BLOOMFIELD PUBLIC SCHOOLS
Bloomfield, New Jersey 07003

Curriculum Guide

Technology Education
Grade 7

Prepared by:

Terri Hughes

Salvatore Goncalves, Superintendent
Joanne Decker, Director of Student Achievement

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Introduction:

Technology Education 7 & 8 incorporates problem-based learning utilizing math, science and technology principles. The goal of the Technology Education course is to spread technological literacy, which is accomplished by providing a rich variety of hands on laboratory activities to students with many exciting new technologies. Technology Education stresses design and problem-solving abilities, and provides to the student career awareness and information about a wide variety of technology related careers. Students become more prepared to prosper in an information and technology rich society.

Technology Education 7 & 8, each is a 90-day middle school program that may be divided into four skill sets:

1. The ability to observe and recognize the use of technology around us.
2. The ability to solve practical problems by using existing technology.
3. The ability to solve practical problems by creating new technology.
4. The ability to evaluate the impact of technology on society and the environment.

Technology is the use of processes, tools, and materials to satisfy needs and wants, and to solve practical problems. Students are encouraged to explore and discover through modeling and by providing opportunities for experimentation. Technology Education is at the forefront of STEM Education: (Science, Technology, Engineering and Mathematics) Technology Education is the catalyst that permits science and mathematics principles to be applied in real world situations.

Title II-D: Enhancing Education through Technology of the No Child Left Behind (NCLB) Act requires that all students are technologically literate by the end of grade eight. Complimenting the federal law, the NJDOE's Technological Literacy Standards, specifically the 8.1 Computer and Information Literacy Standards, provide standardized criteria for technological literacy across the state. Technology Education 7 & 8 allows for the assessment of the students, at the end of eight grade that are technologically proficient in accordance with NJTAP-IN.

Title of Unit	The Nature of Technology	Grade Level	7
Curriculum Area	Technology Education	Time Frame	50 Days
Developed By	Terri Hughes		

Desired Results (Stage 1)

Established Goals

NJ Core Curriculum Content Standards 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.
8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.
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.
8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real world problem or theory
8.1.8.A.5 Create a database query, sort and create a report and describe the process, and explain the report results.
8.1.8.D.1 Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.
8.1.8.D.2 Demonstrate the application of appropriate citations to digital content.
8.1.8.D.3 Demonstrate an understanding of fair use and Creative Commons to intellectual property.
8.1.8.D.4 Assess the credibility and accuracy of digital content.
8.1.8.D.5 Understand appropriate uses for social media and the negative consequences of misuse.
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.
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
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.
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).
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.
8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.
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.
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.
8.2.8.B.2 Identify the desired and undesired consequences from the use of a product or system.
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.
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.
8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.
8.2.8.B.6 Compare and contrast the different types of intellectual property including copyrights, patents and trademarks.
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.

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

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

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.

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

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.

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.

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. 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.

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

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.

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.

8.2.8.D.4 Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

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.

8.2.8.E.2 Demonstrate an understanding of the relationship between hardware and software.

8.2.8.E.3 Develop an algorithm to solve an assigned problem using a specified set of commands and use peer review to critique the solution.

8.2.8.E.4 Use appropriate terms in conversation (e.g., programming, language, data, RAM, ROM, Boolean logic terms).

Primary Interdisciplinary Connections

Science and Engineering Practice 1 Asking Questions and Defining Problems
- 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.

Science and Engineering Practice 2 Developing and Using Models
- Develop or modify a model—based on evidence – to match what happens if a variable or component of a **system is changed.**

Science and Engineering Practice 3 Planning and Carrying Out Investigations
- 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.
- 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.

Science and Engineering Practice 6 Constructing Explanations and Designing Solutions
- Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.

21st Century Interdisciplinary Themes:
  __X__ **Global Awareness**   ____ **Financial, economic, business, and entrepreneurial literacy**
  __X__ **Civic Literacy**   ____ **Health Literacy**

Transfer

Students will be able to independently use their learning to:
1. Observe and recognize the use of technology around us.
2. Solve practical problems by using existing technology.
3. Solve practical problems by creating new technology.
4. Evaluate the impact of technology on society and the environment.
5. Recognize a problem and apply critical thinking and problem-solving skills to solve the problem.

