# Englewood Public School District
# Technology
# Grades 3-5

## 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 can be used to enhance what we learn.
Technology adapts to meet new challenges and solve new problems.

**Essential Questions:**
*How can we make the best use of technology?*
*How does technology relate to other subjects we learn about?*
*What makes a system function?*

| Standards | Topics and Objectives | Activities | Resources | Assessments |
|---|---|---|---|---|
| 8.2.A Creativity and Innovation<br><br>8.2.5.A.1 Compare and contrast how products made in nature differ from products that are human made in how they are produced and used.<br><br>8.2.5.A.2 Investigate and present factors that influence the development and function of a product and a system. | **Topics**<br><br>Characteristics of Technology<br><br>Relationship of Technology and Other Fields<br><br>Twenty-First Century Themes and Skills include:<br>• Informational Literacy<br>• Media Literacy<br>• Creativity and Innovation<br>• Critical Thinking and Problem Solving<br>• Communication and | **Natural vs. Man-made**<br><br>Natural Resources<br>Instructors can select from a variety of lesson plans regarding natural resources, SMCPS<br>• Recycling: Make a Map<br>• Earth Awareness: What's Our Cause?<br>• How Oil Production Can Impact Oceans<br><br>Students will bring items to school that reflect the two | Natural or Man-Made, SMCPS https://schools.smcps.org/gkes/images/Natural_or_Man-Made-.pdf<br><br>Natural Resources Bingo, California Academy of Sciences https://www.calacademy.org/educators/lesson-plans/natural-resources-bingo<br><br>Group Product-Pitch Presentations, Scholastic http://www.scholastic.com/teachers/lesson-plan/group-product- | Students will be evaluated on the quality of their participation and completion of the activities:<br>1. Natural Resources<br>2. Natural Resources Bingo<br>3. Group Product-Pitch Presentations<br>4. Technology: Past, Present, and Future |

8.2.5.A.3 Investigate and present factors that influence the development and function of products and systems, e.g., resources, criteria and constraints.

8.2.5.A.4 Compare and contrast how technologies have changed over time due to human needs and economic, political and/or cultural influences.

8.2.5.A.5 Identify how improvement in the understanding of materials science impacts technologies.

Collaboration

**Objectives**

- Students will consider the qualities of natural vs. man-made products.
- Students will investigate the factors that influence the development of a given product.
- Students will consider the resources, criteria and constraints of the development of a given product.
- Students will gain an understanding of the impact of technology over time.
- Students will identify an understanding of how new understandings in science impact technology.

categories, natural vs. man-made.

Natural Resources Bingo
Students will learn what types of natural resources are used to make objects we use every day by playing Natural Resources Bingo. California Academy of Sciences

**Product Design**

Group Product-Pitch Presentations
Students will work in teams to create a new and unique product. They will use their public speaking skills in a presentation that advertises their product. Scholastic

Students will create a drawing of a product or device that communicates its function to the peers.

After reading a book on goods and services, students will explain why we need to make new products.

In small groups, students will consider how to improve a product that is used in the classroom.

Students will complete a research project on an inventor/invention. The student then modifies the invention to meet needs of today's society.

pitch-presentation

Technology: Past, Present, and Future, Science NetLinks
http://sciencenetlinks.com/lessons/technology-past-present-and-future/

**Teacher Resources:**

Natural Resources, Brain Pop
https://educators.brainpop.com/bp-jr-topic/natural-resources/

