

Brick Township Public Schools STEM CURRICULUM

GRADES 6, 7, 8

Aligned to the NEXT GEN SCIENCE, CAREER READY PRACTICES, and TECHNOLOGY STANDARDS
ENGAGING STUDENTS • FOSTERING ACHIEVEMENT • CULTIVATING 21ST CENTURY GLOBAL SKILLS

**BRICK TOWNSHIP PUBLIC SCHOOLS
STEM CURRICULUM**

Content Area: STEM

Course Title: STEM

Grade Level: 6, 7, 8

Unit	Timeframe
Safety	10 weeks
Stem Process	10 Weeks
Physical Science: Forces and Motion	2-3 Weeks
Physical Science: Simple Machines	2-3 Weeks
Physical Science: Structures	2-3 Weeks
Energy and Power	2-3 Weeks
Environmental Awareness	2-3 Weeks

Date Created: August 4, 2017

Board Approved on: September 14, 2017

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BRICK TOWNSHIP PUBLIC SCHOOLS STEM: SAFETY	
Content Area: STEM	
Unit Title: SAFETY	
Target Course/Grade Level: 6, 7, 8	
<p>Unit Summary</p> <p>This unit is designed to promote safe STEM classroom practices. The teacher will introduce and model safe laboratory practices to be used throughout the duration of the STEM course. <u><i>STEM safety will be utilized not only as an independently taught unit but also as a co-unit with all subject matter taught in the STEM classroom.</i></u></p> <p>Primary interdisciplinary connections: Science, Technology and Engineering</p> <p>21st Century Themes: All students will develop an understanding of the necessity of safety in the 21st Century environment. The essential nature of safety requires communication, technology and tool utilization within the dynamic nature of a laboratory “maker space” environment. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.</p> <p>Technology connections: Safe operation of all STEM technology, including but not limited to; tools, 3D printers, computers, etc.</p>	
Learning Targets	
Content Standards	
CONTENT STANDARDS LINK:	
CPI #	Cumulative Progress Indicator (CPI)
12.9.3.ST.3	Describe and follow safety, health and environmental standards related to science, technology, engineering and mathematics (STEM) workplaces.
<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How do I appropriately use resources within the classroom to ensure a safe environment for myself and others? 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • Safety is essential to all innovation and experimentation. • Maintaining an appropriate workspace allows for a safe work environment.

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<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none">• ...what to do when handling specific tools.• ... what to do in an emergency.	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none">• ... apply knowledge of safety within the classroom.
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BRICK TOWNSHIP PUBLIC SCHOOLS

Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Safety Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM Safety is a critical component for students of all ability levels. Everyone must be capable of operating in a safe manner within the class. Appropriate and necessary modifications would be made on a case by case basis dependent upon the specific needs of the student. All students of varying abilities will be challenged at their appropriate level to ensure personal safety and individual academic success.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher

Resources:

- Aprons
- Goggles
- Gloves
- Hot Glue Guns and Sticks
- Chemicals
- Tools
- Machines

Media:

- Teacher generated safety checklist
- Teacher generated safety assessment
- PowerPoint
- Videos

Teacher Notes:

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BRICK TOWNSHIP PUBLIC SCHOOLS STEM: STEM PROCESS

Content Area: STEM

Unit Title: STEM PROCESS

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and implement:

- The Engineering Design Process
- Growth Mindset
- Exemplars of Innovation History

This unit students will also reinforce how to apply the tools:

- S.C.A.M.P.E.R. (Substitute, Combine, Adapt, Modify, Put to Another Use, Eliminate, Reverse)
- A.I.D.A. (Attention, Interest, Desire, Action)

... within the Engineering Design Process.

STEM Process will be utilized not only as an independently taught unit but also as a co-unit with all subject matter taught in the STEM classroom.

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherent within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #

Cumulative Progress Indicator (CPI)

CRP.K-12.CRP1

Act as a responsible and contributing citizen and employee.

