

Englewood Public School District

Technology

Grades 6-8

The Nature of Technology

Overview: Over the course of the school year, students will study and implement the use of technology throughout the core subjects. Students will research technology, solve problems, and create their own technologies to address issues in science, social studies, mathematics, and English language arts.

Time Frame: One school year

Enduring Understandings:

Technology is an integral part of 21st century life and skills.

Technology made for one purpose can be used to solve additional problems.

Essential Questions:

How can we make the best use of technology?

How does the enormous increase in knowledge and information affect society today?

What are the risks and rewards of using technology?

Standards	Topics and Objectives	Activities	Resources	Assessment
8.2.A Creativity and Innovation 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	Topics Characteristics and Scope of Technology Core Concepts of Technology Technology and Other Fields Twenty-First Century Themes and Skills include: <ul style="list-style-type: none"> Informational Literacy Media Literacy ICT Literacy Creativity and Innovation Critical Thinking and 	<u>Computer vs. Paper Models</u> Students will analyze computer and paper models of faults based on their relative strengths and limitations. Grade 6 Science, MP 1 – Earth Systems – Plate Tectonics, Earthquakes, & Volcanoes <u>Gravity-Fed Water Systems</u> Students will design a water delivery system to aid developing communities in the <u>Gravity-Fed Water System Activity</u> . Grade 6 Science –	Computer vs. Paper Models Folds, Faults and Mountains https://ees.as.uky.edu/sites/default/files/elearning/module10s/wf.swf Gravity-Fed Water System Teach Engineering https://www.teachengineering.org/activities/view/cub_gravityfed_activity1 Greywater, Teach Engineering https://www.teachengineering.org/activities/view/cub_huma	Students will be evaluated on the quality of their participation and completion of the activities: 1. Computer vs. Paper Models 2. Gravity-Fed Water Systems 3. Greywater 4. Life Support Systems 5. Create a Colony 6. Marine Food Web and Human Impact 7. Cells to Tissues 8. Playing with Parachutes 9. All the Energy in the

the system.	Problem Solving	MP2 – Rocks and Minerals	nwatercycle_lesson01_activit	Universe
8.2.8.A.3 Investigate a malfunction in any part of a system and identify its impacts.	Communication and Collaboration		yl	
8.2.8.A.4 Redesign an existing product that impacts the environment to lessen its impact(s) on the environment.	Objectives	<u>Greywater</u> Students will model the amount of “greywater” generated in a home and propose solutions to reduce water waste in the Shades of Grey(water) activity . Grade 6 Science – MP2 – Rocks and Minerals	Modeling Marine Food Webs and Human Impact, NSTA http://ngss.nsta.org/Resource.aspx?ResourceID=516	
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.	<ul style="list-style-type: none"> Students will describe the nature of technology and the consequences of technological activity. Students will describe how components of a technological product, system, or environment interact. Students will describe how one technological innovation can be applied to solve another human problem that enhances human life or extends human capability. Students will describe how technological activity has an affect on economic development, political actions, and cultural change. Students will explain the cultural and societal effects resulting from the dramatic increases of knowledge and information available today. 	<u>Life Support Systems</u> In English, Social Studies and/or Science students will design a life support system that would allow humans to live in every level of the atmosphere taking into consideration changes in temperature, pressure, and radiation. <u>Create a Colony</u> Based on research about the solar system, students will <i>Create a Colony</i> by selecting a place for future colonization and developing a plan for addressing all basic human needs in that environment. Grade 6 Science – MP4 – Space Systems <u>Marine Food Web and Human Impact</u> Students develop food webs and investigate human impacts on marine ecosystems in Modeling Marine Food Webs and Human Impact . Grade 7 Science – MP3 –	Cells to Tissues, Better Lesson http://betterlesson.com/lesson/632404/cells-to-tissues-to-organs?grade=19&subject=2&from=bl_directory_no-keywords_middle-school_human-anatomy--physiology-and-body-systems_mt-lesson_632404_title Playing with Parachutes, Try Engineering www.tryengineering.org/lessons/playingwithparachutes.pdf All the Energy in the Universe TedEd http://ed.ted.com/lessons/all-of-the-energy-in-the-universe-is-george-zaidan-and-charles-morton	

Matter and Energy in
Organisms and Ecosystems

Cells to Tissues

Students will model how the body is a system of interacting subsystems by completing the lesson [From Cells to Tissues to Organs](#). Grade 7 Science – MP4, Unit 8 – Living Things and Body Systems

Playing with Parachutes

Student will experiment with different parachute designs in the lab [Playing with Parachutes](#). Grade 8 Science – MP2 – Force and Motion

All the Energy in the Universe

Students will watch the video [All the Energy in the Universe is...](#) and trace the path energy in an everyday activity. Grade 8 Science – MP3 – Relationship Among Forms of Energy

8.2.B Technology and Society

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.