| | | **Impact of Technology** | | |
|---|---|---|---|---|
| | | Technology: Past, Present, and Future<br>In this lesson, students examine a number of technological innovations that have occurred since the beginning of humanity. As they become familiar with these needs-based inventions, they are prompted to consider how they helped change the way people lived and how societies work.<br>Science NetLinks<br><br>The class will make a list and identify how technology impacts or improves life and are designed to meet human needs.<br><br>Students will conduct simple research and identify how the ways people live and work has changed because of technology. | | |
| **8.2.B Technology and Society**<br><br>8.2.5.B.1 Examine ethical considerations in the development and production of a product through its life cycle.<br><br>8.2.5.B.2 Examine systems used for recycling and recommend simplification of the systems and share with product developers. | **Topics**<br><br>The Effects of Technology<br><br>Societal Use of Technology<br><br>The Influence of Technology on History<br><br>Twenty-First Century Themes and Skills include:<br>• Informational Literacy<br>• Media Literacy<br>• ICT Literacy | **Life Cycle of Products**<br><br>The instructor will generate a class discussion about how electricity impacts our lives.<br><br>Life Cycles<br>Students extend their knowledge of matter and energy cycles in organisms to engineering life cycle assessment of products. They learn about product life cycle assessment and the flow of | Life Cycles, Teach Engineering<br>https://www.teachengineering.org/lessons/view/cub_life_lesson01<br><br>Product Life Cycle, PBS Learning<br>http://florida.pbslearningmedia.org/resource/lpsc10.sci.life.lp_product/product-life-cycle/<br><br>From Cradle to Grave: Product Lifecycles, Teachers Try Science<br>http://www.teacherstryscience.or | Students will be evaluated on the quality of their participation and completion of the activities:<br>1. Life Cycles<br>2. Product Life Cycle<br>3. From Cradle to Grave: Product Lifecycles<br>4. Buyer's Choice<br>5. Feed the Bin<br>6. How Computers and Electronics are Recycled |

8.2.5.B.3 Investigate ways that various technologies are being developed and used to reduce improper use of resources.

8.2.5.B.4 Research technologies that have changed due to society's changing needs and wants.

8.2.5.B.5 Explain the purpose of intellectual property law.

8.2.5.B.6 Compare and discuss how technologies have influenced history in the past century.

- Critical Thinking and Problem Solving
- Communication and Collaboration

**Objectives**

- Students will develop an initial understanding of the ethical considerations in the development of the new products and their life cycle.
- Students will gain an understanding of recycling and make suggestions for simplifying the process.
- Students will consider how materials are disposed of improperly and suggest ways to improve.
- Students will investigate how technology has changed to meet new needs and wants.
- Students will explain what intellectual property law is and why it is important.
- Students will explain the impact that technology has had in the 21st century.

energy through the cycle, comparing it to the flow of nutrients and energy in the life cycles of organisms. Teach Engineering

Product Life Cycle
In this lesson, students apply geographic knowledge and critical thinking skills to consider where materials come from. By examining objects from their own backpacks or the classroom garbage can, students piece together the objects' "life stories" and discuss implications for disposal and biodegradation. PBS Learning

From Cradle to Grave: Product Lifecycles
Students will learn that products have life cycles that can be compared to the life cycles of living things. Throughout the lesson, students will consider where products come from and how the life cycle of a product can impact the environment. Teachers Try Science

**Recycling and Disposal**

Buyer's Choice
By making very simple changes in our purchases, we can prevent waste by not generating it in the first place. Such changes include making purchases of high quality,

g/lp/cradle-grave-product-lifecycles

Buyer's Choice, Greening Schools
http://www.greeningschools.org/resources/view_cat_teacher.cfm?id=8

Feed the Bin, WakGov
http://www.wakegov.com/recycling/recycle/ftb/pages/lessonplans.aspx

How Computers and Electronics Are Recycled, Sims Recycling Global
https://youtu.be/Iw4g6H7alvo

What is Intellectual Property? Street Law, Inc.
http://www.educateip.org/images/pdf/FINAL+Lesson+1.pdf

Technology at Work, Discovery Education
http://www.discoveryeducation.com/teachers/free-lesson-plans/technology-at-work.cfm

Technological Artifacts and the Evolution of the Student Desk, Learn NC
http://www.learnnc.org/lp/pages/5543

7. Expository Essay
8. What is Intellectual Property?
9. Technology at Work
10. Technological artifacts and the evolution of the student desk

durable products, reusing what we can, and recycling as much as possible. Greening Schools

Feed the Bin
During this lesson, students will identify items that can be recycled from those that cannot. Additionally, students will sort and match items based on whether they are recyclable or not. WakGov

Students will create a brochure showing recycle, renew, reuse.