CRP.K-12.CRP2

Apply appropriate academic and technical skills.

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CRP.K-12.CRP3	Attend to personal health and financial well-being.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP5	Consider the environmental, social and economic impacts of decisions.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.
CRP.K-12.CRP9	Model integrity, ethical leadership and effective management.
CRP.K-12.CRP10	Plan education and career paths aligned to personal goals.
CRP.K-12.CRP11	Use technology to enhance productivity.
CRP.K-12.CRP12	Work productively in teams while using cultural global competence.
MS-ETS1-1	Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
MS-ETS1-2	Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
MS-ETS1-3	Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
MS-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.
TECH.K-12.4	Innovative Designer: Students use a variety of technologies within a design process to identify and solve problems by creating, new, useful or imaginative.
TECH.K-12.4.a	Know and use a deliberate design process for generating ideas, testing theories and creating innovative artifacts or solving authentic problems.
TECH.K-12.4.b	Select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
TECH.K-12.4.c	Develop, test and refine prototypes as part of a cyclical design process.
TECH.K-12.4.d	Exhibit a tolerance for ambiguity, perseverance and the capacity to work with open-ended problems.

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<p>Unit Essential Questions</p> <ul style="list-style-type: none"> • How do I appropriately use STEM process within the classroom in order to complete the assigned task? 	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none"> • ... what the Engineering Design Process is and how it is applied. • ... what a Growth Mindset is and how to achieve one. • ... innovation is a process. • ... as problem solvers they will be able to analyze a situation and know what has to be done, why the process is appropriate, and can support their choice with reason and evidence.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none"> • ... how to apply the Engineering Design Process. • ... how to apply S.C.A.M.P.E.R. and A.I.D.A. as need within the design process. • ... the power of “Yet” in growth mindset towards achieving a goal. • ... How to identify and describe each step in the Engineering Design Process. 	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none"> • apply knowledge of all of the STEM processes in order to successfully complete a STEM activity.

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BRICK TOWNSHIP PUBLIC SCHOOLS
Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Peer Evaluation
- Marzano Scale
- Observation

Summative Assessments

- Class Post Assessment
- Scoring Rubric
- Closure Activity

Modifications (ELLs, Special Education, Gifted and Talented)

STEM Process is a critical component for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project Specific Resources

Media:

- Available Technology and Resources

Teacher Notes:

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**BRICK TOWNSHIP PUBLIC SCHOOLS
STEM: PHYSICAL SCIENCE – FORCES AND MOTION**

Content Area: STEM

Unit Title: PHYSICAL SCIENCE – FORCES and MOTION

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and implement the concept of Forces and Motion.

The following possible topics are dependent on grade level:

- Newtonian Physics
- Kinetic and Potential Energy
- Aerospace

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherent within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #	Cumulative Progress Indicator (CPI)
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
SCI.MS-PS2-1	Apply Newton’s Third Law to design a solution to a problem involving the motion of two colliding objects.
SCI.MS-PS3-1	Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

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<p>Unit Essential Questions</p> <ul style="list-style-type: none">• How do I appropriately use physics and resources within the classroom in order to complete the assigned task?	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none">• ... application of Newtonian Physics, Kinetic and Potential Energy and Aerospace (task and area dependent upon grade level) is essential to successfully complete their assigned task through the Engineering Design Process.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none">• ... how to use Newtonian Physics, Kinetic and Potential Energy and Aerospace (task and area dependent upon grade level) to successfully complete their assigned task through the Engineering Design Process.	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none">• ... apply knowledge of physics in order to successfully complete a stem activity.

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Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Class Post Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM is important for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project specific resources

Media:

- Available technology and resources

Teacher Notes:

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BRICK TOWNSHIP PUBLIC SCHOOLS STEM: PHYSICAL SCIENCE – SIMPLE MACHINES

Content Area: STEM

Unit Title: PHYSICAL SCIENCE – SIMPLE MACHINES

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and implement the concept of Simple Machines.

