SNAPSHOT

Unit 1 LEARNING CYCLE 1

The History of Technology

ENDURING UNDERSTANDINGS

This Learning Cycle will allow students to explore the evolution of technology throughout history. Students will explore important impacts Inventions and Innovations have made on varying time period throughout history.

BIG IDEA

People are better able to understand the world around them when they explore how people of all times and places have used their unique skills to develop inventions and innovations.

PURPOSE OF THE LEARNING CYCLE

The purpose of this lesson is to explore how technology has evolved through the years and helped humans progress. Knowledge of the history of technology helps us understand our world by showing us how people of different times and places increased their abilities by using their unique skills to innovate, improvise, and invent technology!

LESSON DURATION

of hours 5

HIGHLIGHTS OF THE LEARNING CYCLE

ENGAGE

In their engineering design journal students will respond to the writing prompt (File 1.1.1), "What characteristics do all humans have in common? / How has technology impacted the evolution of man and his/her society?" Students discuss their responses with classmates. (Specifically teachers can use Think Pair Share Strategy as a way for students to discuss their work before they discuss openly with the class.)

EXPLORE

Students will research one of the nine historical stages of technological development (Paleolithic Age, Mesolithic Age, Neolithic Age, Bronze Age, Iron Age, Middle Ages, Renaissance, Industrial Age, and Information Age) to identify important technological developments of the era and how those developments impacted the lives of people (File 1.1.2).

EXPLAIN

The teacher delivers a presentation on technology through the ages (Presentation 1.1.1). The teacher seeks examples and explanations from students for each age based on their work in the Engagement and Exploration activities, e.g., how that artifact influenced the development of other technologies.

ENGINEER (Extend/Elaborate)

Students will use appropriate technology to depict a technological development in history (File 1.1.3). The teacher may have students individually create the presentation or work together. The event should relate to the historical period the student(s) researched in the exploration activity. Students will present the event to the class. Students may alternatively redesign a common board game to include questions that depict the history of technology and the historical periods (File 1.1.4). If time allows, students may play the game.

Teacher Note: This lesson has students create a website and/or use sample web 2.0 technologies that could be used for the Extension activity. If the teacher would like students to use a specific product or a number of the available products, additional preparation on the part of the teacher may be needed.

ENRICH

Students present their presentations or post their presentations to be viewed by the teacher, classmates, or fellow Foundations of Technology students.

EVALUATE

Student knowledge, skills, and attitudes are assessed using brief constructed response items and performance rubrics for class participation, discussion, and design briefs.

UNIT 1 LEARNING CYCLE 1

The History of Technology

STANDARDS/BENCHMARKS

This unit is based on three sets of Standards:
1. Standards for Technological Literacy (STL)
2. Next Generation Science Standards (NGSS)
3. Common Core State Standards (CCSS)

TECHNOLOGY: Standards for Technological Literacy (STL) *(ITEA/ITEEA, 2000/2002/2007)*	
STL 1	**Students will develop an understanding of the characteristics and scope of technology.**
J	The nature and development of technological knowledge and processes are functions of the setting.
STL 14	**Students will develop an understanding of and be able to select and use medical technologies.**
L	Telemedicine reflects the convergence of technological advances in a number of fields, including medicine, telecommunications, virtual presence, computer engineering, informatics, artificial intelligence, robotics, materials science, and perceptual psychology.
STL 15	**Students will develop an understanding of and be able to select and use agricultural and related biotechnologies.**
K	Agriculture includes a combination of businesses that use a wide array of products and systems to produce, process, and distribute food, fiber, fuel, chemical, and other useful products.
STL 16	**Students will develop an understanding of and be able to select and use energy and power technologies.**
J	Energy cannot be created nor destroyed; however, it can be converted from one form to another.
K	Energy can be grouped into major forms: thermal, radiant, electrical mechanical, chemical, nuclear, and others.
STL 17	**Students will develop an understanding of and be able to select and use information and communication technologies.**
L	Information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information.
M	Information and communication systems allow information to be transferred from human to human, human to machine, machine to human, and machine to machine.
STL 18	**Students will develop an understanding of and be able to select and use transportation technologies.**
J	Transportation plays a vital role in the operation of other technologies, such as manufacturing, construction, communication, health and safety, and agriculture.
STL 19	**Students will develop an understanding of and be able to select and use manufacturing technologies.**
M	Materials have different qualities and may be classified as natural, synthetic, or mixed.
O	Manufacturing systems may be classified into types, such as customized production, batch production, and continuous production.

STL 20	**Students will develop an understanding of and be able to select and use construction technologies.**
J	Infrastructure is the underlying base or basic framework of a system.
K	Structures are constructed using a variety of processes and procedures.

SCIENCE: Next Generation Science Standards (NGSS, 2013)	
HS-ESS2-7	Construct an argument based on evidence about the simultaneous coevolution of Earth's systems and life on Earth

MATHEMATICS: Common Core State Standards (CCSS, 2012)	
HSN.Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

ENGLISH-LANGUAGE ARTS: Common Core State Standards (CCSS, 2012)	
RST.9-10.1	Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.
RST.9-10.2	Determine the central ideas or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
RST.9-10.10	By the end of grade 10, read and comprehend science/technical texts in the grades 9-10 text complexity band independently and proficiently.
WHST.9-10.1	Write arguments focused on *discipline-specific content*.
WHST.9-10.2	Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.
WHST.9-10.4	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WHST.9-10.5	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WHST.9-10.6	Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

WHST.9-10.8	Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
WHST.9-10.10	Draw evidence from informational texts to support analysis, reflection, and research.

UNIT OBJECTIVES

CYCLE	BIG IDEA	OBJECTIVES
Learning Cycle 1: Lesson 1. The History of Technology (5 hours)	People are better able to understand the world around them when they explore how people of all times and places have used their unique skills to innovate, improvise, and invent.	Compare and contrast technology that was used during the different historical periods.
		Research a technological device from one of the historical periods that produced long-lasting effects on technology and society.
		Explain that the Industrial Revolution saw the development of continuous manufacturing, sophisticated transportation and communication systems, advanced construction practices, improved education, and leisure time.
		Describe societal events from the 1900s that led to progress in science and invention.
		Select one of the following areas of technology and explain how technology changed the way people live and work: agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications.
		Demonstrate how Information Age devices are used to process and exchange information.
		Contribute to a group endeavor by offering useful ideas, supporting the efforts of others, and focusing on the task.
		Actively participate in group discussions, ideation exercises, and debates.
Total for This Learning Cycle = 5 Hours		

RESOURCE MATERIALS

Note: Books, periodicals, pamphlets, and websites may provide teachers and students with background information and extensions. Inclusion of a resource does not constitute an endorsement, either expressed or implied, by ITEEA.