How Computers and Electronics are Recycled
Students will discuss how computers are disposed of properly and then watch a video on the subject. Sims Recycling Global

Students will write an expository essay about how disposing of materials properly impacts the environment.

Students will conduct on-site research and identify how their school recycles.

Students will research how NJ is developing renewable energy sources.

Students will design their own energy source (windmill; solar panels; etc.) with simple designs and a plan for how to develop them.

## Intellectual Property

The students will be given specific details of the purpose of trademarks and products in the global society with consideration of the proper ethics.

What is Intellectual Property?
In this lesson, students focus on the basic building blocks of intellectual property law. They will participate in an interactive strategy and connect intellectual property with everyday life. Street Law, Inc.

## Evolution of Technology

Technology at Work
During this lesson students will learn that the history of technology began in prehistoric times.  Discovery Education

Technological Artifacts and the Evolution of the Student Desk
In this lesson, students discuss a variety of definitions for the word "technology" and the relationships between technology, science, and society. Learn NC

| | **Topics** | **Components of Design** | Elements of Design, Kid Courses | Students will be evaluated on the quality of their participation and completion of the activities: |
|---|---|---|---|---|
| 8.2.C Design  8.2.5.C.1 Collaborate with peers to illustrate components of a designed | Attributes of Design  Application of Engineering Design | Students will develop a business: brochure; trademark; budget; and marketing plan. | http://kidcourses.com/lessons-on-elements-design-coloring-sheet/ | 1. Elements of Design 2. My School as a System |

system.

8.2.5.C.2 Explain how specifications and limitations can be used to direct a product's development.

8.2.5.C.3 Research how design modifications have lead to new products.

8.2.5.C.4 Collaborate and brainstorm with peers to solve a problem evaluating all solutions to provide the best results with supporting sketches or models.

8.2.5.C.5 Explain the functions of a system and subsystems.

8.2.5.C.6 Examine a malfunctioning tool and identify the process to troubleshoot and present options to repair the tool.

8.2.5.C.7 Work with peers to redesign an existing product for a different purpose.

Invention and Innovation

Twenty-First Century Themes and Skills include:
- Informational Literacy
- Media Literacy
- ICT Literacy
- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

**Objectives**

- Students will create an illustration that displays the components of a system.
- Students will consider how to direct a product's development.
- Students will explain how design modifications have evolved into new products.
- Students will participate in several STEM projects in order to collaborate and design solutions to real-world problems.
- Students will suggest ways to repair a broken product.
- Students will consider how to repurpose a given product.

Students will conduct a survey, and then based upon the results suggest a product based on consumer wants and needs (t-shirt; ice cream flavor; etc.).

Students will bring in the packages of a product and then display how to modify the design to create a new product.

Elements of Design
Instructors can select from a large variety of activities to hone students' understanding of the elements of design. Kid Courses

My School as a System
In this lesson, students will explore systems; they will think about their schools as systems, focusing on a social rather than scientific understanding of the concept. Science NetLinks

**Limitations of Design**

Develop a product, such as a car that would be safer. What features would you put in this Smart car?

