computer. This particular lesson will also review relevant brainstorming techniques.

Lesson 3:

Students will participate in a biomimicry design challenge through which they will be required to identify relevant characteristics of plants/animals to drive the engineering design of a new product.

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Writing

Text Types and Purposes

1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant

and sufficient evidence.

D WHST.6-8.1. Write arguments focused on discipline-specific content.

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

D Ask questions to determine relationships between independent and dependent variables and relationships in models.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

Connections to the Nature of Science: Most Closely Associated with Practices

Scientific Investigations Use a Variety of Methods

D Science investigations use a variety of methods and tools to make measurements and observations.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

D Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.

D Patterns can be used to identify cause and effect relationships.

D Graphs, charts, and images can be used to identify patterns in data.

Connections to Engineering, Technology and Applications of Science

Interdependence of Science, Engineering, and Technology

D Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.

D Science and technology drive each other forward.

Influence of Engineering, Technology, and Science and the Natural World

D All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.2 Technology Education, Engineering, Design, and Computational Thinking

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

Show details

D 8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

D 8.2.8.C.2 Explain the need for optimization in a design process.

D 8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

D 8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

10 Standards Assessed

-

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum http://biomimicry.org/what-is-biomimicry/#.VfgPXyxViko http://challenge.biomimicry.org/	DDistrict Curriculum

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Unit Planner: Ecological and Agricultural Engineering

STEM 7

Tuesday, October 13, 2015, 9:12PM

District Middle > 2015-2016 > Grade 7 > Science > STEM 7 (**D**) > Week 3 - Week 5

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Agricultural engineers must have a wealth of knowledge and skills to function effectively in the diverse agricultural industries. • Ecological Engineers will work to optimize the connections between people and the environment.	Samples DDistrict Curriculum How have science and technology affected engineering in our environment? How has our environment affected advances in technology and engineering?

Content	Skills - Standards Aligned and Critical Thinking
DDistrict Curriculum • Students will know the effects of technology on the environment. • Identify how agricultural and ecological technology affects their lives. • Students will know that agricultural engineers work on a variety of activities that can range from aquaculture to land farming to forestry; from developing biofuels to improving conservation; from planning animal environments to finding better ways to process food. • Students will know people in ecological engineering (the application of engineering and life-science principles and problem-solving techniques) can utilize the design process.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to ask questions and solve problems using appropriate technology. • Students will be able to apply an engineering design process to complete a design challenge regarding agricultural or ecological engineering. • Students will be able to integrate scientific conclusions into an engineering design process to solve agricultural problems. • Students will be able to digitally present engineering designs and scientific conclusions. • Students will be able to read and interpret technical writing of unit-related topics. • Students will be able to create a technical report to professionally communicate topics of study. • Students will be able to communicate procedures and results using appropriate science and technology terminology. • Students will be able to offer explanations of procedures, and critique and revise them. • Students will be able to illustrate the iterative nature of the engineering design process by offering suggestions for the redesign of an original product.

Vocabulary/Key Terms	Modifications: Support and Enrichment
DDistrict Curriculum Agriculture Ecology	DDistrict Curriculum ***Planning and Preparing for Special Needs of Students*** ***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions

Ecosystem Organic Bioproduct Sustainable Climate Toxic System Biofuel Nutrient Terrestrial Aquaponic	• Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed • Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: • Conduct research and provide presentation of cultural topics. • Design surveys to generate and analyze data to be used in discussion. • Debate topics of interest / cultural importance. • Authentic listening and reading sources that provide data and support for speaking and writing prompts. • Exploration of art and/or artists to understand society and history. • Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic). • Anchor Activities • Use of Higher Level Questioning Techniques • Provide assessments at a higher level of thinking
District Learning Plan	
District Suggested Mini-Lessons/Activities DDistrict Curriculum **Lesson 1:** Students will complete an engineering design challenge to further explore biotechnology through either a Hydroponics Design Challenge or Photobioreactor Design Challenge. Lesson 2: Students will explore Bioproducts and Organic	District Mini-Lesson Resources DDistrict Curriculum

Cleaners as compared to nonorganic products to draw conclusions about the environmental effects of each.	

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They build strong content knowledge.

D Show details

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

They come to understand other perspectives and cultures.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

D RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure
4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

6. Assess how point of view or purpose shapes the content and style of a text.

D RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

D RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

9. Analyze how two or more texts address similar themes or topics in order to build knowledge or to compare the approaches the authors take.

D RST.6-8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.

Writing

Text Types and Purposes
1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

D WHST.6-8.1. Write arguments focused on discipline-specific content.

D WHST.6-8.1a. Introduce claim(s) about a topic or issue, acknowledge and distinguish the claim(s) from alternate or opposing claims, and organize the reasons and evidence logically.