Topics	Classroom Paper Recycling	Classroom Paper Recycling, Try Engineering	Students will be evaluated on the quality of their participation and completion of the activities:
The Effects of Technology	Lesson focuses on how engineers and others have developed and improved the manufacturing of recycled paper. Students work in teams to recycle and manufacture their own recycled paper while learning how recycled paper is manufactured on a larger scale in paper facilities.	http://tryengineering.org/sites/default/files/lessons/paper.pdf	1. Classroom Paper Recycling
Technology and the Environment	Student teams evaluate current processes for creating paper and develop	Decision Making: Scarcity, Opportunity Cost, and You	2. Decision Making: Scarcity, Opportunity Cost, and You
Societal Use of Technology		Council of Economic Education	3. Genetically Modified Seeds
Technology and History		www.councilforeconed.org/lesson.../lessons/.../lessons/Focus_Personal_Decision_Making_sample_lesson.pdf	4. Consumption
Twenty-First Century Themes and Skills include:			5. Trip Tally: Discovering Environmental Solutions
• Informational Literacy			

<p>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. Research examples of how humans can devise technologies to reduce the negative consequences of other technologies and present your findings.</p> <p>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.</p> <p>8.2.8.B.5 Identify new technologies resulting from the demands, values, and interests of individuals, businesses, industries and societies.</p> <p>8.2.8.B.6 Compare and contrast the different types of intellectual property including copyrights, patents and trademarks.</p> <p>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.</p>	<ul style="list-style-type: none"> • ICT Literacy • Creativity and Innovation • Critical Thinking and Problem Solving • Communication and Collaboration <p style="text-align: center;">Objectives</p> <ul style="list-style-type: none"> • Students will gain a strong understanding of the need and importance of sustainability on product design. • Students will identify the positive and negative impact of a given product. • Students will conduct research to better understand the ethical issue of a given product. • Students will conduct research to learn more about the negative consequences of some technologies. • Students will explain how new technologies are developed based upon societal demands and needs. • Students will gain a strong understanding of intellectual property rights. • Students will investigate the process of upcycling a given product. 	<p>improvement to the procedure. Try Engineering</p> <p>Students examine recycling of tires to identify the impact of its ecological footprint during the tires' life cycle.</p> <p>Students analyze and present alternative methods to reduce waste during one stage of the product life cycle, minimizing human impact on the environment.</p> <p>Students use technology to collaborate, produce and publish research to increase awareness in the community demonstrating the impact of upcycling to individuals and society.</p> <p><u>Decision Making: Scarcity, Opportunity Cost, and You</u> During this lesson, students will identify the opportunity cost in examples of personal decision-making. Additionally, students will describe the trade-offs involved in their choices. Council of Economic Education</p> <p><u>Genetically Modified Seeds</u> During this lesson students will consider the prevalence of genetically modified seeds in the food supply. And students will select the three most important benefits</p>	<p>Genetically Modified Seeds, PBS Learning http://www.pbs.org/pov/foodinc/lesson-plan-3/</p> <p>Consumption, No Impact Projects http://noimpactproject.org/educators-middle-high-school-environment-curriculum/html/consumption-lesson-plan/</p> <p>Trip Tally: Discovering Environmental Solutions, Northeast Sustainability Energy Association https://www.edutopia.org/environmentally-conscious-lesson-ideas</p> <p>Environmental Explorers, National Geographic Society https://www.edutopia.org/environmentally-conscious-lesson-ideas</p> <p>The Trash We Pass, Redefining Progress http://rprogress.org/education/lesson_plans.htm</p> <p>Clean It Up! Teach Engineering https://www.teachengineering.org/lessons/view/cub_lifescience_lesson04</p> <p>Generators: Three Mile Island vs. Hoover Dam, Teach Engineering https://www.teachengineering.org</p>	<ol style="list-style-type: none"> 6. Environmental Explorers 7. The Trash We Pass 8. Clean It Up! 9. Generators: Three Mile Island vs. Hoover Dam
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and/or controversies related to the use of genetically modified seeds and explain their significance in a position paper. PBS Learning org/lessons/view/duk_powergen_tech_less

