

Secondary 4 Technology Fair



Group Name:

Group Members:

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Secondary 4
Science
&
Technology

Introduction

Our ability to build objects, tools and structures to change the way we live our lives is something that has a huge affect on the success and accomplishments of humankind. In the past the people that designed and developed tools and technologies had many names: artificers, builders, makers, craftsmen and more. Today, however, we call them **engineers**.

Throughout this week's activities we will be investigating and dissecting technological objects to learn about the processes and decisions made by mechanical and electrical engineers. In doing so we have four particular goals:

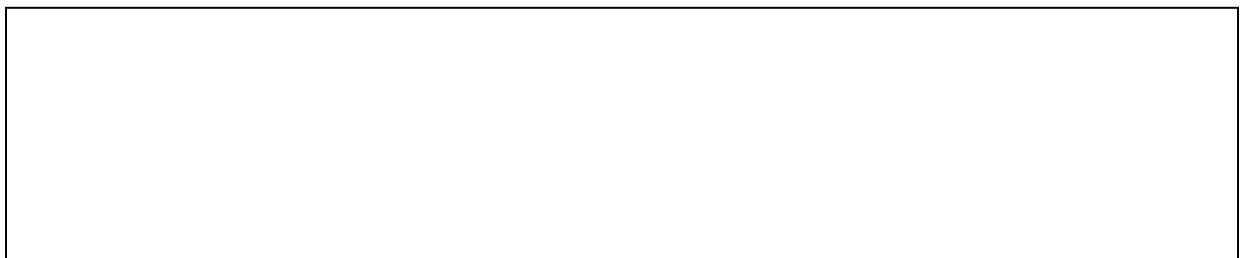
1. To discover and identify the types of mechanical components used in the creation of our technological objects (links, guides, motion transmission systems, motion transformation systems) and to determine how these components relate to the function of the device.
2. To analyze the materials used to construct these objects and how the choice of material relates to the function of the object through its advantages and disadvantages.
3. To investigate how simple electric circuits function in technological objects and how their functions are controlled.
4. Finally, to reflect on the exercise as a whole and how the knowledge gained through these investigations applies to other parts of our lives.

What do you think of when you think of engineering (or an engineer as a person)?

Draw or describe (or both) your answer below.



What does the term "technological object" make you think about? What sort of things qualify as a technological object? What sorts of things don't?



Day 1: Links & Guides

What is your group's technological object?

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Explain how the object fulfills its purpose. How does it work, how do the parts of the object interact?

--

Links

In your technological object, identify and draw and describe two links. Indicate the four characteristics of each link and what the advantages and disadvantages of those characteristics are, relative to the function of the technological object. Finally, explain how the types of links allow the object to function.

Link 1		Link 2	
Drawing		Drawing	
Description/Characteristics		Description/Characteristics	
Direct/Indirect	Rigid/Flexible	Direct/Indirect	Rigid/Flexible
Removable or Not?	Complete/Partial	Removable or Not?	Complete/Partial
Advantages	Disadvantages	Advantages	Disadvantages
Purpose in Device		Purpose in Device	

Guiding Controls

Examine your technological object; identify, draw and describe an example of a guiding control. Indicate what purpose it guide serves and why it is of a specific type.

Guiding Control
Drawing
Type of Guiding Control:
Purpose

Materials

What materials is your technological object made out of, and if it is composed of several materials, which parts are made of each material?

--

Why would those materials be used? What are the advantages and disadvantages of those materials?

Material	Advantages	Disadvantages
Material	Advantages	Disadvantages

Day 2: Motion Transmission Systems

What is your group's technological object?

Explain how the object fulfills its purpose. How does it work, how do the parts of the object interact?

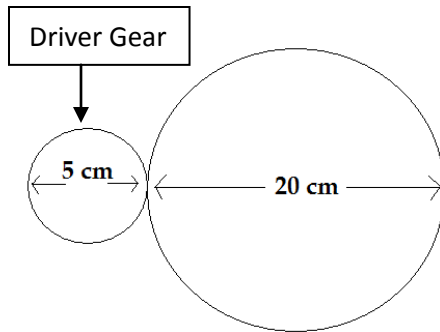
Transmission System

Examine your technical object and identify a motion transmission system within the workings of the object. In the table below draw & label and describe the motion transmission system found in your technological object. Indicate why this type of system was used instead of another, based on the function of the object (for example: why use a gear train instead of a chain and sprocket?)