D WHST.6-8.1b. Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

2014 CCSS: Mathematics

2014 CCSS: Grade 7

Ratios & Proportional Relationships

7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

D 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

Show details

D 7.RP.A.2. Recognize and represent proportional relationships between quantities.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

D MP.1. Make sense of problems and persevere in solving them.

Show details

D MP.3. Construct viable arguments and critique the reasoning of others.

Show details

D MP.4. Model with mathematics.

Show details

D MP.5. Use appropriate tools strategically.

Show details

D MP.6. Attend to precision.

Show details

MP.7. Look for and make use of structure.

D Show details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

D Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Evaluate limitations of a model for a proposed object or tool.

D Develop and/or use a model to predict and/or describe phenomena.

D Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Construct, use, and/or present an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem.

D Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

D Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.

D Patterns can be used to identify cause and effect relationships.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

D Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.C: Organization for Matter and Energy Flow in Organisms

D Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)

LS2: Ecosystems: Interactions, Energy, and Dynamics

LS2.A: Interdependent Relationships in Ecosystems

D In any ecosystem, organisms and populations with similar requirements for food, water, oxygen, or other resources may compete with each other for limited resources, access to which consequently constrains their growth and reproduction. (MS-LS2-1)

LS2.D: Social Interactions and Group Behavior

D Changes in biodiversity can influence humans' resources, such as food, energy, and medicines, as well as ecosystem services that humans rely on—for example, water purification and recycling. (secondary to MS-LS2-5)

ETS1: Engineering Design

ETS1.A: Defining and Delimiting an Engineering Problem

D The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-ETS1-1) (secondary to MS-PS3-3)

ETS1.B: Developing Possible Solutions

D Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

D Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (MS-ETS1-3 (secondary to MS-PS1-6)

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

D 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.1 Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).

D 8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

D 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Show details

D 8.2.8.B.1 Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.

D 8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

D 8.2.8.B.3 Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.

D 8.2.8.B.4 Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.

D 8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.

D 8.2.8.B.7 Analyze the historical impact of waste and demonstrate how a product is upcycled, reused or remanufactured into a new product.

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

Show details

D 8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

D 8.2.8.C.2 Explain the need for optimization in a design process.

D 8.2.8.C.6 Collaborate to examine a malfunctioning system and identify the step-by-step process used to troubleshoot, evaluate and test options to repair the product, presenting the better solution.

D 8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

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

Show details

D 8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

22 Standards Assessed

•

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum	DDistrict Curriculum

http://www.hydroponics101.com/sw63114.php https://www.brightagrotech.com/teaching-hydroponics-in-the-classroom/ http://www.livescience.com/1737-truth-green-cleaning-products.html ASEE_2013_Madhumi (1).pdf	

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Unit Planner: Biotechnology and Biomedical Engineering
STEM 7

Tuesday, October 13, 2015, 9:15PM

District Middle > 2015-2016 > Grade 7 > Science > STEM 7 (**D**) > Week 6 - Week 8

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Bioengineering is the application of the principles of engineering and natural sciences to tissues, cells and molecules. • Biomedical engineers analyze and design solutions to problems in biology and medicine.	Samples DDistrict Curriculum How have science and technology affected the quality of life? How has biotechnology advanced in the 21st century?

Content	Skills - Standards Aligned and Critical Thinking
DDistrict Curriculum • Students will know the many different roles of biomedical professionals. • Students will know how nature and natural phenomena affect and inspire advances in engineering. • Students will know that both mechanical and biological technologies may be used to improve our health and/or daily lives. • Students will know major advances in Bioengineering include the development of artificial joints, magnetic resonance imaging (MRI), the heart pacemaker, and bioengineered skin.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to apply an engineering design process to complete a bioengineering design challenge. • Students will be able to communicate the results of a scientific experiment to defend an engineering design solution. • Students will be able provide evidence, claims and reasoning in support of scientific conclusions. • Students will be able to brainstorm possible solutions to an advanced engineering problem. • Students will be able to describe the career pathways of a biomedical engineer. • Students will be able to draft a technical brief of appropriate level as a method of communicating an original design. • Students will be able to describe and present engineering sketches to develop engineering design details. • Students will be able to mathematically explain data and findings using multiple representations, including tables, graphs, mathematical and physical models, and demonstrations.

Vocabulary/Key Terms	Modifications: Support and Enrichment
DDistrict Curriculum Bioengineering	DDistrict Curriculum ***Planning and Preparing for Special Needs of Students***

Circulatory system Artery Fracture Nervous system Biomimicry Prosthetic	***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions • Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed • Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: • Conduct research and provide presentation of cultural topics. • Design surveys to generate and analyze data to be used in discussion. • Debate topics of interest / cultural importance. • Authentic listening and reading sources that provide data and support for speaking and writing prompts. • Exploration of art and/or artists to understand society and history. • Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic). • Anchor Activities • Use of Higher Level Questioning Techniques • Provide assessments at a higher level of thinking
District Learning Plan	
District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources

DDistrict Curriculum	DDistrict Curriculum
Lesson 1: Students will participate in an engineering design challenge using Lego Robotics to either Repair a Femoral Artery or Bone Fractures Students will work in small groups to identify a biomedical engineering problem and develop a robotic surgery to analyze and solve that problem. This lesson will be modeled using concepts identified through Lego Education, NJIT's biomedical engineering robotics units or similar, relevant and most current engineering design challenges. **Lesson 2:** To continue this study of biomedical engineering with regard to STEM best practices, students will identify a problem and create solutions that address the creation of prosthetics using hydraulics or the creation of a heart valve using similar hydraulic/pneumatic devices. Students will be required to investigate a problem and develop clear design solutions. Through the creation of this particular project, students will solely be creating a prototype of a piece of the solution. This project may be adapted in the future as technology continue to advance.	https://www.bio.org/articles/what-biotechnology

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They build strong content knowledge.

D Show details

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

They come to understand other perspectives and cultures.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

5. Analyze the structure of texts, including how specific sentences, paragraphs, and larger portions of the text (e.g., a section, chapter, scene, or stanza) relate to each other and the whole.

D RST.6-8.5. Analyze the structure an author uses to organize a text, including how the major sections contribute to the whole and to an understanding of the topic.

6. Assess how point of view or purpose shapes the content and style of a text.

D RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

8. Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence.

D RST.6-8.8. Distinguish among facts, reasoned judgment based on research findings, and speculation in a text.

2014 CCSS: Mathematics

2014 CCSS: Grade 7

Ratios & Proportional Relationships

7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

D 7.RP.A.2. Recognize and represent proportional relationships between quantities.

Geometry

7.G.B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

D 7.G.B.4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

D 7.G.B.6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

D Show details

MP.2. Reason abstractly and quantitatively.

D Show details

MP.7. Look for and make use of structure.

D Show details

NGSS: Science Performance Expectations(2013)

NGSS: MS Engineering Design

MS.Engineering Design

Performance Expectations

Show details

D 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.

D 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..

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.

D Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

D Macroscopic patterns are related to the nature of microscopic and atomic-level structure.

D Graphs, charts, and images can be used to identify patterns in data.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

D Phenomena may have more than one cause, and some cause and effect relationships in systems can only be described using probability.

3. Scale, Proportion, and Quantity – In considering phenomena, it is critical to recognize what is relevant at different size, time, and energy scales, and to recognize proportional relationships between different quantities as scales change.

D The observed function of natural and designed systems may change with scale.

6. Structure and Function – The way an object is shaped or structured determines many of its properties and functions.

D Complex and microscopic structures and systems can be visualized, modeled, and used to describe how their function depends on the shapes, composition, and relationships among its parts; therefore, complex natural and designed structures/systems can be analyzed to determine how they function.

D Structures can be designed to serve particular functions by taking into account properties of different materials, and how materials can be shaped and used.

Connections to Engineering, Technology and Applications of Science

Interdependence of Science, Engineering, and Technology

D Engineering advances have led to important discoveries in virtually every field of science and scientific discoveries have led to the development of entire industries and engineered systems.

D Science and technology drive each other forward.

Influence of Engineering, Technology, and Science and the Natural World

D All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment.

D The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.

D Technology use varies over time and from region to region.

Connections to the Nature of Science: Most Closely Associated with Crosscutting Concepts

Science Addresses Questions About the Natural and Material World.

D Scientific knowledge is constrained by human capacity, technology, and materials.

D Science knowledge can describe consequences of actions but is not responsible for society's decisions.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

LS1: From Molecules to Organisms: Structures and Processes

LS1.A: Structure and Function

D All living things are made up of cells, which is the smallest unit that can be said to be alive. An organism may consist of one single cell (unicellular) or many different numbers and types of cells (multicellular). (MS-LS1-1)

D 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. (MS-LS1-3)

LS1.D: Information Processing

D Each sense receptor responds to different inputs (electromagnetic, mechanical, chemical), transmitting them as signals that travel along nerve cells to the brain. The signals are then processed in the brain, resulting in immediate behaviors or memories. (MS-LS1-8)

ETS1: Engineering Design

ETS1.A: Defining and Delimiting an Engineering Problem

D The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that is likely to limit possible solutions. (MS-ETS1-1) (secondary to MS-PS3-3)

ETS1.B: Developing Possible Solutions

D A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) (secondary to MS-PS1-6)

D There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem. MS-ETS1-2), (MS-ETS1-3) (secondary to MS-PS3-3) (secondary to MS-LS2-5)

D Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3)

D Models of all kinds are important for testing solutions. (MS-ETS1-4)

ETS1.C: Optimizing the Design Solution

D Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of the characteristics may be incorporated into the new design. (MS-ETS1-3 (secondary to MS-PS1-6)

D The iterative process of testing the most promising solutions and modifying what is proposed on the basis of the test results leads to greater refinement and ultimately to an optimal solution. (MSETS1-4) (secondary to MS-PS1-6)

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

D 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

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

Show details

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

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

D 8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Show details

D 8.2.8.B.1 Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.