Consumption

This lesson plan features the film and book from the project, *No Impact Man*, which follows a family in New York City as they examine how they live, exchange old habits for more environmentally-friendly ones, and discover in the process that such changes actually make them happier and healthier. No Impact Projects

Trip Tally: Discovering Environmental Solutions

What impact does car transportation have on the local environment? That's the key question this lesson aims to ask and answer as students conduct a simple air pollution experiment and analyze the findings in the context of their own weekly trip tally, which documents their comings and goings about town by car, foot, bike, and public transportation. Northeast Sustainability Energy Association

Environmental Explorers

This lesson calls upon observation and analysis skills

as students explore and then discuss the changes that have been made to the natural environment. Students observe and document natural and human features in their locale (during a walk around the neighborhood or a trip downtown, for example), and evaluate the impact of changes made by humans, such as the leveling of an area for a subdivision or the damming of a local stream or river. National Geographic Society

The Trash We Pass

A day's worth of classroom garbage becomes the basis for this lesson, which explores the amount of waste students (and their schools, families, and community) produce each day, and the impact of all this trash on the environment. Faced with the dirty truth about how much trash they accumulate, students are asked to brainstorm how to reduce their waste production (by using less, recycling more, and so on) and then to put their newfound knowledge to further use by taking action in their community. Redefining Progress

Clean It Up!

Students learn about a special branch of engineering called bioremediation, which is the

use of living organisms to aid in the clean-up of pollutant spills. Students learn all about bioremediation and see examples of its importance. In the associated activity, students conduct an experiment and see bioremediation in action!
Teach Engineering

Generators: Three Mile Island vs. Hoover Dam

Students are given a history of electricity and its development into the modern age—an energy lifeline upon which our society so depends. A range of methods of electrical power generation are introduced—turbines, hydroelectric, steam, fuel cells, solar power and wind power—along with further discussion of each technology's pros and cons.
Teach Engineering

8.2.C Design

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

Topics	Chemical Reaction Design Challenge	Chemical Reactions and Design Challenge, Middle School Chemistry	Students will be evaluated on the quality of their participation and completion of the activities:
Attributes of Design	Students will engage in an engineering Chemical Reactions and Design Challenge .	http://www.middleschoolchemistry.com/lessonplans/chapter6/lesson11	1. Chemical Reaction Design Challenge
Applications of Engineering Design	Grade 8 Science – MP2 – Chemical Reactions	Bumper Boats, Better Lesson http://betterlesson.com/lesson/634470/newton-s-second-and-third-laws-of-motion-bumper-boats-investigation	2. Bumper Boats
Inventions and Innovations	Bumper Boats		3. Energy Forms
Twenty-First Century Themes and Skills include:	Students will design solutions for colliding objects in the Bumper Boats Activity .		4. Transition to Digital Television
<ul style="list-style-type: none"> Informational Literacy ICT Literacy Creativity and Innovation 	Grade 8 Science – MP2 –	Energy Forms and Changes,	5. Copycat Engineers