Drawing Label Driver, Driven, Intermediate components, and direction of motion.		
Description	<div style="display: flex; justify-content: space-between;"> Type of system Reversibility </div>	
Justification (Why this system?)	Advantages	Disadvantages

Speed Changes

Controlling the speed of rotation in a device is important for it to function and to prevent damage to mechanical parts. For the friction gears below answer the following questions.



What is the current gear ratio?

If we wanted to increase the speed of the driven gear what could we do?

Materials

What materials is your transmission system made out of, and if it is composed of several materials, which parts are made of each material?

Why would those materials be used? What are the advantages and disadvantages of those materials?

Material	Advantages	Disadvantages
Material	Advantages	Disadvantages

Day 3: Motion Transformation Systems

What is your group's technological object?

Explain how the object fulfills its purpose. How does it work, how do the parts of the object interact?

Transformation System

Examine your technical object and identify a motion transformation system within the workings of the object. In the table below draw & label and describe the motion transformation system found in your technological object. Indicate why this type of system was used instead of another, based on the function of the object (for example: why use a cam and follower instead of slider-crank?)

Drawing Label Directions and types of motion		
Description	Type of system	Reversibility
Justification (Why this system?)	Advantages	Disadvantages

Is there another type of motion transformation system that could have worked in this technical object?
Which type of system and how would it be different?

Alternative Transformation System	Type of system			Reversibility
	Advantages	Disadvantages	Differences	
Consequences				

Materials

What materials is your transformation system made out of, and if it is composed of several materials, which parts are made of each material?

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Why would those materials be used? What are the advantages and disadvantages of those materials?

Material	Advantages	Disadvantages
Material	Advantages	Disadvantages

Day 4: Electromagnetism & Electric Circuits

What is your group's technological object?

Explain how the object fulfills its purpose. How does it work, how do the parts of the object interact?






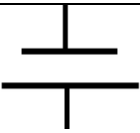
Energy Transformations

Changing the form of energy is very important for electrical devices to function. Electrical energy is very useful for transporting power from one location to another (through power lines or electrical wires/cables). In the following table complete the energy transformations by filling in the missing term and indicate the purpose of the device.

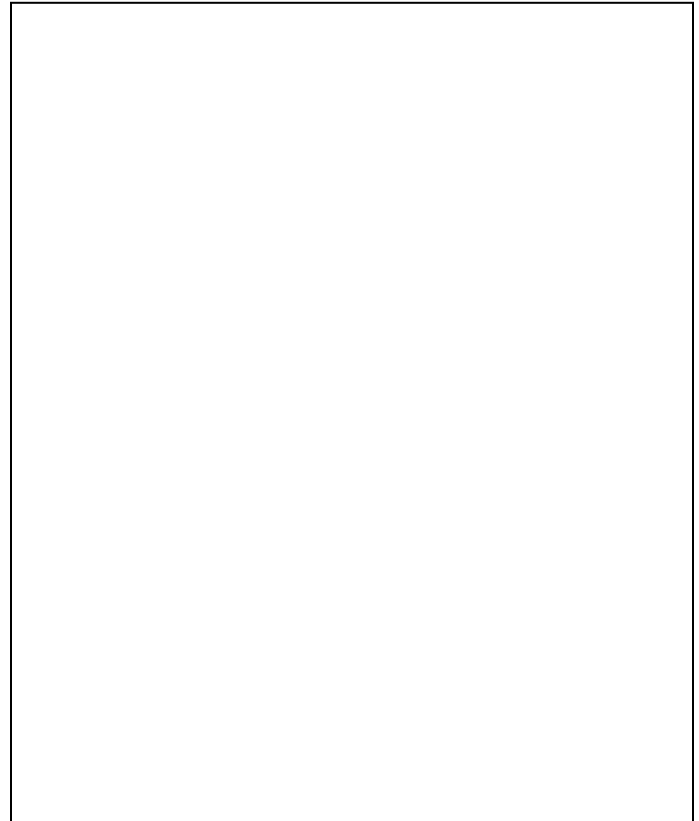
Device	Energy Transformation	Purpose of Device
Gasoline Engine	→Mechanical	
Wind Turbine	Mechanical→	
Toaster	→Heat	
Radio	Electrical→	
Computer Screen	→Light	
Guitar	→Sound	
Battery	→Electrical	
Blender	Electrical→	
Glow Stick	→Light	
Hydroelectric Dam	→Electrical	