Audiovisual Materials

1. Christian Heritage Museum. (2008). 1455: Gutenberg's printing press. Retrieved from http://www.youtube.com/watch?v=S-BEI_4D7tQ
2. Dr Moffet. (n.d.). Industrial Revolution. Retrieved from http://www.youtube.com/watch?v=aO3AW0JAHmU&feature=related
3. Prezi. (2012). Interactive presentation tool. Retrieved from http://prezi.com/.

Print Materials

1. Karwatka, Dennis. (1996). *Technology's past.* Ann Arbor, MI: Prakken Publications, Inc.

Internet Search Terms and Suggested Sites

1. Boston University. (n.d.). Iron Age (1200-550 BCE). Retrieved from http://www.bu.edu/anep/Ir.html
2. Backer, Patricia. (n.d.). Technology in the Middle Ages: History of technology. Retrieved from http://www.engr.sjsu.edu/pabacker/history/middle.htm
3. About.com/inventors. (n.d.). Industrial Revolution. Retrieved from http://inventors.about.com/od/indrevolution/Industrial_Revolution.htm
4. Backer, Patricia. (n.d.). The cause of the Industrial Revolution. Retrieved from http://www.engr.sjsu.edu/pabacker/causeIR.htm

REQUIRED KNOWLEDGE & SKILLS (KSB's)

Students should be able to search for information on the Internet and know how to use word processing and presentation software.

ASSESSMENT TOOLS

Assessment Instrument – Quiz

(Pre-/Post-Content Knowledge Questions).

Selected Response Items

1. Comparing tools made of stone, iron, and bronze: place them in the correct order from least to most durable.
    1. Stone, iron, bronze
    2. Iron, bronze, stone
    3. **Stone, bronze, iron**
    4. Bronze, stone, iron

2. Today, the development of tools and machines is based on scientific knowledge and engineering design, however early in the history of technology, the development of tools and machines was based on _____.
    1. Technology and mathematics principles
    2. The engineering design process
    3. **Technical know-how**
    4. Positive and negative effects of using technology
3. Which of the following is an impact technology has had on our society?
    1. Political
    2. Economic
    3. Environmental
    4. **All of the above**
4. What is the most significant result based on the development of windmills and waterwheels?
    1. The rise and fall of feudalism
    2. Humans no longer had to use their muscle to move machines
    3. Popularity of money and capitalism
    4. **Beginning of mechanical labor**
5. Information Age devices are used to process and exchange information. Which of the following does this as its primary function?
    1. iPod
    2. Laptop
    3. GPS receiver
    4. **All of the above**
6. Television is a technological development that occurred during the _____.
    1. Renaissance
    2. **Industrial Age**
    3. Paleolithic Age
    4. Information Age
7. The microscope is a technological development that occurred during the
    1. **Renaissance**
    2. Industrial Age
    3. Paleolithic Age
    4. Information Age
8. Digital photography is a technological development that occurred during the
    1. Renaissance
    2. Industrial Age
    3. Paleolithic Age
    4. **Information Age**
9. The printing press is a technological development that occurred during the
    1. **Middle Ages**
    2. Renaissance
    3. Industrial Age
    4. Information Age

Brief Constructed Response (BCR)
Students are expected to respond to one of the questions described below. Students should provide examples to clarify their response.

1. Cite specific examples of how people have contributed to the advancement of science, mathematics, and technology. Include information on how those advancements have had a political, economic, social, and environmental influence.

2. Select one of the following areas of technology and explain how technology changed the way people live and work: agriculture, manufacturing, sanitation and medicine, warfare, transportation, information processing, and communications.

Assessment Instrument - Brief Constructed Response (BCR)

BCR Rubric

Category	Below Average	Average	Excellent
Understanding	Response demonstrates an implied, partial, or superficial under-standing of the question.	Response is written technically and precisely. The answer demonstrates understanding of the topic.	Response is written technically and precisely. The answer demonstrates understanding of the topic and cites specific examples.
Focus	Response lacks transitional information to show the relationship between the content and the support to the question.	Response addresses the question, includes pertinent information, and remains focused on the topic.	Response addresses the question, cites specific examples, includes pertinent information, and remains focused on the topic. Details are clearly stated and do not detract from the response.
Use of Related Information	Response uses minimal supporting information to clarify or extend meaning.	Response uses expressed and/or implied supporting information that clarifies or extends meaning.	Response uses clear and concise examples as well as supporting information that clarifies or extends meaning.

6-E LESSON PLANNING

UNIT 1 LEARNING CYCLE 1

The History of Technology

ENGAGE
In their engineering design journal students will respond to the writing prompt (File 1.1.1), "What characteristics do all humans have in common? / How has technology impacted the evolution of man and his/her society?" Students discuss their responses with classmates. (Specifically teachers can use Think Pair Share Strategy as a way for students to discuss their work before they discuss openly with the class.)

EXPLORE
Students will research one of the nine historical stages of technological development (Paleolithic Age, Mesolithic Age, Neolithic Age, Bronze Age, Iron Age, Middle Ages, Renaissance, Industrial Age, and Information Age) to identify important technological developments of the era and how those developments impacted the lives of people (File 1.1.2).

(Teaching suggestion: Divide the class into 9 groups. Have each group research one historical era. Students should make a presentation to the class about their specific topic. This process encourages collaboration, writing, and oral presentations which are areas covered by the Common Core.)

> Teacher's Note:
>
> During the explanation, students who researched the specific historical age should be asked to add additional information based on their research.

EXPLAIN
The students will takes notes in their engineering design journals on the content delivered by the teacher and actively participate throughout the presentation.

(Possible Option: Have students view the presentation individually or in groups and write questions based on the content. This process uses inquiry based learning and is a more student centered learning experience.)

The teacher delivers a presentation on technology through the ages (Presentation 1.1.1). The teacher seeks examples and explanations from students for each age based on their work in the Engagement and Exploration activities, e.g., how that artifact influenced the development of other technologies.