Meaning

Understandings	Essential Questions
Students will understand that...	**Students will keep considering...**
U1. Technology is used to enhance learning, increase productivity, and promote creativity.	**Q1.** How to develop positive attitudes towards technology usage in real life situations? **Q2.** How can I use technology to become a better problem solver?

Acquisition

Knowledge	Skills
Students will know...	**Students will be able to...**
K1. How to define technology. **K2.** The reasons we study technology. **K3.** What technology workers are called. **K4.** The link between science, engineering, and technology. **K5.** The influence of democracy on technology in the United States. **K6.** That science explains how things happen, engineering determines how to make things, and technology makes things happen. **K7.** There are 7 technology resources. **K8.** How to describe the 6 simple machines. **K9.** How to define criteria and constraints, optimization, maintenance, and control. **K10.** How to identify tradeoffs during product development. **K11.** How to describe separating, forming, combining, conditioning, and finishing processes. **K12.** The purpose of and how to use several hand tools. **K13.** The purpose of and how to use several portable power tools.	**S1.** Explain the advantages of being technologically literate. **S2.** Explain how teens have contributed to technology. **S3.** Discuss how technology changes. **S4.** Understand that technology is the practical use of human knowledge to extend human abilities and to satisfy human needs and wants. **S5.** Conclude that technology builds on the knowledge of the past and present to create things for the future. **S6.** Develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving. **S7.** Explain how skills and creativity lead to new inventions. **S8.** Explain systems and subsystems. **S9.** Discuss the difference between open and closed loop systems. **S10.** Explain how systems relate to technology. **S11.** Describe how requirements affect the development of products and systems. **S12.** Explain the positive and negative effects of technology. **S13.** Explain how the different process are used. **S14.** Explain the importance of safety when using tools and machines. **S15.** Explain how creativity influences design. **S16.** Explain the importance of engineering and appearance in design. **S17.** Describe an effective problem statement.

K14. Some basic properties of materials.
K15. The names of common engineering materials.
K16. The 6 steps in problem solving.
K17. The difference between freehand sketching and technical drawing.
K18. The alphabet of lines and drawing to scale.
K19. The purpose of each kind of technical drawing.
K20. Examples of drafting applications.
K21. The purpose of rapid prototyping.
K22. The ways which science and technology are connected.
K23. Ways in which mathematics and technology are connected.
K24. Ways in which social studies and technology are related.
K25. Ways in which language arts and technology are connected.

S18. Design and create a product that addresses a real-world problem using the design process and working with specific criteria and constraints.
S19. Identify the design constraints and trade-offs involved in designing a prototype by completing a design problem.
S20. Build a prototype using science and math principles through the design process.
S21. Explain the purpose of working drawings and schematic diagrams.
S22. Explain the purpose of models and prototypes.
S23. Explain the purpose of scientific and engineering visualization.
S24. Explain the need for patents and the process of registering one.
S25. Combine the elements of design and technology to express individual creativity.
S26. Use the closed-loop system to design with a specific purpose.
S27. Apply and demonstrate the design/problem solving process.

Evidence (Stage 2)

Checks for Alignment	*Evaluation Criteria* *Performance is judged in terms of...*	*Assessment Evidence*

U1
 Q1 – Q2
 K1 – K25
 S1 – S27
	Blooms Taxonomy
	 • Remembering
	 • Understanding
	 • Applying
	 • Analyzing
	 • Evaluating
	 • Creating
		Transfer Task(s)
		 Formative
		     • Classroom discussion
		     • Informal observation
		     • Graphic organizers
		     • Handouts/worksheets
		     • Vocabulary databases
		
		 Summative
		     • Self-checks
		     • Rubrics

U1
 Q1 – Q2
 K1 – K25
 S1 – S27
	Blooms Taxonomy
	 • Remembering
	 • Understanding
	 • Applying
	 • Analyzing
	 • Evaluating
	 • Creating
		Other Evidence
		 Formative
		     • Design Portfolio
		
		 Summative
		     • Design Portfolio

Learning Plan (Stage 3)