Electric Circuits

Carefully examine the electric circuit in your device. Using the symbols in the table below; draw a representation of the circuit with all of its components.

Symbol	Component	Function
	Motor	Transformation of electricity into mechanical energy
	Light	Transformation of electricity into light energy
	Resistor	Reduce current flow by increasing resistance
	Speaker	Transformation of electrical energy into sound energy.
	Switch	Control when current flow is and is not active by completing the circuit
	Battery or Power Source	Provides voltage and acts as an energy source.

Circuit Diagram



Using what you've learned this week and what you already knew about technological devices; compare electrical and mechanical components and systems of energy transmission and transformation. Discuss the advantages and disadvantages of each type of system.

	Mechanical Transmission	Mechanical Transformation	Electrical Transmission	Electrical Transformation
Advantages				
Disadvantages				

Day 5: Presentations & Reflection

Why is understanding how the parts of a device relate to its function important for understanding the device as a whole?

How does the shape (form) of an object or part relate to its function? Are the two closely related or distantly? Explain your thoughts and use examples from your investigations to justify your ideas.

Presentation [3 Minutes]

For the final part of the tech fair you will present your findings and newfound understanding to your peers. As a group you will choose one technological object that you studied this week and present it to the class. Be sure to explain its overall function and how it performs that function through the use of its component parts (Links, guides, transmission/transformation systems and electrical components).

Use the space below to plan what you will present and who will speak about what.

Group Members	Topic Discussed/Role in Presentation	Approximate time

Evaluation Rubrics

Introduction, Reflection & Presentation					
/20	<i>Excellent</i>	<i>Very Good</i>	<i>Average</i>	<i>Below Average</i>	<i>Expectations not met</i>
Use of scientific language	5	4	3	2	1
Understanding of form-function relationships	5	4	3	2	1
Organized and clear presentation	5	4	3	2	1
Fair distribution of tasks and responsibilities	5	4	3	2	1
Links & Guides					
/20	<i>Excellent</i>	<i>Very Good</i>	<i>Average</i>	<i>Below Average</i>	<i>Expectations not met</i>
Description/Depiction of components	5	4	3	2	1
Understanding of form-function relationships	5	4	3	2	1
Identification of the characteristics of different types of links and guides	5	4	3	2	1
Analysis of materials (advantages and disadvantages)	5	4	3	2	1
Motion Transmission Systems					
/20	<i>Excellent</i>	<i>Very Good</i>	<i>Average</i>	<i>Below Average</i>	<i>Expectations not met</i>
Description/Depiction of components	5	4	3	2	1
Understanding speed changes and gear ratios	5	4	3	2	1
Identification of the characteristics of different types of transmission systems	5	4	3	2	1
Analysis of materials (advantages and disadvantages)	5	4	3	2	1

Motion Transformation Systems					
/20	<i>Excellent</i>	<i>Very Good</i>	<i>Average</i>	<i>Below Average</i>	<i>Expectations not met</i>
Description/Depiction of components	5	4	3	2	1
Understanding of form-function relationships	5	4	3	2	1
Identification of the characteristics of different types of transformation systems	5	4	3	2	1
Analysis of materials (advantages and disadvantages)	5	4	3	2	1
Electricity and Circuitry					
/20	<i>Excellent</i>	<i>Very Good</i>	<i>Average</i>	<i>Below Average</i>	<i>Expectations not met</i>
Depiction of components relative to one another	5	4	3	2	1
Understanding of form-function relationships	5	4	3	2	1
Understanding of energy transformations and forms of energy.	5	4	3	2	1
Comparison of energy transmission and transformation in mechanical and electrical systems	5	4	3	2	1
Total	/100				