- Most technological development has been evolutionary, the result of a series of refinements to a basic invention.
- The evolution of civilization has been directly affected by, and has in turn affected the development of tools and materials.
- Throughout history, technology has been a powerful force in reshaping the social, cultural, political, and economic landscape.

- Early in the history of technology, the development of many tools and machines was not based on scientific knowledge but on technological know-how.

- Paleolithic Age
  - Time period: 500,000 BC – 10,000 BC
  - Description: The archaeological period characterized by the earliest known stone tool manufacture.
  - Artifacts: stone axes, bone needles, hearth sites.
  - Impact of technology on history: Improved diet and enhanced security enabled early humans to increase their numbers.
- Mesolithic Age
  - Time period: 10,000 BC – 4000 BC
  - Description: The period between the Paleolithic and the Neolithic, associated with the rise to dominance of microliths (very small geometric-form tools commonly used in composite tools).
  - Artifacts: leatherwork, basketry, fishing tackle, stone adzes and wooden objects such as canoes and bows, domesticating animals first began, stone circles, hinges.
  - Impact of technology on history: The gradual domestication of plants and animals led to the beginnings of settled communities.
- Neolithic Age
  - Time period: 4000 BC – 2300 BC
  - Description: The period characterized by the development of agriculture and, hence, an increasing emphasis on year-round settlements.
  - Artifacts: pottery, polished stone tools, spinning and weaving tools, wooden and stone plows, and sickles.
  - Impact of technology on history: Dependable year-round food supply enables division of labor and specialization that spurs invention and innovation.
- Bronze Age
  - Time period: 2300 BC – 700 BC
  - Description: Stage of cultural history that includes the earliest civilizations and the development of metallurgy, mainly the combining of copper and tin to make bronze.
  - Artifacts: bronze jewelry, tools, and weapons.
  - Impact of technology on history: The use of bronze was a great technological step, eventually changing the course of everyday life as stone tools were gradually replaced by metal ones that enabled humans to alter their environment at a great rate.
- Iron Age
  - Time period: 700 BC – 450 AD
  - Description: A period of human history characterized by the use of iron as the main metal.
  - Artifacts: iron dagger, iron chisels, small figurines, ornamental jewelry, swords, axes, spearheads.
  - Impact of technology on history: Military dominance for uses of iron weapons and the use of iron-bladed plows enabled humans to cultivate heavier soils and increase food production.
- Middle Ages
  - Time period: 450 – 1400 AD
  - Description: The period of European history between the fall of Rome and the Renaissance, often dated from A.D. 476 to 1453.
  - Artifacts: wheeled plow, improved harness for horses, horseshoes, stirrups, waterwheels, crank, windmill, cast iron, cannons, mechanical clock, compass, ocean-going ships, the printing press
  - Impact of technology on history: The rise and decline of serfdom and feudalism, the rise of the money economy and capitalism, the expansion and contraction of economic activity, and the beginnings of urbanization and industrialization.

- Renaissance/Reformation/Enlightenment
  - Time period: 1400 – 1750 AD
  - Description: The transitional movement in Europe between the Middle Ages and modern times, marked by a humanistic revival of classical influence.
  - Artifacts: telescope, microscope, thermometer, clocks, barometer.
  - Impact of technology on history: Instrumentation enabled early scientists to observe and quantify natural phenomena.
- Industrial Age
  - Time period: 1750 – 1950 AD
  - Description: The cultural stage characterized by the first use of complex machinery, factories, urbanization, and other economic and general social changes from strictly agricultural societies.
  - Artifacts: steam engine, electricity, automobile, airplane, radio, television, telephone, and rocket.
  - Impact of technology on history: The Industrial Revolution gave rise to urban centers requiring vast municipal services, created a specialized and interdependent economic life, and provided the economic base for the rise of the professions, population expansion, and improvement in living standards.
- Information Age
  - Time period: 1950 AD – Present
  - Description: A period of activity starting in the 1950s and continuing today in which the gathering, manipulation, classification, storage, and retrieval of information is central to the workings of society.
  - Artifacts: transistor, integrated circuit, computer, communication satellite, digital photography/camera, artificial heart, nuclear power plant, space shuttle
  - Impact of technology on history: As information becomes more widely available, increasing numbers of individuals and organizations will be in a better position to make decisions that "experts" now make, decentralizing decision making and empower more people.

ENGINEER (EXTEND/ELABORATE)

Students will use appropriate technology to depict a technological development in history (File 1.1.3). The teacher may have students individually create the presentation or work together. The event should relate to the historical period the student(s) researched in the exploration activity. Students will present the event to the class. Students may alternatively redesign a common board game to include questions that depict the history of technology and the historical periods (File 1.1.4). If time allows, students may play the game.

Teacher Note: This lesson has students create a website and/or use sample web 2.0 technologies that could be used for the Extension activity. If the teacher would like students to use a specific product or a number of the available products, additional preparation on the part of the teacher may be needed.

Teacher Note: There are several online tools to help students properly cite sources.

- NoodleTools: http://www.noodletools.com/ allows you to create an account and assists with formatting.
- Citationmachine.net: www.citationmachine.net allows you to select APA style and the type of source.
- Citation Builder: http://www.lib.ncsu.edu/lobo2/citationbuilder/ allows you to enter the information for the source and converts to APA formatting.
- Purdue Owl APA: https://owl.english.purdue.edu/owl/resource/560/01/
- Purdue Owl MLA: https://owl.english.purdue.edu/owl/resource/747/01/
- Microsoft Word (2010) also has built in citation capabilities: http://office.microsoft.com/en-us/word-help/create-a-bibliography-HA010368774.aspx

Teacher Note: There are several tutorials on creating MLA or APA citations.

- Doing Research Tutorial from the University of Illinois at Chicago: http://www.uic.edu/depts/lib/reference/services/tutorials/Tutorial--Final%20Version.swf allows students to walk through a brief introduction to conducting research online.
- MLA / APA Citation Game from the University of Washington: http://depts.washington.edu/trio/quest/citation/apa_mla_citation_game/index.htm allows students to play a game on APA and MLA citations.

ENRICH

Students present their presentations or post their presentations to be viewed by the teacher, classmates, or fellow Foundations of Technology students.