D 8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.

D 8.2.8.B.3 Research and analyze the ethical issues of a product or system on the environment and report findings for review by peers and /or experts.

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

Show details

D 8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

17 Standards Assessed

•

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum http://www5.njit.edu/precollege/educatorprograms/medibotics.php	DDistrict Curriculum

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Franklin Lakes Public Schools

STEM 8 (D)

In order to publish changes to this District Map, there must be Teacher Maps associated to the same Course Title.

District Middle > Grade 8 > Science > STEM 8 (D)

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

Collaboration

Sep Oct Nov Dec Jan Feb Mar Apr May Jun

Unit: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

Introduction to STEM Engineering and Design

Power and Energy

Structural Design

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39

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Unit Planner: Introduction to STEM Engineering and Design
STEM 8

Wednesday, October 14, 2015, 1:05PM

District Middle > 2015-2016 > Grade 8 > Science > STEM 8 (**D**) > Week 1 - Week 2

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Technology is a medium for self-expression, and it may open unexpected avenues for exploration and insight. • The development, use, and implementation of technology produce desired results, unanticipated opportunities, and unintended consequences.	Samples DDistrict Curriculum How do we use technology to effectively solve problems? How do you select appropriate tools and resources for a given task?
Content	**Skills - Standards Aligned and Critical Thinking**
DDistrict Curriculum • Students will know that problem-solving is a systematic process employed to answer a question, to address an issue, or to fulfill a need. • Students will know appropriate materials, tools, and machines help us solve problems and make inventions. • Students will know that isometric and orthographic sketches. • Students will know that prototyping is the creation of a model to provide understanding of product qualities or traits. • Students will know that industrial design is the professional service of creating products and systems that optimize function, value and appearance for the mutual benefit of both user and manufacturer. • Students will know that time management is extremely important to the manufacturing process. • Students will know that 3D printing is one method of prototyping. • Students will know that 3D printing requires the utilization of computer aided design programs such as AutoCAD.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to complete scaled, annotated engineering drawings in multi-view and 3-dimensional styles. • Students will be able to evaluate information for credibility, reliability, authority, and authenticity • Students will be able to describe how engineers, architects, and others who engage in design and technology use scientific knowledge to solve practical problems. • Students will be able to create CAD drawings that can be 3D printed. • Students will be able to describe the qualities of a complete industrial design. • Students will be able to discuss the expansion of prototyping technology over time. • Students will be able to manage time appropriately to model a manufacturing environment.
Vocabulary/Key Terms	**Modifications: Support and Enrichment**
DDistrict Curriculum Technology Design principles	DDistrict Curriculum ***Planning and Preparing for Special Needs of Students*** ***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions

Engineering

System

Orthographic and Isometric sketches

Criteria

Constraints

Scale

Design Statement

Engineering Design Process

Electrical Engineering

Mechanical Engineering

Structural Engineering

Environmental Engineering

- Modify work, tests and quizzes
- Additional time to complete assigned tasks
- Allow student to respond to questions orally as needed
- Prompting and refocusing as needed
- Directions read and paraphrased as needed
- Extra time to process information
- Check for understanding of directions
- Frequent review and reinforcement
- Allow 50% additional time for the completion of written tasks, quizzes, and tests.
- Provide study guides
- Use visual cues
- Provide verbal praise
- Read the directions out loud
- Break down tasks into smaller more manageable parts
- Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager

Extensions for Gifted Students

Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study.

The teacher will provide applicable extension activities as needed which may include any or all of the following:

- Conduct research and provide presentation of cultural topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).
- Anchor Activities
- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities
DDistrict Curriculum

- **Lesson 1**: Students will work in small groups to review design challenge components such as the steps of the engineering design process, technical sketching, prototyping, etc. By the end of this lesson, students will be able to participate in a brief engineering design challenge to model competency of each of the aforementioned

District Mini-Lesson Resources
DDistrict Curriculum

http://www.aboriginalaccess.ca/adults/types-of-engineering

http://www.beanengineer.com/types-of-careers

components of an engineering design process. • **Lesson 2:** To solidify student understanding of the engineering design process and industrial design, students will utilize a grade appropriate CAD software such as Google Sketch-up or TinkerCAD to create an original product. The suggested design challenge includes the creation of an iPhone stand. However, this product may change as technology continues to advance.	http://tryengineering.org/become-an-engineer

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

They come to understand other perspectives and cultures.

D Show details

Reading: Science & Technical Subjects

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

D RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

6. Assess how point of view or purpose shapes the content and style of a text.

D RST.6-8.6. Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text.

2014 CCSS: Mathematics

2014 CCSS: Grade 8

Geometry

8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.

D 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations:

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

D Show details

MP.4. Model with mathematics.