The following possible topics are dependent on grade level:

- Wheel and Axle
- Levers
- Wedges
- Pulleys
- Inclined Planes
- Screws
- Rube Goldberg Machines

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherent within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #	Cumulative Progress Indicator (CPI)
SCI.6-8.4.1	Systems may interact with other systems; they may have sub-systems and be a part of larger complex systems.
TECH.8.2.8 .D	The designed world is the product of a design process that provides the means to convert resources into products and systems.

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<p>Unit Essential Questions</p> <ul style="list-style-type: none">• How do I appropriately use Simple Machines and resources within the classroom in order to complete the assigned task?	<p>Unit Enduring Understandings</p> <p><i>Students will understand that...</i></p> <ul style="list-style-type: none">• ... application of Simple Machines – Wheels & Axles, Levers, Pulleys, Inclined Planes, Wedges and Screws – can make a task more efficient (task and area dependent upon grade level and resources).
<p>Unit Objectives</p> <p><i>Students will know...</i></p> <ul style="list-style-type: none">• ... how to apply a simple machine to achieve a particular task (task and area dependent upon grade level and resources).	<p>Unit Objectives</p> <p><i>Students will be able to...</i></p> <ul style="list-style-type: none">• ...apply knowledge of Simple Machines in order to successfully complete a STEM task (task and area dependent upon grade level and resources).

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BRICK TOWNSHIP PUBLIC SCHOOLS
Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Class Post Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM is important for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project specific resources

Media:

- Available technology and resources

Teacher Notes:

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**BRICK TOWNSHIP PUBLIC SCHOOLS
STEM: PHYSICAL SCIENCE - STRUCTURES**

Content Area: STEM

Unit Title: PHYSICAL SCIENCE – STRUCTURES

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and implement the knowledge of how forces impact a structure and methods used to enhance support in structure design. Possible examples of structures based upon grade level addressed within this unit may include, but are not limited to:

- Bridges
- Towers
- Geodesic Domes

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherit within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #	Cumulative Progress Indicator (CPI)
9.3.12.AC. 2	Use architecture and construction skills to create and manage a project.
9.3.12.AC. 6	Read, interpret and use technical drawings, documents and specifications to plan a project.

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<p>Unit Essential Questions</p> <ul style="list-style-type: none">• How do I appropriately use knowledge of structures and resources within the classroom in order to complete the assigned task?	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none">• ... application of knowledge of forces (such as compression and tension) is essential in order to successfully complete their assigned task through the Engineering Design Process (task and area dependent upon grade level and resources).
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none">• ... the various types of forces (compression, tension, shearing, torsion, bending, etc) that may impact the sustainability of a structure.• ... various methods to add strength and support while focusing on the efficient use of materials (task and area dependent upon grade level and resources)..	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none">• ... apply knowledge of forces and support in order to design and construct a structure that will successfully meet the requirements of the design challenge.

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BRICK TOWNSHIP PUBLIC SCHOOLS
Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Class Post Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM is important for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project specific resources- may include wood (i.e.- balsa), adhesives (i.e.- elmer's/tacky glue)
- Testing equipment (i.e.- compression testing equipment)
- Scoring Rubric

Media:

- Available technology and resources

Teacher Notes:

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BRICK TOWNSHIP PUBLIC SCHOOLS STEM: ENERGY and POWER

Content Area: STEM

Unit Title: ENERGY and POWER

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and implement one or more of the various sources of energy and power. Subjects in this unit may include, but are not limited to:

- Renewable Resources
- Electricity
- Solar Power
- Wind Power
- Hydro Power

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherent within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #	Cumulative Progress Indicator (CPI)
SCI.MS-PS1-3	Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
SCI.6-8.5.3	Energy may take different forms. (e.g. energy in fields, thermal energy, energy of motion)

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<p>Unit Essential Questions</p> <ul style="list-style-type: none">• How do I appropriately use knowledge of energy and power as well as resources within the classroom in order to complete the assigned task?	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none">• ... application of knowledge of energy and power and safety is essential in order to successfully complete their assigned task through the Engineering Design Process (task and area dependent upon grade level and resources).• ... the generation of energy and power can be achieved through various sources.
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none">• ... proper safety procedures (i.e.-soldering safety) associated with the specified energy and power assignment(task and area dependent upon grade level and resources).	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none">• ...apply knowledge of energy and power in order to safely construct the specified design project.