EVALUATE

Student knowledge, skills, and attitudes are assessed using brief constructed response items and performance rubrics for class participation, discussion, and design briefs.

CLASSROOM PREPARATION

UNIT 1 LEARNING CYCLE 1

The History of Technology

TEACHER PREPARATION

The classroom or laboratory must provide a learning environment that provides for lecture and demonstration, small-group meetings, and research activities. This lesson features sample web 2.0 technologies which could be used for the Extension activity, however additional preparation on the part of the teacher may be needed for students to access the product or website.

TOOLS / MATERIALS / EQUIPMENT

Below is a list of supplies and equipment needed to teach this course, assuming a class of 25 students. Optional/additional supplies required for Enrichment Activities are indicated. Where possible and appropriate, merchants are listed that support ITEEA; however, materials may often be obtained from alternative and/or local sources.

Additionally, these materials are based upon the lessons in the course and make no assumptions for classrooms with access to specialized equipment (e.g., fabrication equipment). **If the student has access to specialized equipment, the teacher may wish to incorporate the use of it into the lessons, and additional supplies may be necessary (as well as safety procedures).**

LABORATORY CLASSROOM SAFETY AND CONDUCT

Note: Safety is of paramount importance to every classroom. While this Guide contains some general safety guidelines, it does not address the specific tools, equipment, and working spaces found in any specific classroom. Teachers must provide comprehensive safety guidelines to students based upon individual classrooms.
1. Students use tools and equipment safely, maintaining a safety level for themselves and others in the laboratory-classroom.
2. Students demonstrate respect and courtesy for the ideas expressed by others in the class.
3. Students show respect and appreciation for the efforts of others.

STUDENT RESOURCES

File 1.1.1 Invention/Innovation Writing Prompt
File 1.1.2 Enduring Ideas of Technology Student Survey
File 1.1.3 Evolution of Technology Design Brief
File 1.1.4 Technology Board Game Design Brief

TEACHER RESOURCES

Presentation 1.1.1 History of Technology

VOCABULARY

Technology: the study of the designed world. Used to solve practical problems and extend human capabilities. Developments in technology are evolutionary, and are often the result of a series of refinements to an idea or basic invention.

Impacts of Technology: are divided into four categories: social (the impact on people), political (the impact on policy and laws), cultural (the impact on human achievement), and economic (the impact on the economy).

Paleolithic Age: the Old Stone Age, occurred between 500,000 BC and 10,000 BC and is marked by improvements to diet and security allowing the population to grow.

Mesolithic Age: the Middle Stone Age, occurred between 10,000 BC and 4,000 BC and is marked by the domestication of animals and agriculture.

Neolithic Age: the New Stone Age, occurred between 4,000 BC and 2,300 BC and is marked by specialization, division of labor, and the use of math and documentation of concepts.

Bronze Age: the architectural period that includes combining copper and tin to produce bronze; occurred between 2,300 BC and 700 BC.

Iron Age: the architectural period marked by the use of iron and steel; occurred between 700 BC and 450 AD.

Middle Ages: the architectural period after the Roman Empire; divided into Early Middle Ages, High Middle Ages, and Late Middle Ages; occurred between 450 AD and 1,400 AD and marked by the development of tools of war.

Renaissance: the architectural period marked by the revival of classical influence and the sharing of ideas; occurred between 1,400 AD and 1,750 AD.

Industrial Age: the architectural period marked by the first use of complex machinery, factories and urbanization, occurring between 1,750 AD and 1,950 AD.

Information Age: the architectural period marked by information sharing, gathering, manipulation, and retrieval; occurred between 1,950 AD and present.

Unit 1 LEARNING CYCLE 1

The History of Technology

STUDENT RESOURCES

The following STUDENT RESOURCES follow:

Description	Filename	Purpose
Worksheet	1.1.1 (Word) 1.1.1 (PDF)	Use Worksheet 1.1.1 to prepare student cognitive preparation for lesson.
Worksheet	1.1.2 (Word) 1.1.2 (PDF)	History of Technology Research Online
Worksheet	1.1.3 (Word) 1.1.3 (PDF)	Demonstrate student understanding through use of electronic or web based software.
Worksheet	1.1.4 (Word) 1.1.4 (PDF)	Follow up that will allow students to expand understanding
PowerPoint	Presentation 1.1.1 (ppt.) Presentation 1.1.1 (PDF)	On 2nd day, introduces historical time periods of technology

Name:	Period:	Date:

Foundations of Technology
Unit 1 Learning Cycle 1: Technological Inventions and Innovations
File 1.1.1: History of Technology Writing Prompt

Directions: In your engineering journal, respond to the writing prompts below. Use complete sentences.

What characteristics do all humans have in common?
How have tools impacted the evolution of man and his/her society?

Name:	Period:	Date:

Foundations of Technology
Unit 1 Learning Cycle 1: The History of Technology
File 1.1.2: History of Technology Research Outline

Background	The evolution of civilization has been directly affected by the development of tools and materials, which has in turn created innovation.
Problem	Choose one of the historical periods listed below to research. Use both the Internet and school database systems/media center (such as: SIRS) to find reference material. Cite all sources using APA style, including at least one periodical/book.

1. Paleolithic Age (500,000 BC – 10,000 BC)
2. Mesolithic Age (10,000 BC – 4,000 BC)
3. Neolithic Age (4,000 BC – 2,300 BC)
4. Bronze Age (2,300 BC – 700 BC)
5. Iron Age (700 BC – 450 AD)
6. Middle Ages (450 AD – 1,400 AD)
7. Renaissance/Reformation/Enlightenment (1,400 AD – 1,750 AD)
8. Industrial Age (1,750 AD – 1,950 AD)
9. Information Age (1950 AD – Present)

Procedure	• Choose an historical period to research. • Use the outline provided below to frame your research. • Record all research in your Engineering Design Journal. • Document all sources using APA or MLA citations.
Materials	Computer w/Internet Access School Database System/Media Center

Research Outline:

1. Important technological development A (cite one invention, innovation and/or process developed during the period):

   • How did this invention or innovation assist in completing work? How was work done previously?

   • What social, cultural, political, and economic impacts did this event have on society?

2. Important technological development B (cite one invention, innovation, and/or process developed during the period):

- How did this invention or innovation assist in completing work? How was work done previously?