D Show details

MP.5. Use appropriate tools strategically.

D Show details

MP.6. Attend to precision.

D Show details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

D Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Use and/or develop a model of simple systems with uncertain and less predictable factors.

D Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.

D Develop and/or use a model to predict and/or describe phenomena.

Practice 5. Using mathematics and computational thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

D Use digital tools and/or mathematical concepts and arguments to test and compare proposed solutions to an engineering design problem.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.1 Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).

D 8.2.8.A.2 Examine a system, consider how each part relates to other parts, and discuss a part to redesign to improve the system.

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum https://www.tinkercad.com/ https://grabcad.com/challenges/iphone-5-accessory-design-challenge/entries?page=4 http://blog.justinmind.com/school-from-science-projects-to-app-prototyping/	DDistrict Curriculum Software • Collaboration tool • Drawing tool • Interactive Websites • Multimedia tool • Skill Building Software • Virtual Manipulatives • Web-based Research www.tinkercad.com http://www.sketchup.com/

	https://code.org/

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Unit Planner: Power and Energy STEM 8

Wednesday, October 14, 2015, 1:07PM

District Middle > 2015-2016 > Grade 8 > Science > STEM 8 (**D**) > Week 3 - Week 5

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Physical science is the science of matter and energy and their interactions. • Electrical systems generate, transfer, and distribute electricity.	Samples DDistrict Curriculum How do engineers use and develop energy and power technologies? How do energy and power technologies affect our everyday life?

Content	Skills - Standards Aligned and Critical Thinking
DDistrict Curriculum • Students will know components of a circuit include sources, conductors, circuit breakers, fuses, controllers, and loads. • Students will know electric current is a continuous flow of charge caused by the motion of electrons. • Students will know that according to Ohm's law, as voltage increases, current increases. • Students will know examples of some controllers are switches, relays, diodes, and variable resistors. • Students will know resistance is affected by external factors. • Students will know that there are a range of energy types like electrical, light, sound and thermal, as well as the renewable energy sources of wind, hydro, and solar power. • Students will know engineers apply their understanding of energy principles and behavior to solving real-world problems, resulting in everyday products. • Students will know engineers keep in mind the needs of the application, and optimize characteristics such as power output, ability to recharge, reliability, size, safety, heat generation, length of life cycle, abuse tolerance, cost and ability to be recycled. • Students will know energy can change from one form into another, and be described and determined by equations. • Students will know that engineers take into consideration the concepts of work and power.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to select and use energy power technologies. • Students will be able to analyze the designed world of engineering, electronics, manufacturing, and energy systems • Students will be able to pose questions, collect data, represent and analyze data, and interpret results • Students will be able to measure and calculate voltage, current, resistance, and power consumption in a series circuit and in a parallel circuit. • Students will be able to identify the instruments used to measure voltage, current, power consumption, and resistance. • Students will be able to explain the relationships among voltage, current, and resistance in a simple

	circuit, using Ohm's law. • Students will be able to identify and explain alternatives to nonrenewable energies • Students will be able to apply an engineering design process to solve a problem or meet a challenge in an electrical system.
Vocabulary/Key Terms DDistrict Curriculum Circuit Electric force Electric power Conduction Insulation Electron Resistance Voltage Electromagnetism Magnetic forces LED Kinetic and Potential energy Current Alternative energy	Modifications: Support and Enrichment DDistrict Curriculum ***Planning and Preparing for Special Needs of Students*** ***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions • Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed • Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case

manager

Extensions for Gifted Students

Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study.

The teacher will provide applicable extension activities as needed which may include any or all of the following:

- Conduct research and provide presentation of cultural topics.
- Design surveys to generate and analyze data to be used in discussion.
- Debate topics of interest / cultural importance.
- Authentic listening and reading sources that provide data and support for speaking and writing prompts.
- Exploration of art and/or artists to understand society and history.
- Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic).
- Anchor Activities
- Use of Higher Level Questioning Techniques
- Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources
DDistrict Curriculum **Lesson 1:** To begin studying electricity, students will explore simple circuits in an LED light design challenge. Students will explore electricity by creating simple, alligator clip circuits using such applications as Makey Makey or Squishy Circuits. If time permits, students may use knowledge of coding to create the video games to play using their student designed "controllers." **Lesson 2:** Students will explore electromagnetism through the creation of either transportation systems or turbines. Each uses electromagnets to create energy through either a generator, motor or magnetic levitation setting.	DDistrict Curriculum https://learn.sparkfun.com/tutorials/makey-makey-quickstart-guide www.edn.com/electronics-blogs/led-zone/4418877/Six-LED-challenges-that-still-remain

Teacher Learning Plan

Weekly Learning Plan / Diary Map
View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They build strong content knowledge.