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BRICK TOWNSHIP PUBLIC SCHOOLS
Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Class Post Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM is important for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project specific resources- may include solar panels, wires, electrical components, batteries, soldering equipment, safety equipment/goggles, etc.
- Scoring Rubric

Media:

- Available technology and resources

Teacher Notes:

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BRICK TOWNSHIP PUBLIC SCHOOLS STEM: ENVIRONMENTAL AWARENESS

Content Area: STEM

Unit Title: ENVIRONMENTAL AWARENESS

Target Course/Grade Level: 6, 7, 8

Unit Summary

This unit is designed to introduce and foster an understanding of technology's influence on the environment. Possible topics in this unit may include, but are not limited to:

- The use of alternative energy sources
- The positive and negative impacts of technology on the environment
- Methods of reducing your environmental footprint (Reduce, Reuse, Recycle, etc.)

Primary interdisciplinary connections:

Science, Technology, Engineering and Math

21st Century Themes:

The nature of STEM is that it is a highly interdisciplinary 21st Century concept. Students are encouraged to innovate, create and embrace the concept of a Growth Mindset while utilizing the Engineering Design Process to complete an assigned task. The appropriate use of tools and resources within the classroom, combined with hands-on experience and collaboration with peers is essential to career/workplace readiness.

Technology connections:

STEM is connected to all forms of technology inherit within a 21st Century workplace and classroom, including but not limited to; tools, 3D printers, computers, etc.

Learning Targets

Content Standards

CONTENT STANDARDS LINK:

CPI #	Cumulative Progress Indicator (CPI)
TECH.8.2. 8.D.6	Identify and explain how the resources and processes used in the production of a current technological product can be modified to have a more positive impact on the environment.
TECH.8.2. 8	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the design world as they relate to the individual, global society, and the environment.

Brick Township Public Schools STEM CURRICULUM

GRADES 6, 7, 8

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<p>Unit Essential Questions</p> <ul style="list-style-type: none">• How do I appropriately use knowledge of the environment as well as resources within the classroom in order to complete the assigned task?	<p>Unit Enduring Understandings <i>Students will understand that...</i></p> <ul style="list-style-type: none">• ... the use of technology can have positive and negative impacts on the environment and that these impacts could be intended or unintended consequences of the use of technology.• ... application of knowledge of the environment is essential in order to successfully complete their assigned task through the Engineering Design Process (task and area dependent upon grade level and resources).
<p>Unit Objectives <i>Students will know...</i></p> <ul style="list-style-type: none">• ... technology, manufacturing and production can have positive and negative implications on the world in which we live.	<p>Unit Objectives <i>Students will be able to...</i></p> <ul style="list-style-type: none">• ...apply knowledge of the environment in order to safely construct the specified design project.

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BRICK TOWNSHIP PUBLIC SCHOOLS
Evidence of Learning

Formative Assessments

- Observation
- Self Assessment/ Self Reflection
- Marzano Scale

Summative Assessments

- Class Post Assessment
- Scoring Rubric

Modifications (ELLs, Special Education, Gifted and Talented)

STEM is important for students of all ability levels. Modifications would be made on a case by case basis dependent upon the need of the specific need of the student.

- ELL --- Language Reference Resources
- Special Education --- In accordance with an IEP or 504 plan
- Gifted and Talented --- Differentiated Instruction dependent upon need
- Peer Helpers

Curriculum Development Resources/Instructional Materials/Equipment Needed Teacher Resources:

- Project specific resources

Media:

- Available technology and resources

Teacher Notes:

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