- What social, cultural, political, and economic impacts did this event have on society?

Citing Sources: Use APA or MLA citations to cite all resources used in your research. Include that information below.

Name:	Period:	Date:

Technology Depiction Design Brief

Background
Technological development has been an evolutionary process. People of all times and places have increased their capability by using their unique skills to innovate, improvise, and invent. The history of technological development has been divided into nine historical time periods: Paleolithic Age, Mesolithic Age, Neolithic Age, Bronze Age, Iron Age, Middle Ages, Renaissance, Industrial Age, and Information Age.

Design Problem
Your teacher has asked you to design and build an interactive presentation using an appropriate technology to depict the historical time period you researched in the Engagement activity. The presentation should include video, pictures, and text depicting the period. All resources should include APA or MLA citations.

Procedure
1. Conclude your research on the historical period.
3. Catalog the information you will use in the presentation.
4. Develop a plan to deliver the content in a logical and sequential way.
5. Develop an interactive presentation using an appropriate technology .
6. Reflect on the social, cultural, political, and economic impacts the development had upon society.
7. Complete APA or MLA citations for all resources.

Materials
Computer w/ Internet access

The following rubric will be used to evaluate your Extension activity:

Category	Below Target	At Target	Above Target
Use of Technology	The student did not use appropriate technology to depict an historical period.	The student chose a technology that allows them to be creative in their presentation of a technological development.	The student chose a technology that allows the presentation to artfully highlight and accurately describe the technological development within the time period.
Representation of the Historical Period	The student did not accurately reflect the historical period.	The student accurately represented the historical period, included pertinent information in his/her depiction, and accurately reflected upon the impact	The student accurately represented the historical period, included pertinent information in their depiction, and accurately reflected upon the impact

		the development had on society.	the development had on the social, cultural, political, and economic impacts on society.
Graphics	The student did not use graphics appropriately.	The student used graphics that depicted the historical period and added to the overall quality of the depiction.	The student used various graphics/formats of graphics to accurately depict the historical period, and the quality of such added to the overall quality of the depiction.
Cite all Resources	The student did not cite or cited only a few of the resources used to develop the depiction.	The student cited most resources in APA or MLA format.	The student cited all resources in APA or MLA format.
Presentation	The information presented was not in a logical sequence.	The information presented was in a logical sequence and addressed all requirements of the assignment.	The information presented was in a logical sequence, addressed all requirements of the assignment, and allowed for audience participation.

UNIT 1 DESIGN BRIEF

Technology Board Game Design Brief

ENDURING UNDERSTANDINGS

This Learning Cycle will allow students to explore the evolution of technology throughout history. Students will explore important impacts Inventions and Innovations have made on varying time period throughout history.

BIG IDEA

People are better able to understand the world around them when they explore how people of all times and places have used their unique skills to develop inventions and innovations.

OVERVIEW & CONTEXT

Students will improve their current content knowledge of historical technology time periods.

DESIGN BRIEF DURATION :

of hours (1)

MATERIALS AND EQUIPMENT

Computer with Internet access.

TEACHER NOTES

As students enter the room, the teacher will group students in pairs and hand them a set of instructions for the activity.

STUDENT MAJOR CONCEPTS/NOTES

- ✓ Teamwork is an essential skill when solving technological challenges. As individuals work in teams they begin to understand that all people have good ideas and can contribute something unique and valuable to the group – if given the opportunity.
- ✓ A design journal is necessary for the development of successful designs. Recognizing that a design journal is an important tool takes time and positive reinforcement.
- ✓ Being able to transpose ideas into two- and three-dimensional realities takes time to adequately develop. Small design challenges, such as the one described in this assessment, will help students further refine their abilities.

FRAMING QUESTIONS

For discussions – list framing questions as a way to
1. What is the difference between design and inquiry?
2. What is STEM literacy and why is it important for all students?
3. Why should STEM education begin in elementary school, and what should it look like?
4. How do I use the Grand Challenges for Engineering to provide a meaningful context for learning?
5. Why should I and how do I integrate inquiry, design, problem-solving, and literacy strategies in one unit?
6. With so many definitions of STEM, how do I create an action plan for my school or district?

Name:	Period:	Date:
Date Started:	Due Date:	
Group Members:		

DESIGN BRIEF

TECHNOLOGY BOARD GAME DESIGN BRIEF

Background   Technological development has been an evolutionary process. People of all times and places have increased their capability by using their unique skills to innovate, improvise, and invent. The history of technological development has been divided into nine historical time periods: Paleolithic Age, Mesolithic Age, Neolithic Age, Bronze Age, Iron Age, Middle Ages, Renaissance, Industrial Age, and Information Age.

Design Problem   Your teacher has asked you to redesign a common board game to depict the historical periods of technology. The board game should include instructions and questions specific to the design problem. All resources should include APA or MLA citations.

Specifications
1. The topic for the nonverbal communication activity must be pre-approved by the teacher and relate to the *Foundations of Technology* course.
2. The nonverbal communication must be electronic; however, it cannot be a technical report/research paper.
3. The nonverbal communication must be designed to persuade, entertain, educate, control, or manage a peer group.
4. If the nonverbal communication is in video format, it cannot exceed one minute in length.

Materials   Computer w/ Internet access

This rubric will be used to evaluate the Design Brief activity:

Category	Below Target	At Target	Above Target
Nonverbal Communication	The student presents a communication that does not align with the specifications or has not be preapproved by the teacher.	The student presents a communication that clearly articulates a purpose, aligns with the specifications, and has been preapproved by the teacher. The message is designed to persuade, entertain, educate, control, or manage a peer group.	The student presents a communication that clearly articulates a purpose, aligns with the specifications, and has been preapproved by the teacher. The message is designed to persuade, entertain, educate, control, or manage a peer group. The communication is creative and captures the audience's attention.