D Show details

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

They come to understand other perspectives and cultures.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

D RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

10. Read and comprehend complex literary and informational texts independently and proficiently.

D RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

Writing

Text Types and Purposes
1. Write arguments to support claims in an analysis of substantive topics or texts using valid reasoning and relevant and sufficient evidence.

D WHST.6-8.1. Write arguments focused on discipline-specific content.

9. Draw evidence from literary or informational texts to support analysis, reflection, and research.

D WHST.6-8.9. Draw evidence from informational texts to support analysis reflection, and research.

2014 CCSS: Mathematics

2014 CCSS: Grade 8

Geometry

8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

D 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

D Show details

MP.4. Model with mathematics.

D Show details

MP.5. Use appropriate tools strategically.

D Show details

MP.6. Attend to precision.

D Show details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions that arise from careful observation of phenomena, models, or unexpected results, to clarify and/or seek additional information.

D Ask questions to identify and/or clarify evidence and/or the premise(s) of an argument.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

D Ask questions that require sufficient and appropriate empirical evidence to answer.

D Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Evaluate limitations of a model for a proposed object or tool.

D Develop or modify a model—based on evidence – to match what happens if a variable or component of a system is changed.

D Develop and/or revise a model to show the relationships among variables, including those that are not observable but predict observable phenomena.

D Develop and/or use a model to predict and/or describe phenomena.

D Develop a model to describe unobservable mechanisms.

Practice 4. Analyzing and interpreting data

Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.

D Analyze data to define an optimal operational range for a proposed object, tool, process or system that best meets criteria for success.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Make an oral or written argument that supports or refutes the advertised performance of a device, process, or system based on empirical evidence concerning whether or not the technology meets relevant criteria and constraints.

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

D Patterns in rates of change and other numerical relationships can provide information about natural and human designed systems.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

D Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

4. Systems and System Models – A system is an organized group of related objects or components; models can be used for understanding and predicting the behavior of systems.

D Models can be used to represent systems and their interactions—such as inputs, processes and outputs—and energy, matter, and information flows within systems.

5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

D Within a natural or designed system, the transfer of energy drives the motion and/or cycling of matter.

D Energy may take different forms (e.g. energy in fields, thermal energy, energy of motion).

D The transfer of energy can be tracked as energy flows through a designed or natural system.

NGSS: Disciplinary Core Ideas

NGSS: 6-8

PS2: Motion and Stability: Forces and Interactions

PS2.A: Forces and Motion

D For any pair of interacting objects, the force exerted by the first object on the second object is equal in strength to the force that the second object exerts on the first, but in the opposite direction (Newton's third law). (MS-PS2-1)

PS2.B: Types of Interactions

D Electric and magnetic (electromagnetic) forces can be attractive or repulsive, and their sizes depend on the magnitudes of the charges, currents, or magnetic strengths involved and on the distances between the interacting objects. (MS-PS2-3)

PS3: Energy

PS3.A: Definitions of Energy

D Motion energy is properly called kinetic energy; it is proportional to the mass of the moving object and grows with the square of its speed. (MS-PS3-1)

D A system of objects may also contain stored (potential) energy, depending on their relative positions. (MS-PS3-2)

D The term “heat” as used in everyday language refers both to thermal motion (the motion of atoms or molecules within a substance) and radiation (particularly infrared and light). In science, heat is used only for this second meaning; it refers to energy transferred when two objects or systems are at different temperatures. (secondary to MS-PS1-4)

PS3.C: Relationship Between Energy and Forces

D When two objects interact, each one exerts a force on the other that can cause energy to be transferred to or from the object. (MS-PS3-2)

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

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

Show details

D 8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

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

Show details

D 8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

D 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.

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

19 Standards Assessed

-

Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum http://makeymakey.com/lessons/ http://courseweb.stthomas.edu/apthomas/SquishyCircuits/howTo.htm http://media.wfyi.org/IndianaExpeditions/IDEXSeason3_2010/IDEX301/IDEX301ElectircEnergyCircuits.pdf	DDistrict Curriculum

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Unit Planner: Structural Design STEM 8

Tuesday, October 13, 2015, 9:18PM

District Middle > 2015-2016 > Grade 8 > Science > STEM 8 (**D**) > Week 6 - Week 8