<p>of a technological product or system, from the perspective of the user and the producer.</p> <p>8.2.8.C.4 Identify the steps in the design process that would be used to solve a designated problem.</p> <p>8.2.8.C.5 Explain the interdependence of a subsystem that operates as part of a system.</p> <p>8.2.8.C.5.a Create a technical sketch of a product with materials and measurements labeled.</p> <p>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.</p> <p>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.</p> <p>8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to</p>	<ul style="list-style-type: none"> • Critical Thinking and Problem Solving • Communication and Collaboration <p>Objectives</p> <ul style="list-style-type: none"> • Students will demonstrate and explain how the design process is not linear. • Students will use hands on activities to analyze products and systems to determine how the design process was applied to create the solution. • Students will identify a technological problem and use the design process to create an appropriate solution. • Students will describe how variations in resources can affect solutions to a technological problem. • Students will select and safely use appropriate tools and materials in analyzing, designing, modeling or making a technological product, system or environment. • Students will collaborate to make a new product including a sketch of the product using accurate measurements and appropriate details. 	<p>Force and Motion</p> <p><u>Energy Forms</u> Students will explore heat transfer and build their own systems in the simulation Energy Forms and Changes. Grade 8 Science – MP3 – Thermal Energy</p> <p><u>Transition to Digital Television</u> Students will gain a fundamental understanding of the transition from analog television to digital with a scientific and policy perspective. They will then develop a presentation to inform consumers of the upcoming digital TV transition in the lesson Transition to Digital Television. Grade 8 Science – MP4 – the Electromagnetic Spectrum</p> <p><u>Copycat Engineers</u> Students are introduced to the idea of biomimicry—or looking to nature for engineering ideas. Biomimicry involves solving human problems by mimicking natural solutions. Students learn about a few fun examples of the many creative and useful instances of biomimicry. Teach Engineering</p>	<p>Colorado.edu www.SCHSFormsandTranformationsofEnergy-pdf.pdf</p> <p>Copycat Engineers, Teach Engineering https://www.teachengineering.org/lessons/view/cub_lifescience_lesson03</p> <p>Transition to Digital Television, PBS www.pbs.org/newshour/spc/t henews/materials/digitalconversion_lessonplan.pdf</p>
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peers.

8.2.D **Abilities for a Technological World**

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

Topics			
Apply the Design Process	<u>Keep It Cool</u> Students will engineer a thermos in the Keep It Cool activity. Grade 8 Science – MP3 – Thermal Energy	Keep It Cool, Try Engineering www.Kepticool.pdf	Students will be evaluated on the quality of their participation and completion of the activities: 1. Keep It Cool 2. Cause for Alarm 3. Are Dams Forever? 4. Are You in Control?
Technological Products and Systems		Are Dams Forever?, Teaching Engineering https://www.teachengineering.org/lessons/view/cub_dams_lesson08	
Impact of Products and Systems	<u>Cause for Alarm</u> Students will design an alarm system in Chapter Project (p33) Cause for Alarm. Grade 8 Science – MP4 – Types of Interactions	Are You in Control, Teach Engineering https://www.teachengineering.org/lessons/view/cub_airplane_lesson07	
Twenty-First Century Themes and Skills include: <ul style="list-style-type: none">• Informational Literacy• ICT Literacy• Creativity and Innovation• Critical Thinking and Problem Solving• Communication and Collaboration	<u>Are Dams Forever?</u> Students learn that dams do not last forever. Similar to other human-made structures, such as roads and bridges, dams require regular maintenance and have a finite lifespan. Many dams built during the 1930-70s, an era of intensive dam construction, have an expected life of 50-100 years. Teach Engineering		
Objectives <ul style="list-style-type: none">• Students explain technological advances in medical, agricultural, energy and power, information and communication, transportation, manufacturing, and construction technologies.• Students will explain reasons why human-designed systems, products, and environments need to be monitored, maintained, and improved to ensure safety, quality, cost	<u>Are You in Control?</u> Students learn about airplane control surfaces on tails and wings, and engineering testing wherein one variable is changed while others are held constant. Through the associated activity, they compare the performance of a single paper airplane design while changing its shape, size and flap positions. Teach Engineering		

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.

- efficiency, and sustainability.
- Students will explain the functions and interdependence of subsystems such as waste disposal, water purification, electrical, structural, safety, climatic control, and communication.
- Students will identify how the process used to construct a new product can be revised to limit the impact on the environment.

8.2.E Computational Thinking: Programming

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,

Topics				
Tools Used in Design and Engineering	Brain is a Computer Students learn about the similarities between the human brain and its engineering counterpart, the computer. Since students work with computers routinely, this comparison strengthens their understanding of both how the brain works and how it parallels that of a computer. Students are also introduced to the "stimulus-sensor-coordinator-effector-response" framework for understanding human and robot actions. Teach Engineering	Brain is a Computer, Teach Engineering https://www.teachengineering.org/lessons/view/umo_ourbod_ies_lesson01		Students will be evaluated on the quality of their participation and completion of the activities:
Twenty-First Century Themes and Skills include:				
<ul style="list-style-type: none"> Informational Literacy ICT Literacy Creativity and Innovation Critical Thinking and Problem Solving Communication and Collaboration 		Basic Computer Hardware and Software, ACMP www.arcticclimatemodeling.org/lessons/.../acmp_k4_DataAnalysisAndDisplay_BasicComputerHardwareAndSoftware.pdf		<ol style="list-style-type: none"> Brain is a Computer Basic Computer Hardware and Software Computer Comparison Project Get Creative with Programming The Alice Project Code Combat
Objectives				
<ul style="list-style-type: none"> Students will consider how computers are used in different careers. Students will explain the relationship of hardware to software. 	Basic Computer Hardware and Software This lesson is an introduction to basic computer hardware	Computer Comparison Project Alabama Learning Exchange http://alex.state.al.us/lesson_view.php?id=4741		
		Get Creative with Programming, Scratch https://scratch.mit.edu/		
		The Alice Project		

RAM, ROM, Boolean logic terms).