The teacher may also use the following rubric to evaluate the Engineering Design Process:

Category	Below Target	At Target	Above Target
Define Problem	Rephrases the problem with limited clarity.	Develops a problem statement that includes the who, what, when, and how the problem will be addressed. Recorded in the Engineering Folio or EDJ.	Develops a problem statement that is clearly and precisely stated. The problem statement includes the who, what, when, and how the problem will be addressed. Recorded in the Engineering Folio or EDJ.
Brainstorm Possible Solutions	Contributes few or implausible ideas.	Contributes a series of plausible ideas, which are recorded in the Engineering Folio or EDJ.	Contributes multiple plausible ideas, which are expanded upon to show understanding of the concept. All notes are recorded in the Engineering Folio or EDJ.
Research Ideas/ Explore Possibilities	Contributes ideas, but without documented research. Produces incomplete sketches.	Contributes several additional plausible ideas and includes documented research. Produces accurate conceptual models to show the design concepts. All notes are recorded in the Engineering Folio or EDJ.	Contributes many additional plausible ideas and with clearly documented research. Produces accurate conceptual models to show the design concepts with annotated sketches. All notes are recorded in the Engineering Folio or EDJ.
Specify Constraints and Identify Criteria	Does not identify the criteria and/or fails to specify constraints.	Clearly identifies the criteria and specifies the constraints listed in the design specifications. All notes are recorded in the Engineering Folio or EDJ.	Clearly identifies the criteria and specifies the constraints that are listed in the design specifications and some that are not but pertain to their suggested design. All notes are recorded in the Engineering Folio or EDJ.
Consider Alternative Solutions	Inadequate analysis of a variety of possible solutions.	Satisfactorily analyzes a variety of possible solutions, based on research and the relationship of those designs to the criteria and constraints. All notes are recorded in the Engineering Folio or EDJ.	Did not enter the research phase with a preconceived idea of the final design. Satisfactorily analyzes a variety of possible solutions, based on research and the relationship of those designs to the criteria and constraints. All notes are recorded in the Engineering Folio or EDJ.

Category	Below Target	At Target	Above Target
Select an Approach	Selection of solution is not justified based on consideration of criteria and constraints.	Selects and justifies a promising solution based on the problem statement as well as the criteria and constraints. Uses some type of evaluation method to determine the final design. All notes are recorded in the Engineering Folio or EDJ.	Selects and thoroughly justifies a promising solution based on the problem statement, criteria, and constraints as well as evidence collected through research. Uses some type of evaluation method to determine the final design. All notes are recorded in the Engineering Folio or EDJ.
Develop a Written Design Proposal	Design proposal is inadequate and lacking pertinent information.	Design proposal contains the who, what, when, where, and how the solution will be developed as well as how the solution will be evaluated and what tests will be conducted to determine success. Includes annotated sketches, notes, and technical drawings. Recorded in the Engineering Folio or EDJ.	Design proposal is written technically and precisely and contains the who, what, when, where, and how the solution will be developed as well as how the solution will be evaluated and what tests will be conducted to determine success. Includes annotated sketches, notes, and technical drawings. Recorded in the Engineering Folio or EDJ.
Make a Model or Prototype	The model or prototype meets the task criteria to a limited extent.	The model or prototype is neatly developed to meet the problem statement and the given criteria and constraints. A record of the construction process can be found in the Engineering Folio or EDJ.	The model or prototype is neatly and precisely developed to meet the problem statement and the given criteria and constraints. A record of the construction process can be found in the Engineering Folio or EDJ.
Test and Evaluate	Testing and evaluation processes are inadequate.	Testing and evaluation processes are defined in the Design Proposal and align to the problem statement. The data collected during evaluation can be used to improve the design. All notes are recorded in the Engineering Folio or EDJ.	Testing and evaluation processes are clearly defined in the Design Proposal and align to the problem statement. The data collected during evaluation is clearly documented and can be used to improve the design. All notes are recorded in the Engineering Folio or EDJ.
Refine/ Improve	Refinement based on testing and evaluation is not evident.	Refinements were made from data collected during testing and evaluation. Data-driven decision making is clearly evident, and the solution has improved based on testing. All notes are recorded in the Engineering Folio or EDJ.	Refinements were made from data collected during testing and evaluation. Data-driven decision making is clearly evident and documented. Refinements to the solution are clearly documented, and the solution has improved based on testing. All notes are recorded in the Engineering Folio or EDJ.
Create/ Make Product	Finished solution (product) fails to meet specifications.	Finished solution (product) aligns to the design proposal and reflects the Engineering Design Process and includes evidence of refinement based on testing and evaluation of the design. The process(es) used to create the product are recorded in	Finished solution (product) aligns to the design proposal and reflects the Engineering Design Process and includes evidence of refinement based on testing and evaluation of the design. The solution (product) is well constructed and easily meets the problem statement. The

Category	Below Target	At Target	Above Target
		the Engineering Folio or EDJ.	process(es) used to create the product are recorded in the Engineering Folio or EDJ.
Communicate Results	Solution presented with limited accuracy. Limited supporting evidence on how the solution meets the task criteria.	Solution is presented accurately and precisely using the Engineering Folio or the EDJ. The Engineering Design Process is well documented, with supporting evidence. All information aligns to how the solution meets the problem statement as well as the criteria and constraints.	Solution is presented accurately and precisely using the Engineering Folio or the EDJ. The Engineering Design Process is well documented, with supporting evidence. All information aligns to how the solution meets the problem statement as well as the criteria and constraints. A more formal presentation/showcase was developed to support the solution.

Name:	Period:	Date:
Date Started:	Due Date:	
Group Members:		