Last Updated: Tuesday, September 15, 2015 by Kelly Hart

*Editor, District; Antonison, Eileen

District Desired Results

Enduring Understandings	Essential Questions
DDistrict Curriculum • Appropriate materials, tools, and machines enable us to solve problems, invent, and construct. • Engineers work together to design better and more creative tools, devices, equipment and products that help people do more with less, incorporating the principles of simple machines.	Samples DDistrict Curriculum What do engineers who build structures need to anticipate in regard to requirements and constraints? Where do we see structural engineering in our everyday lives?
Content	**Skills - Standards Aligned and Critical Thinking**
DDistrict Curriculum • Students will know that different materials, processes, and systems are used to build strong structures. • Students will know details of construction technologies. • Students will know that compound machines are combinations of two or more simple machines. • Students will know that friction is a force that impedes motion when two surfaces are in contact. • Students will know that work occurs when a force causes an object to move in the direction of the force. • Students will know that the unit for work is the joule. • Students will know that work can be calculated by multiplying force by distance. • Students will know that when a machine changes the size of a force, the distance through which the force is exerted must also change.	Bloom's Taxonomy DDistrict Curriculum • Students will be able to pose questions, collect data, represent and analyze data, and interpret results. • Students will be able to develop engineering plans, diagrams, and working drawings in the construction of prototypes and models. • Students will be able to explain the parts of a structure. • Students will be able to identify and explain the engineering properties of materials used in structures. • Students will be able to apply an engineering design process and knowledge of structural engineering to solve a problem. • Students will be able to design a test for different building materials to prove their appropriateness for an engineering design. • Students will be able to verbally, digitally and in writing describe a solution to an advanced engineering design.
Vocabulary/Key Terms	**Modifications: Support and Enrichment**
DDistrict Curriculum Forces	DDistrict Curriculum ***Planning and Preparing for Special Needs of Students***

Machine Work input and Work output Mechanical Efficiency Compression Tension Shear Pulley Lever Wedge Inclined plane Gear Friction	***Needs of Special Education Students/ELL's*** • Repeat and paraphrase directions • Modify work, tests and quizzes • Additional time to complete assigned tasks • Allow student to respond to questions orally as needed • Prompting and refocusing as needed • Directions read and paraphrased as needed • Extra time to process information • Check for understanding of directions • Frequent review and reinforcement • Allow 50% additional time for the completion of written tasks, quizzes, and tests. • Provide study guides • Use visual cues • Provide verbal praise • Read the directions out loud • Break down tasks into smaller more manageable parts • Alert case manager (or parent/guardian if the child does not have an IEP) if grade falls below the preset grade determined by the case manager ***Extensions for Gifted Students*** Students who are deemed gifted are eligible for a faster pace course work through the Aces Program of Study in the STEM and Humanities areas of study. The teacher will provide applicable extension activities as needed which may include any or all of the following: • Conduct research and provide presentation of cultural topics. • Design surveys to generate and analyze data to be used in discussion. • Debate topics of interest / cultural importance. • Authentic listening and reading sources that provide data and support for speaking and writing prompts. • Exploration of art and/or artists to understand society and history. • Implement RAFT Activities as they pertain to the types / modes of communication (role, audience, format, topic). • Anchor Activities • Use of Higher Level Questioning Techniques • Provide assessments at a higher level of thinking

District Learning Plan

District Suggested Mini-Lessons/Activities	District Mini-Lesson Resources
DDistrict Curriculum Possible examples: **Lesson 1:** Students will participate in an engineering design challenge to create either Marble Roller Coasters or Rube Goldberg Machines as a solution to a teacher-posed problem. **Lesson 2:** Students will work in small	DDistrict Curriculum www-tc.pbskids.org/designsquad/pdf/parentseducators/DS_TG_ImplementResources.pdf

groups to complete design challenges through which they will build either Towers, Bridges or Catapults to demonstrate knowledge of structure and function. **Lesson 3:** Students will complete the "How the Rubber Meets the Road" activity. This activity will serve as a final activity to stress the importance of materials choice in the design and creation of a product.	

Teacher Learning Plan

Weekly Learning Plan / Diary Map

View Learning Plan Details

Standards

Standards

2014 CCSS: Literacy in History/Social Studies, Science, & Technical Subjects 6-12

2014 CCSS: Grades 6-8

Capacities of the Literate Individual

Students Who are College and Career Ready in Reading, Writing, Speaking, Listening, & Language

They demonstrate independence.

D Show details

They build strong content knowledge.

D Show details

They respond to the varying demands of audience, task, purpose, and discipline.

D Show details

They comprehend as well as critique.

D Show details

They value evidence.

D Show details

They use technology and digital media strategically and capably.

D Show details

They come to understand other perspectives and cultures.

D Show details

Reading: Science & Technical Subjects

Key Ideas and Details

1. Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.

D RST.6-8.1. Cite specific textual evidence to support analysis of science and technical texts.

2. Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

D RST.6-8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

3. Analyze how and why individuals, events, or ideas develop and interact over the course of a text.

D RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks.

Craft and Structure

4. Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

D RST.6-8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6–8 texts and topics.

10. Read and comprehend complex literary and informational texts independently and proficiently.

D RST.6-8.10. By the end of grade 8, read and comprehend science/technical texts in the grades 6–8 text complexity band independently and proficiently.

2014 CCSS: Mathematics

2014 CCSS: Grade 8

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

MP.1. Make sense of problems and persevere in solving them.

D Show details

MP.2. Reason abstractly and quantitatively.

D Show details

MP.3. Construct viable arguments and critique the reasoning of others.

D Show details

MP.4. Model with mathematics.