Checks for alignment and best practice	Summary of Key Learning Events and Instruction *The teaching and learning needed to achieve the unit goals.*	
	Required Activities	**Required Resources**
	Graphic organizers to pinpoint ways in which students enjoy technology, to categorize Science, Technology, and Engineering, to identify the 7 technology resources, to identify the closed-loop system, to identify the impacts and effects of technology, to identify technology processes, to identify safety rules, to list engineering materials, to identify design principles, to record the 6 steps in problem solving, to list the types of pictorial drawings, to identify criteria and constraints when designing, and to identify connections between technology and the working world.	Introduction to Technology textbook pages 6-121.
	Create a database with vocabulary words.	Why Study Technology PowerPoint. Concepts of Technology PowerPoint. Processes, Tools, and Materials of Technology PowerPoint. Design and Problem Solving PowerPoint. From Drawings to Prototypes PowerPoint. Technology Connections PowerPoint.
	Design, build, and test a shock-absorbing system that will protect two "astronauts" when they land.	Paper, straws, mini-marshmallows, cups, cardboard, index cards, masking tape, and marshmallows.
	Choose one item to innovate, either a skateboard, ice cream, or a sweatshirt. Sketch your idea and explain what the innovation is, why the item needs to be improved, and why people would want to buy it. Peer critique each innovation with cool and warm feedback.	Drawing materials, paper, and post-its.
	Build, fly, and measure two different high-tech paper airplanes.	Paper.

	Select 2 out of 6 simple machine projects:
	  Pulley – Lift weights with no pulley, simple pulley, and a double pulley.
	  Lever – Create a lever with ruler and fulcrum.
	  Repair my House – Draw a house that needs repair, along with which simple machines you would use to repair your house.
	  Multimedia– Create a multimedia presentation to explain each simple machine, along with how you would use each machine in your everyday lives.
	  Screw – Create a paper screw.
	  Inclined Plane and Wedge –Using Legos, create an inclined plane and wedge.
		Pulleys, string, weights, c-clamps, rulers, pencils, drawing materials, poster paper, PowerPoint, Prezi, paper, and Legos.

	Using plaster of paris, create a mold and casting, then use the finishing process to complete the final product.	Plaster of paris, water, aluminum foil, cups, spoons, cardboard, sandpaper, paint, and paintbrushes.
	Complete the plastics WebQuest to learn about different types of plastics and how they can be recycled.	Plastics WebQuest.
	Design, build, and test a prototype sandal using criteria and constraints.	Foam core, oak tag, and glue.
	Design and build a house using Google Sketch Up.	Google Sketch Up.
	Animate a verb using Pivot (flash stick figure animation program).	Pivot.
	Explore Choosing a Computer.	http://www.everfi.com/
	Explore Internet Resources.	http://www.everfi.com/
	Explore Digital Relationships and Respect.	http://www.everfi.com/
	Learn the basic concepts of computer science through drag and drop programming.	www.code.org
	Suggested Activities	**Suggested Resources**

	Virtually design a cell phone using the following process:
	    Research
	    Design
	    Test results
	    If needed, redesign and test results
	    Monitor phone sales
		www.edheads.org

	Do an Internet search using the key words "green companies" and "socially responsible companies." Find out about their products and decide if you want to use them. Present your findings to the class.	Internet.
	Complete a recycled plastics table that lists the 7 types of plastics, their normal uses, and ways in which they can be recycled.	Recycled plastics table.
	Write a request for a design patent for one of Benjamin Franklin's inventions. The invention needs to include a drawing of the invention, description f its purpose and uses, and reasons for why it deserves a patent.	http://www.pbs.org/benfranklin/index.html

Strategies for Differentiation

Students Below Target:	Students Meeting or Exceeding Target:
Paired/Group Activity	Cooperative Learning
Cooperative Learning	Independent Study
Learning Buddies	Internet based mini-lesson
Self-Check modifications	Choice menus
Extended time	Varied rubrics
Choice menus	Paired/Group Activity
Varied rubrics	

Bloomfield Public Schools
Understanding by Design Unit Template

Title of Unit	Energy and Power	Grade Level	7
Curriculum Area	Technology Education	Time Frame	20 Days
Developed By	Terri Hughes		

Desired Results (Stage 1)

Established Goals

NJ Core Curriculum Content Standards 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.