Foundations of Technology
Unit 1 Learning Cycle 1: The History of Technology
File 1.1.4: Technology Board Game Design Brief - Design Folio
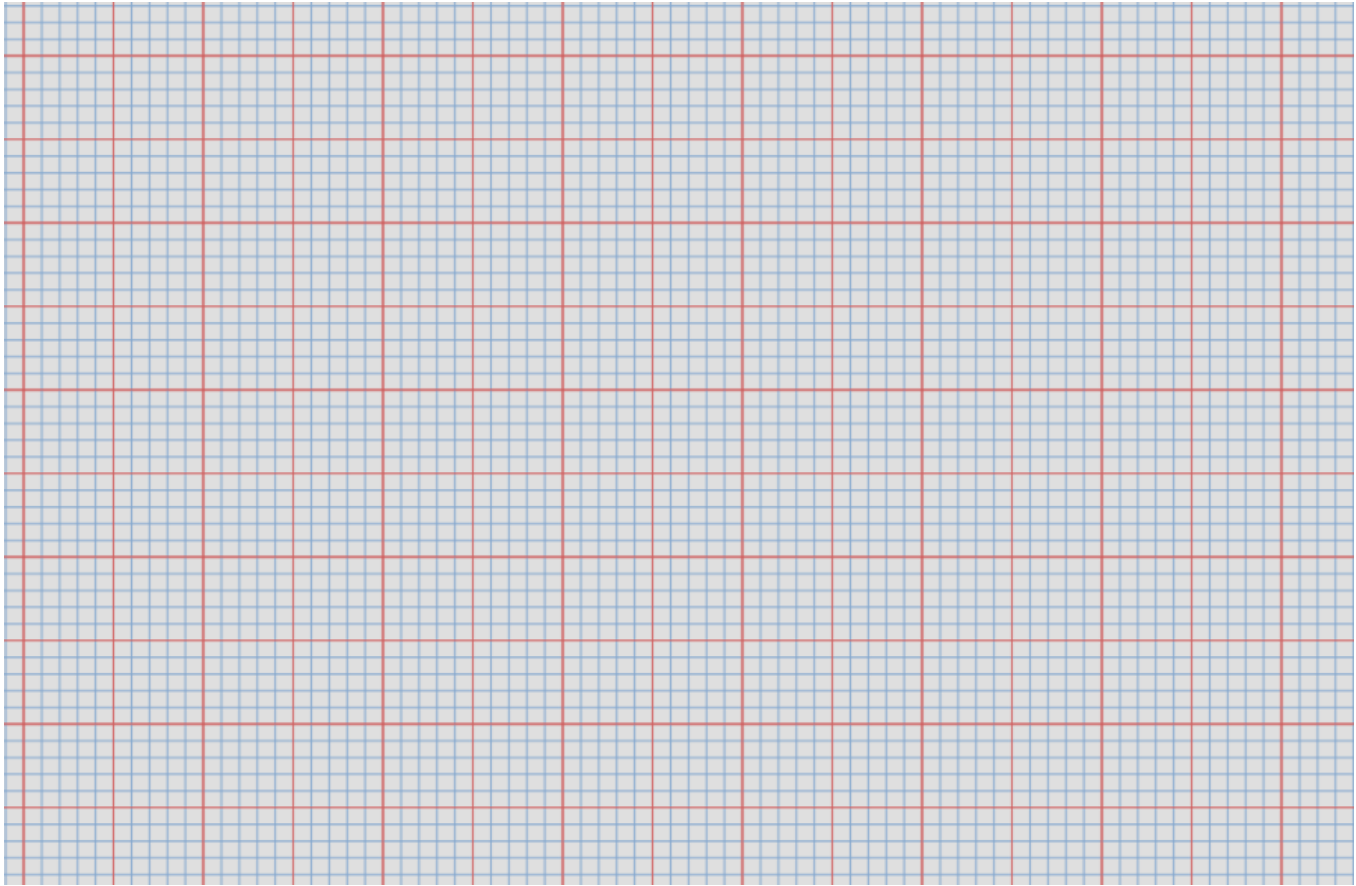
DESIGN FOLIO

2. Define the Problem
Develop a problem statement that identifies the what, who, when and how the problem should be addressed.