Product Design at ArtCenter College of Design
Students watch a video on product design. ArtCenter College of Design

**Problem Solving**

Five Problem-Solving

My School as a System, Science NetLinks
http://sciencenetlinks.com/lessons/my-school-as-a-system/

Product Design at ArtCenter College of Design
https://youtu.be/kv8GSZApW_g

Five Problem-Solving Activities fro Elementary Classrooms, Concordia University
http://education.cu-portland.edu/blog/teaching-strategies/5-problem-solving-activities-for-elementary-classrooms/

Problem-Solving Process, Learning Skills
http://www.eds-resources.com/edcreative.htm

Simple Machines, Science NetLinks
http://sciencenetlinks.com/lessons/systems-1-simple-machines/

3. Product Design at Art Center College of Design
4. Five Problem-Solving Activities for Elementary Classrooms
5. Problem-Solving Process
6. Simple Machines

Activities fro Elementary Classrooms
Classroom problem-solving activities teach children how to engage problems rather than become frustrated with them. Teachers have the opportunity to teach children the proper methods for dealing with stressful situations, complex problems, and fast decision-making. Concordia University

Problem-Solving Process
This lesson covers the problem-solving process using a program example with a student-selected issue or problem to use the process to develop a solution. Learning Skills

Students will collaborate and brainstorm with peers to solve a problem, considering all solutions to provide the best results with supporting sketches or models.

The instructor will present a product that has stopped working. Students will examine the product and then brainstorm ideas to correct the problem.

Students will bring in a product and take it apart, sketch how the parts fit, and put it back together. Next, students will identify the strengths and weaknesses of the product.

Collaboratively, students will apply a design process to solve a simple problem from everyday experiences.

**Systems and Subsystems**

Simple Machines
During this lesson, students will explore the parts of a system and develop their understanding of the interactions between those parts. Additionally, students will engage in troubleshooting and design related to systems. Science NetLinks

Students will describe how technology can help produce products and systems. For example: designing a pizza to satisfy the different tastes of consumers.

Using Inspiration or another mind-mapping tool, students will diagram a living system and its subsystems.

| 8.2.D Abilities for a Technological World  8.2.5.D.1 Identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered. | **Topics**  The Design Process  Technological Products and Systems  Impact of Products and Systems  Use and Twenty-First Century Themes and Skills include: • Informational Literacy | **Problem Solving With Technology**  Students will identify and collect information about a problem that can be solved by technology, generate ideas to solve the problem, and identify constraints and trade-offs to be considered.  Using Creative Thinking and | Design Technology: Children's Engineering, Erin Denniston, LEARN NC http://www.learnnc.org/lp/editions/designtech/contents  Using Creative Thinking and Technology to Solve World Problem, Accenture https://www.plotr.co.uk/_assets/files/view/f9a4b895-baaf-4fdb-9d10-612cac889bc4/pdf | Students will be evaluated on the quality of their participation and completion of the activities: 1. Using creative thinking and technology to solve world problem. 2. Find It with GPS! 3. Going…Going…Gondola! 4. Design Technology: Children's Engineering |