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

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.

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

8.1.8.A.5 Create a database query, sort and create a report and describe the process, and explain the report results.

8.1.8.B.1 Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

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.

8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

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.

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).

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.

8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.

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

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.

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.

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

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.

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.

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

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.

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

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

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.

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

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.

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.

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. 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.

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

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.

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.

8.2.8.D.4 Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

8.2.8.D.5 Explain the impact of resource selection and the production process in the development of a common or technological product or system.

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.

Primary Interdisciplinary Connections

Science and Engineering Practice 1 Asking Questions and Defining Problems
- 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.

Science and Engineering Practice 2 Developing and Using Models
- Develop or modify a model—based on evidence – to match what happens if a variable or component of a **system is changed.**

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- 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.
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Science and Engineering Practice 6 Constructing Explanations and Designing Solutions
- Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.

21st Century Interdisciplinary Themes:
  __X__ Global Awareness   ____ Financial, economic, business, and entrepreneurial literacy
  ____ Civic Literacy   ____ Health Literacy

Transfer

Students will be able to independently use their learning to:
  1. Observe and recognize the use of technology around us.
  2. Solve practical problems by using existing technology.
  3. Solve practical problems by creating new technology.
  4. Evaluate the impact of technology on society and the environment.
  5. Recognize a problem and apply critical thinking and problem-solving skills to solve the problem.
  6.

Meaning

Understandings

Students will understand that...

U1. A sustainable future depends on personal choices and actions and the conservation of available resources.

Essential Questions

Students will keep considering...

Q1. How does energy affect my life and those of the rest of the world?
Q2. How can I use technology to become a better problem solver?

Acquisition

Knowledge

Students will know...

K1. Different form of energy.
K2. How to identify the most common forms of power.
K3. How to describe different uses for each form of power.
K4. Forms of pollution resulting from energy and power technologies.
K5. The definition of electricity.
K6. How to identify the three types of electricity.
K7. The uses for direct and alternating current.
K8. The use of Ohm's law to determine measurements in a circuit.
K9. Some uses for semiconductors and superconductors.
K10. How to describe the two basic types of electrical circuits.
K11. The different types of electrical circuits.
K12. The different types of electronic signal transmissions.
K13. The process of assembling and testing a variety of simple electrical circuits.
K14. That an electrical current in a wire can be controlled by a switch, either mechanical or electronic.

Skills

Students will be able to...

S1. Explain the advantages of being technologically literate.
S2. Explain how energy and power technologies are selected.
S3. Discuss methods to slow depletion of energy resources.
S4. Recognize that through conservation and other measures, we can lessen the effects of the burning of fossil fuels on the environment.
S5. Know what fossil fuels are and how burning fossil fuels contributes to the greenhouse effect, smog, and acid rain.
S6. Discuss voltage, amperage, and resistance.
S7. Explain the difference between a conductor and an insulator.
S8. Tell how fiber optic cables work.
S9. Compare analog and digital signals.
S10. Understand that an electrical current in a wire is a flow of electrons.
S11. Understand the construction of a transistor.
S12. Apply and demonstrate the design/problem solving process.

Evidence (Stage 2)

Checks for Alignment	*Evaluation Criteria* *Performance is judged in terms of...*	*Assessment Evidence*
U1 **Q1 – Q2** **K1 – K14** **S1 – S12**	Blooms Taxonomy • Remembering • Understanding • Applying • Analyzing • Evaluating	**Transfer Task(s)** Formative Classroom discussion • Informal observation • Graphic organizers • Handouts/worksheets • Vocabulary databases

	• Creating	Summative • Self-checks • Rubrics
U1 Q1 – Q2 K1 – K14 S1 – S12	Blooms Taxonomy • Remembering • Understanding • Applying • Analyzing • Evaluating • Creating	**Other Evidence** Formative • Design Portfolio Summative • Design Portfolio

Learning Plan (Stage 3)