3. Brainstorming
List/sketch possible solutions that might be used in your final design. Clearly identify and describe how each of these ideas relates to the problem statement.
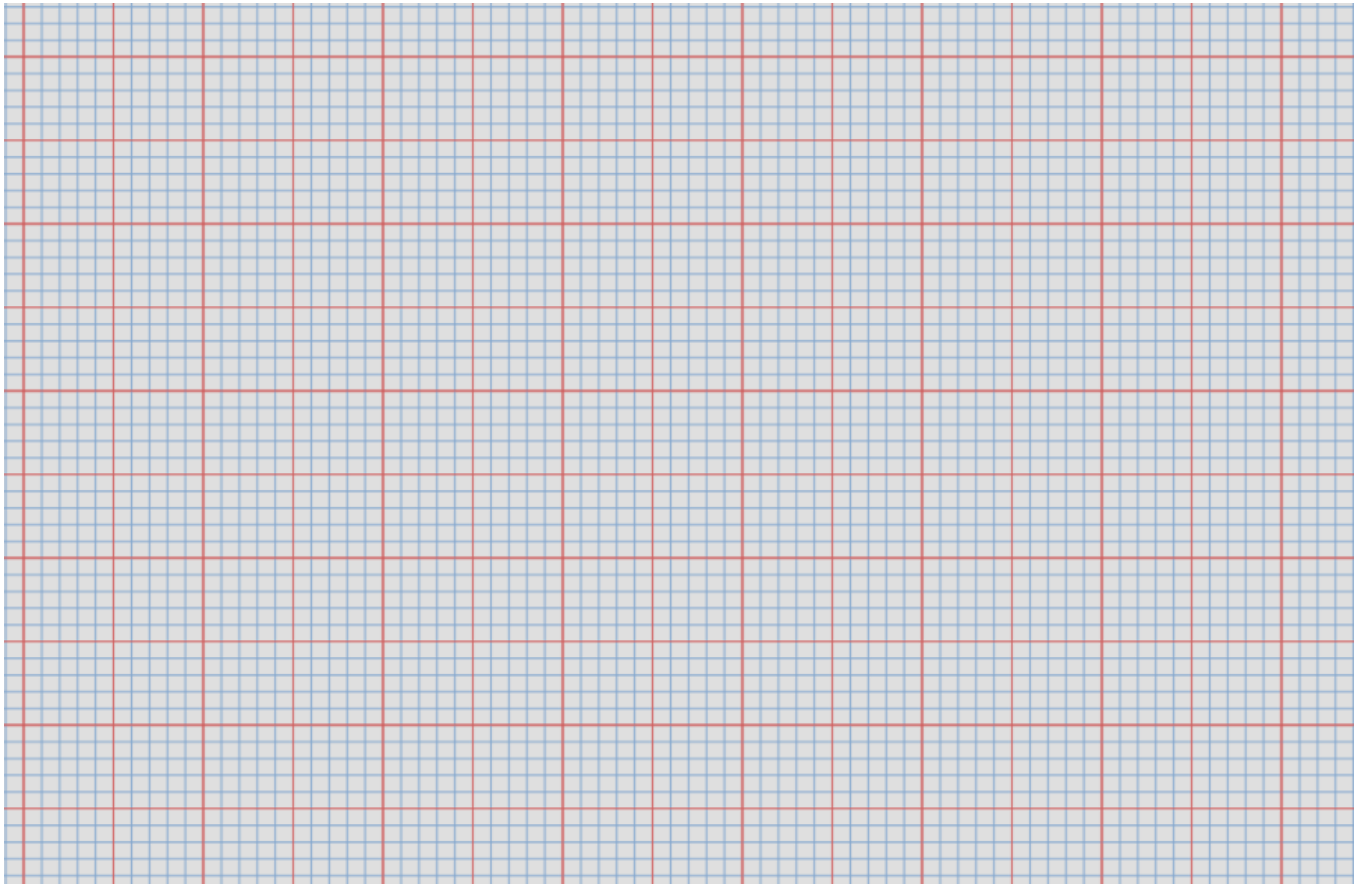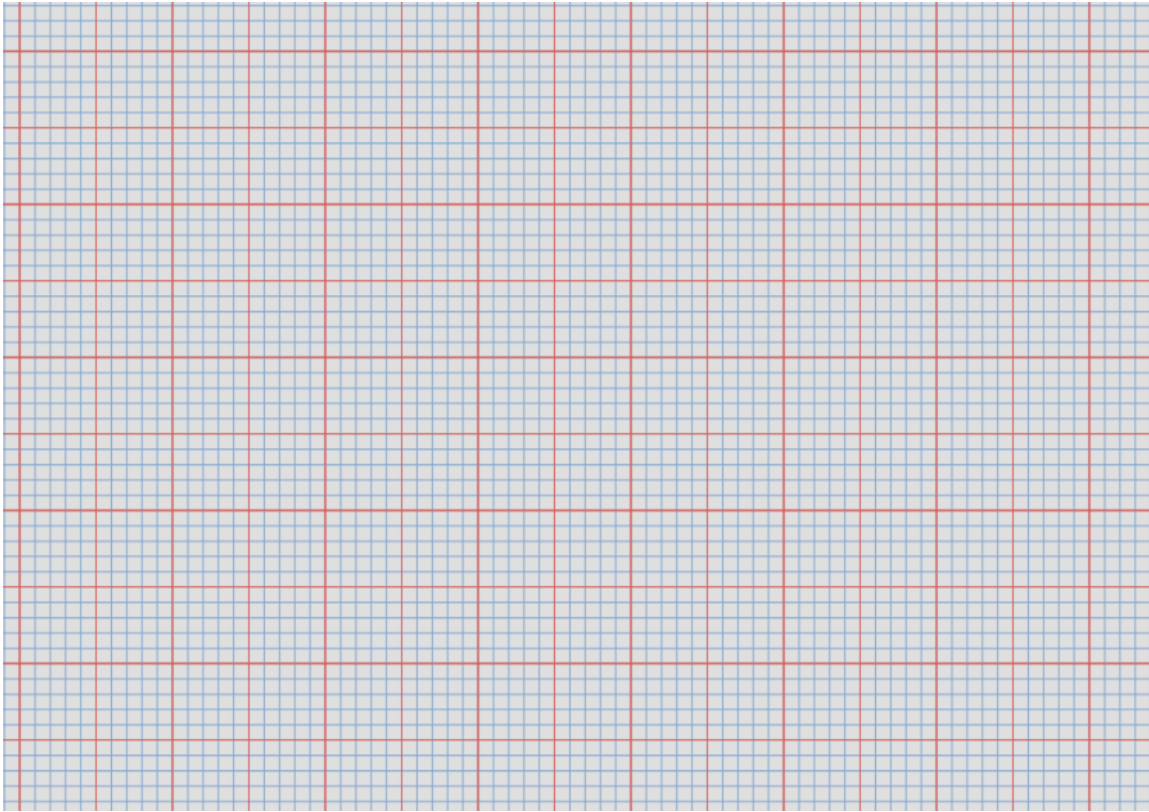
4. Research and generating ideas

In the space below, document your research. Be sure to include proper citations at the end of your notes.

Notes

Citations/References

5. Identifying criteria and specifying constraints

What are the criteria and constraints of the design problem?

Criteria	Constraints

6. Exploring possibilities

Reflect on your brainstormed ideas and research notes and describe the plusses and minuses of each design approach you have considered. Is there an alternative solution you did not consider?

Brainstorming Idea	Pluses	Minuses
Idea 1		
Idea 2		
Idea 3		

Did alternative solutions arise as you initially evaluated your designs? Cite examples.

7. Selecting an approach

a. Enter the constraints and criteria of the project in the first column.
b. Score your brainstorming ideas against each constraint or criterion and indicate how well the idea meets the criteria and constraints.
     3 pts = easily meets, 2 pts = somewhat meets, 1 pt = does not meet
c. Total the columns and circle the highest score to indicate your best design idea.
d. Write a short paragraph justifying your solution. Include trade-offs that were made in the selection.

Constraint/ Criterion	Brainstorming Idea 1	Brainstorming Idea 2	Brainstorming Idea 3	Brainstorming Idea 4	Brainstorming Idea 5
Total					

Justify the solution

8. Developing a design proposal

Take your highest-scoring brainstorming ideas and create working drawings (sketches with dimensions so that you could build your project) of your complete device. Attach your working drawings to this sheet.

Material to be Used	Qty

9. Making a model or prototype

In the space below, document (using digital pictures) your construction of the model/prototype. Be sure to include a picture of the final model/prototype.

Construction in Process	Construction in Process

Construction in Process	Final Product

10.   Testing and evaluating the design, using specifications

As you create your solution, you will perform tests to make sure that the solution is meeting the needs of the given problem. If your solution does not work, you may need to repeat the previous steps of the Engineering Design Process until you find a functional design. In the space below, document the type of tests you conducted and the results.

Test Performed	Test Results

11.   Refining the design

Based on your tests, what design refinements should be made to the prototype to ensure that it can satisfy all of the criteria and constraints of the design problem?

Refinements

12. Creating or making it

Modify your model/prototype to incorporate the design refinements you identified in section 10. Document the construction of the model/prototype. Be sure to include sketches/pictures as appropriate.

Construction in Process	Construction in Process

Construction in Process	Final Product

13. Communicating processes and results

Demonstrate the operation of your Nonverbal Communication to the class. As part of your demonstration, describe the steps involved in the development.