| | | | |
|---|---|---|---|
| 8.2.5.D.2 Evaluate and test alternative solutions to a problem using the constraints and trade-offs identified in the design process to evaluate potential solutions.<br><br>8.2.5.D.3 Follow step by step directions to assemble a product or solve a problem.<br><br>8.2.5.D.4 Explain why human-designed systems, products, and environments need to be constantly monitored, maintained, and improved.<br><br>8.2.5.D.5 Describe how resources such as material, energy, information, time, tools, people and capital are used in products or systems.<br><br>8.2.5.D.6 Explain the positive and negative effect of products and systems on humans, other species and the environment, and when the product or system should be used.<br><br>8.2.5.D.7 Explain the impact that resources such as energy and materials used in a process to produce products or | • Media Literacy<br>• ICT Literacy<br>• Creativity and Innovation<br>• Critical Thinking and Problem Solving<br>• Communication and Collaboration<br><br>**Objectives**<br><br>• Students will identify a problem that can be resolved using technology.<br>• Students will generate alternative solutions to a given problem.<br>• Students will complete a how to report or project.<br>• Students will explain why systems need to be monitored.<br>• Students will gain an understanding of the materials and processes needed to make a given product.<br>• Students will understand the positive and negative effects of a given product.<br>• Students will investigate the impact of a given technology on the environment. | Technology to Solve a World Problem<br>During this lesson, students think creatively and discuss how technology could help to reduce food waste.  Accenture<br><br>Find It with GPS!<br>Students explore how the development of global positioning systems has revolutionized both defense and consumer product engineering. Students work in teams to understand the technology behind GPS, explore current applications, and brainstorm new applications for global use of GPS. Try Engineering<br><br>**Alternative Solutions**<br><br>Going…Going…Gondola!<br>Students will develop an understanding of the complexity of floodwater problems in Venice, Italy and the controversy surrounding the solutions that have been proposed. Students will use critical thinking and problem-solving strategies while learning about the intervention by man in natural environments and how this intervention has continuously created more problems and solutions. PBS Learning<br><br>**How to Report**<br><br>Given a specific task, students | Find it with GPS! Try Engineering<br>www.tryengineering.org/**lessons/**finditgps.pdf<br><br>**Teacher Resource:**<br><br>Problem-Solving Activities with the Help of Technology, EdTech Review<br>http://edtechreview.in/trends-insights/insights/749-problem-solving-activities-with-the-help-of-technology<br><br>Going…Going…Gondola! PBS Learning<br>www.tc.pbs.org/wgbh/nova/education/ideas/media/2914-trantham-overview.doc<br><br>Technology: Past, Present and Beyond, Ohio.gov<br>http://dnet01.ode.state.oh.us/IMS.ItemDetails/LessonDetail.aspx?id=0907f84c805317c4<br><br>Environmental Impact, Baltimore County Public Schools<br>https://www.bcps.org/offices/lis/.../TR.SYMPOSIUM.01_alattimore_071311.docx | 5. Technology: Past, Present and Beyond<br>6. Environmental Impact |

system have on the environment.

will list and demonstrate the steps to complete an everyday task.

**Attributes of Products**

Design Technology: Children's Engineering
Instructors can select from a large variety of children's engineering activities:
1. Aesthetics and Practicality
2. Heat and Temperature
3. Stability
4. Properties of Materials

**Technology and the Environment**

Technology: Past, Present and Beyond
In this lesson students investigate the positive and negative impact that technology has had on society and how it has changed over the years. Students will use pictures, newspapers, magazines and technology tools such as television and computers to find examples of technology and the impact it has had on human life. Ohio.gov

Environmental Impact
Students will develop an environmental impact report for individual invention/innovations.
Baltimore County Public Schools

| 8.2.E Computational Thinking: Programming | Topics | How Computer's Work | All About Computers, Discovery Education | Students will be evaluated |
|---|---|---|---|---|

**8.2.E Computational Thinking: Programming**

8.2.5.E.1 Demonstrate an understanding of how a computer takes input of data, processes and stores the data through a series of commands, and outputs information.

8.2.5.E.3 Using a simple, visual programming language, create a program using loops, events and procedures to generate specific output.

8.2.5.E.4 Use appropriate terms in conversation (e.g., algorithm, program, debug, loop, events, procedures, memory, storage, processing, software, coding, procedure, and data).

**Topics**

Computational Thinking as tools Used in Design

Twenty-First Century Themes and Skills include:
- Informational Literacy
- Media Literacy
- ICT Literacy
- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication and Collaboration

**Objectives**

- Students will gain an understanding of how a computer works.
- Students will create a loop using simple programming language.
- Students will use computer technology language appropriately.