Checks for alignment and best practice	**Summary of Key Learning Events and Instruction** *The teaching and learning needed to achieve the unit goals.*	
	Required Activities	**Required Resources**
	Graphic organizers to categorize renewable, nonrenewable, and unlimited sources of energy, to record different forms of energy, to measure electricity, to show controlling electrical flow, and to list types of signal transmissions.	Introduction to Technology textbook pages 134-175.
	Create a database with vocabulary words.	Energy and Power Technologies PowerPoint. Electricity to Electronics PowerPoint.
	Work through the Energy Sources Interactive Explorations; an activity where student can test their knowledge of energy and power explorations.	http://www.glencoe.com/sec/Tech_Ed/interactive/energy_sources.html
	Build a solar oven to cook smores.	Pizza box, aluminum foil, plastic wrap, masking tape, black construction paper, and newspaper. Ingredients for smores.
	Explore Intel's Circuits and Switches.	www.intel.com/education/journey
	Design, build, and test a simple circuit with a mechanical switch.	Cardboard, aluminum foil, electrical tape, LED, and mechanical switch.
	Design, build, and test a wind turbine to create enough electricity to light a LED.	Wind turbine base, hub, blades, and foam cutter.
	Suggested Activities	**Suggested Resources**
	Use the carbon footprint calculator to determine your own carbon footprint. Consider how you can lower your personal use of nonrenewable energy.	http://www.parkcitygreen.org/Calculators/Kids-Calculator.aspx
	Prepare a poster advertising and promoting one form of power, include its advantages and the ways it is used. Label the form of power, include a picture, use various text sizes to make the poster attractive.	Various drawing materials and poster paper.

Strategies for Differentiation

Students Below Target:	Students Meeting or Exceeding Target:
Paired/Group Activity	Cooperative Learning
Cooperative Learning	Independent Study
Learning Buddies	Internet based mini-lesson
Self-Check modifications	Choice menus
Extended time	Varied rubrics
Choice menus	Paired/Group Activity
Varied rubrics	

Bloomfield Public Schools
Understanding by Design Unit Template

Title of Unit	Transportation Technologies	Grade Level	7
Curriculum Area	Technology Education	Time Frame	20 Days
Developed By	Terri Hughes		

Desired Results (Stage 1)

Established Goals

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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.

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

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

8.1.8.A.5 Create a database query, sort and create a report and describe the process, and explain the report results.

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.

8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.

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.

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).

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.

8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.

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

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.

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.

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

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.

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.

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

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

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

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.

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

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.

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.

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. 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.

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

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.

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.

8.2.8.D.4 Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

8.2.8.D.5 Explain the impact of resource selection and the production process in the development of a common or technological product or system.

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.

Primary Interdisciplinary Connections

Science and Engineering Practice 1 Asking Questions and Defining Problems
- 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.

Science and Engineering Practice 2 Developing and Using Models
- Develop or modify a model—based on evidence – to match what happens if a variable or component of a **system is changed.**

Science and Engineering Practice 3 Planning and Carrying Out Investigations
- 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.
- 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.

Science and Engineering Practice 6 Constructing Explanations and Designing Solutions
- Apply scientific ideas or principles to design, construct, and/or test a design of an object, tool, process or system.
- Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.
- Optimize performance of a design by prioritizing criteria, making tradeoffs, testing, revising, and retesting.

21st Century Interdisciplinary Themes:
  __X__ Global Awareness   ____ Financial, economic, business, and entrepreneurial literacy
  ____ Civic Literacy   ____ Health Literacy

Transfer

Students will be able to independently use their learning to:
1. Observe and recognize the use of technology around us.
2. Solve practical problems by using existing technology.
3. Solve practical problems by creating new technology.
4. Evaluate the impact of technology on society and the environment.
5. Recognize a problem and apply critical thinking and problem-solving skills to solve the problem.

Meaning

Understandings	Essential Questions
Students will understand that...	**Students will keep considering...**
U1. The transportation choices they make will affect their futures and futures of their children and beyond.	**Q1.** What is transportation technology? **Q2.** How can transportation technology be used to solve practical problems? **Q3.** How does the way I use transportation affect my life and those of the rest of the world? **Q4.** How can I use technology to become a better problem solver?