D Show details

MP.5. Use appropriate tools strategically.

D Show details

MP.6. Attend to precision.

D Show details

MP.7. Look for and make use of structure.

D Show details

MP.8. Look for and express regularity in repeated reasoning.

D Show details

NGSS: Science and Engineering Practices

NGSS: 6-8

Practice 1. Asking questions (for science) and defining problems (for engineering)

Asking questions and defining problems in 6–8 builds on K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.

D Ask questions to determine relationships between independent and dependent variables and relationships in models.

D Ask questions to clarify and/or refine a model, an explanation, or an engineering problem.

D Ask questions that require sufficient and appropriate empirical evidence to answer.

D Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions.

Practice 2. Developing and using models

Modeling in 6–8 builds on K–5 experiences and progresses to developing, using, and revising models to describe, test, and predict more abstract phenomena and design systems.

D Evaluate limitations of a model for a proposed object or tool.

D Develop and/or use a model to predict and/or describe phenomena.

D Develop and/or use a model to generate data to test ideas about phenomena in natural or designed systems, including those representing inputs and outputs, and those at unobservable scales.

Practice 3. Planning and carrying out investigations

Planning and carrying out investigations in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or solutions.

D Conduct an investigation and/or evaluate and/or revise the experimental design to produce data to serve as the basis for evidence that meet the goals of the investigation.

Practice 5. Using mathematics and computational thinking

Mathematical and computational thinking in 6–8 builds on K–5 experiences and progresses to identifying patterns in large data sets and using mathematical concepts to support explanations and arguments.

D Apply mathematical concepts and/or processes (e.g., ratio, rate, percent, basic operations, simple algebra) to scientific and engineering questions and problems.

Practice 6. Constructing explanations (for science) and designing solutions (for engineering)

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

D Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.

D Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.

D Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and re-testing.

Practice 7. Engaging in argument from evidence

Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s).

D Evaluate competing design solutions based on jointly developed and agreed-upon design criteria.

Practice 8. Obtaining, evaluating, and communicating information

Obtaining, evaluating, and communicating information in 6–8 builds on K–5 experiences and progresses to evaluating the merit and validity of ideas and methods.

D Communicate scientific and/or technical information (e.g. about a proposed object, tool, process, system) in writing and/or through oral presentations.

NGSS: Crosscutting Concepts

NGSS: 6-8

Crosscutting Statements

1. Patterns – Observed patterns in nature guide organization and classification and prompt questions about relationships and causes underlying them.

D Patterns can be used to identify cause and effect relationships.

2. Cause and Effect: Mechanism and Prediction – Events have causes, sometimes simple, sometimes multifaceted. Deciphering causal relationships, and the mechanisms by which they are mediated, is a major activity of science and engineering.

D Cause and effect relationships may be used to predict phenomena in natural or designed systems.

5. Energy and Matter: Flows, Cycles, and Conservation – Tracking energy and matter flows, into, out of, and within systems helps one understand their system's behavior.

D The transfer of energy can be tracked as energy flows through a designed or natural system.

NJ: 2014 CCCS: Technology

NJ: Grades 6-8

8.1 Educational Technology

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

Show details

D 8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

D 8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

D 8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.2 Technology Education, Engineering, Design, and Computational Thinking

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
A. The Nature of Technology: Creativity and Innovation Technology systems impact every aspect of the world in which we live.

Show details

D 8.2.8.A.1 Research a product that was designed for a specific demand and identify how the product has changed to meet new demands (i.e. telephone for communication - smart phone for mobility needs).

D 8.2.8.A.5 Describe how resources such as material, energy, information, time, tools, people, and capital contribute to a technological product or system.

B. Technology and Society: Knowledge and understanding of human, cultural and society values are fundamental when designing technology systems and products in the global society.

Show details

D 8.2.8.B.1 Evaluate the history and impact of sustainability on the development of a designed product or system over time and present results to peers.

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

Show details

D 8.2.8.C.1 Explain how different teams/groups can contribute to the overall design of a product.

D 8.2.8.C.2 Explain the need for optimization in a design process.

D 8.2.8.C.3 Evaluate the function, value, and aesthetics of a technological product or system, from the perspective of the user and the producer.

D 8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.

D 8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

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

Show details

D 8.2.8.D.1 Design and create a product that addresses a real world problem using a design process under specific constraints.

D 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.

D 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.

Assessment Plan

Assessments and Their Alignment to Standards

Please align Teacher-level assessments here

D
Design Challenge
Teacher: Formative: Performance: Authentic Task

13 Standards Assessed

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Instructional Resources

Teacher Resources	Student-centered Technology Integration Resources
DDistrict Curriculum http://tryengineering.org/lesson-plans/tall-tower-challenge http://tryengineering.org/become-an-engineer/get-involved/engineering-encounters-bridge-design-contest http://tryengineering.org/lessons/rubberroad.pdf	DDistrict Curriculum

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