**How Computer's Work**

All About Computers
Students will hone their understanding of how the Internet works. Discovery Education

**Programming**

Bee: Debugging
In this lesson, students will encounter puzzles that have been solved incorrectly. They will need to step through the existing code to identify errors, including incorrect loops, missing blocks, extra blocks, and misordered blocks. Code.org

Why Kids Must Learn to Code
Students will watch a video that explains why it's important to learn how to code. YouTube

Graph Paper Programming
By "programming" one another to draw pictures, students will begin to understand what programming is really about. The class will begin by having students instruct each other to color squares in on graph paper in an effort to reproduce an existing picture. Code.org

Sorting Networks: Beat the Clock
To make computers go faster, it can be a lot more effective to have several slower computers

All About Computers, Discovery Education
http://www.discoveryeducation.com/teachers/free-lesson-plans/all-about-computers.cfm

Bee: Debugging, Code.org
https://code.org/curriculum/course2/10/Teacher#GetStarted

Why Our Kids Must Learn to Code, Youtube.com
https://youtu.be/STRPsW6IY8k

**Teacher Resources:**

Teach our K-8 Intro to Computer Science, CODE.org
https://code.org/educate/curriculum/accelerated-course

Coding in the Classroom: 16 Top Resources, Edudemic.com
http://www.edudemic.com/coding-classroom-16-top-resources/

Computer Science without a Computer, Computer Science Unplugged
http://csunplugged.org/

15+ Ways of Teaching Every Student to Code (Even Without a Computer), Eductopia
https://www.edutopia.org/blog/15-ways-teaching-students-coding-vicki-davis

Computer Vocabulary, Youtube
https://youtu.be/wIORiFBjDrg

Basic Programming Vocabulary,

Students will be evaluated on the quality of their participation and completion of the activities:
1. All About Computers
2. Bee: Debugging
3. Why Kids Must Learn to Code
4. Graph Paper Programming
5. Sorting Networks: Beat the Clock
6. Lightbot
7. Find the Technology
8. Basic Programming Vocabulary

working on a problem than a single fast one. This raises questions about how much of the computation can be done at the same time. Here we use a fun team activity to demonstrate an approach to parallel sorting. It can be done on paper, but we like to get students to do it on a large scale, running from node to node in the network.  Code.org

Computer Programming
Instructors can select from a large variety of games and activities to teach elementary students about basic computer programming. Lightbot

**Computer Vocabulary**

Find the Technology
This simple computer game can be utilized to assist students to consider which objects are considered "technology."
Education City

Computer Vocabulary
Students watch a video game that provides clarity about what the different parts and systems of a computer are. YouTube

Basic Programming Vocabulary
This chart displays basic programming language that can be used in the classroom. Lightbot

Education City

Computer Programming, Lightbot
http://lightbot.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:**

Aesthetics – Pleasing in appearance.

Algorithm – Instruction or set of instructions explaining how to solve a problem.

Brainstorming - Seeking creative solutions to an identified problem

Cause-Effect – What happened and what made it happen.

Constraints – The limits on a design.

Consumer – A person or household that purchases goods or services.

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.

Criteria - The features a product or system must have in order to meet the expectations of the customer.

Design Cycle – The process of creating a model of how computer code can be written to provide the functionality or features to solve the problem described in the problem statement and requirements list.

Engineer – A person who is trained in and uses technological and scientific knowledge to solve practical problems.

Engineering design process: A series of steps used by engineering teams to guide them as they develop new solutions, products or systems. The process is cyclical and may begin at, and return to, any step.

Engineering: The use of science and mathematics to solve problems to improve the world around us.

Function - A factor to consider before buying a product.

Optimize - An act, process, or methodology used to make a design or system as effective or functional as possible within the given criteria and constraints.

Problem – Issue or situation that requires a solution.

Problem Solving/Design Process - the procedure used to develop technology that will attempt to satisfy peoples technological needs and wants.

Processes - The steps needed to complete a series of identifiable tasks within a system.

Prototype - A working model of a system, assembly, or product that is built to test the operation, maintenance, and safety of the item.

Revision Cycle – The process of incorporating review comments about a document into revisions of a later version of the document.

Specifications - A detailed description of the design and materials used to make something.

Trade Off - An exchange of one thing in return for another; especially relinquishment of one benefit or advantage for another regarded as more desirable.