Acquisition

Knowledge	Skills
Students will know...	**Students will be able to...**
K1. The difference between a steam engine and a steam turbine. **K2.** How an internal combustion engine works. **K3.** The difference between a four-stroke and a two-stroke engine cycle. **K4.** How to describe the purpose of a crankshaft. **K5.** How to identify differences among various engines. **K6.** How electric motors are used to power locomotives. **K7.** Some factors that affect motion and force. **K8.** The names of different types of land transportation. **K9.** The purpose of transportation subsystems. **K10.** The purpose of a transmission. **K11.** How oceans and inland waterways are used for transportation. **K12.** A list of different types of ships. **K13.** The concept of intermodal transportation. **K14.** Different types of aircraft and spacecraft.	**S1.** Explain how an external combustion engine works. **S2.** Discuss how a hybrid automobile is powered. **S3.** Apply Newton's Laws to real-life applications. **S4.** Discuss ways in which air and space transportation are used. **S5.** Explain how an airplane is lifted into the air. **S6.** Control pitch (up and down movement), yaw (left and right movement), and roll (clockwise or counterclockwise turns) of an airplane. **S7.** Understand potential and kinetic energy. **S8.** Apply and demonstrate the design/problem solving process.

Evidence (Stage 2)

Checks for Alignment	*Evaluation Criteria* *Performance is judged in terms of...*	*Assessment Evidence*

U1
Q1 – Q4
K1 – K14
S1 – S8
	Blooms Taxonomy
	• Remembering
	• Understanding
	• Applying
	• Analyzing
	• Evaluating
	• Creating
		Transfer Task(s)
		Formative
		    • Classroom discussion
		    • Informal observation
		    • Graphic organizers
		    • Handouts/worksheets
		    • Vocabulary databases
		Summative
		    • Self-checks
		    • Rubrics

U1 Q1 – Q4 K1 – K14 S1 – S8	Blooms Taxonomy • Remembering • Understanding • Applying • Analyzing • Evaluating • Creating	**<u>Other Evidence</u>** Formative • Design Portfolio Summative • Design Portfolio

Learning Plan (Stage 3)

Checks for alignment and best practice	**Summary of Key Learning Events and Instruction** *The teaching and learning needed to achieve the unit goals.*	
	Required Activities	**Required Resources**
	Graphic organizers to create a Venn diagram of external combustion engines, to describe the four-stroke engine cycles, to list the part of a hybrid engine, to list the positive and negative features of cars and mass transportation, and to list types of water transportation vessels.	<u>Introduction to Technology</u> textbook pages 448-485.
	Create a database with vocabulary words.	Transportation Power PowerPoint. Transportation Systems PowerPoint.
	Create a water bottle rocket to demonstrate Newton's Laws.	Water bottle, foam core fins, hot glue, plastic stop, paper cone, string, ping pong ball. Water, rocket stand, and bicycle pump. Newton's Laws of Motion PowerPoint.
	Build a balsa wood glider, adding elevators, a rudder, and ailerons; test it, and make observations about the differences.	Balsa wood, glue, rubber bands, rulers, sandpaper, and molding clay.
	Design, build, and test a magnetic levitation vehicle that will travel quickly down a magnetic levitation track.	Foam core chassis, construction paper body, motor with propeller and leads, adhesive tabs, and magnets. Magnetic levitation track and power supply.
	Suggested Activities	**Suggested Resources**
	Simulate an engine.	Small plastic bottle, baking soda, and vinegar.
	Draw a picture of a San Francisco cable car.	Drawing materials and paper.
	Discuss aircraft that fly because they are lighter than air (blimps, zeppelins). Attach weights to a helium-filled balloon to see how much weight it will lift.	Helium-filled balloon and weights.
	Using the design process, build and test a mousetrap car.	Various mousetrap car materials. Mousetrap.

Strategies for Differentiation

Students Below Target:	Students Meeting or Exceeding Target:
Paired/Group Activity	Cooperative Learning
Cooperative Learning	Independent Study
Learning Buddies Extended time Choice menus	Internet based mini-lesson
Self-Check modifications Varied rubrics	Choice menus Varied rubrics Paired/Group Activity

TEXTBOOK Resources

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