- Students will learn basic programming language and develop an algorithm to solve an assigned problem.

and software. If possible, have one or more types of computers available to show students the hardware components found on different computer models. A multimedia projector can be used to show students the different types of software described in the lesson.
ACMP

Computer Comparison Project

In this collaborative project students compare computer hardware and software. Students input data and summarize as a class.
Alabama Learning Exchange

Get Creative with Programming

Instructors can select from a large variety of online games, lessons and activities to introduce students to computer programming.
Scratch

The Alice Project

This site is educational software that teaches students computer programming in a 3D environment. Alice.org

Code Combat is a platform for students to learn computer science while playing through a real game.

www.Alice.org

Code Combat
<https://codecombat.com/>

Modifications:

- New Jersey Department of Education – Instructional Supports and Scaffolds
- Suggested Strategies for English Language Learners
- The Nature of Technology curricula provides enrichment activities that allow for greater personalized learning to meet the needs of all learners including students with gifts and talents.

Vocabulary:

Analyze - To study something carefully in order to understand it or learn more about it.

Anti-Virus - An application designed to search for viruses and repair files on a computer.

Assess - To judge or figure out the value of something, both good and bad values.

Copyright Law - The law that protects the exclusive legal right to reproduce, publish, sell, or distribute the matter and form of something.

Credits - To give reference to the creator and source of the information used in a presentation.

Define - To describe something exactly.

Design: Loosely defined, the art of creating something that does not exist.

Derive - To get something from a source.

Distance learning - Situation in which the instructor and students are separated by time, location, or both. Courses are delivered to remote locations via synchronous or asynchronous means.

Drawing - A sketch, plan, or design. E-learning - Education via the Internet, network, or standalone computer.

Network- Enabled transfer of skills and knowledge. E learning refers to using electronic applications and processes to learn.

E-learning applications and processes include Web-based learning, computer-based learning, virtual classrooms, and digital collaboration.

E-books - A book composed in or converted to digital format for display on a computer screen or handheld device.

Ergonomics - The science of designing products and structures around the people who use them, It is also called human factors analysis.

Feature - A characteristic of a passage.

Freeware - Software written and then donated to the public, so anyone is free to copy it and share it with their friends. This is not the same as shareware or commercial software, which is supposed to be paid for.

Function - The purpose for which something is designed or used.

Goal - The desired result or achievement of a proposed solution.

Interpret - To find or explain the meaning of something.

Intellectual Property - The property (as an idea, invention, or process) that derives from the work of the mind or intellect related topic to another.

Justify - To defend or prove a response using specific examples.

Methodology - A group of methods, hypotheses, and rules used by a field of study to resolve problems or to maintain useful practices.

Model - An example that shows the construction or appearance of something.

Netiquette -Etiquette governing communications on the Internet.

Predict - To estimate (guess) future events based upon present and past information.

Personal Information - Information about yourself such as name, address, phone number, birthday or any family members' information.

Problem Solving - The process of working through details of a problem to reach a solution.

Process - A number of actions done to make a special thing happen.

Prototype - A full scale working model, the original or model on which something is based or formed.

Public Domain - Software written and then donated to the public. Anyone can use and copy public domain software free of charge, but it is not always the same quality as commercial software.

Quality Control - a process that includes all the systems and programs that ensure the outputs of technological systems will meet engineering standards and customer expectations Shareware - Software that can be tried before you purchase.

Sketch - A rough design, plan, or draft, of a possible solution.

Source - A firsthand document or primary reference work.

Specifications - A detailed description or assessment of requirements, dimensions, and materials, etc.

Structure - Something built; or the way parts go together and work together.

Theory - An idea or set of ideas about how and why things work together.

Vandalism - The intentional act of destroying computer files or computer networks.

Vary - To change something.