

Name: _____ Class: _____ Date: _____

Complex Machines: Analyzing a Mechanical Device

Learner Outcomes:

- Analyze machines by describing the structures and functions of the overall system, the subsystems and the component parts
- Analyze a mechanical device by:
 - o Describing the overall function of the device
 - o Describing the contribution of individual components or subsystems to the overall function of the device
 - o Identifying components that operate as simple machines

Key Terms:

Complex machines
Systems

Subsystems
Linkages

Transmissions
Gears

Background Information: You are surrounded by a wide variety of machines in your daily life. Now you have an opportunity to look inside one of those machines and see how it works.

Research Question: How do the structures and sub-systems in a complex machine contribute to its overall function?

Materials: (samples of complex machines)

Can opener

Pencil sharpener

Hole punch

Wheel barrow

Bicycle

Dump cart

Mechanical egg beater

Scissors

Cultivator

Procedure:

1. Sketch your complex machine and describe the overall function / purpose of the device.

This investigation / activity has been adapted from "Analyzing a mechanical device" (p. 271) Mah K, Martha J, McClelland L, et al. *Science in Action 9*. Toronto, ON: Addison Wesley.

2. If possible, disassemble the device to identify the individual subsystems. Describe the specific function of each subsystem.
3. Identify any simple machines found within each subsystem and describe how these simple machines help make the subsystem function.

Observations: (provide a series of labeled schematics or drawings to illustrate the structures and function found within the system, sub-systems and simple machines)

Analysis:

1. What is the energy source for your complex machine?
2. How does your complex machine reduce the amount of energy input or work that is required to make it perform its job? (Consider what you would have to do to achieve the same goal without the machine.)
3. In what ways are the sub-systems or simple machines in your device connected to one another? Be specific!

Conclusion: Use a flowchart or diagram to show how all the subsystems work together to make your device function.

Extension:

1. Research other machines that perform the same function as the one you investigated. Identify the advantages and disadvantages of each and submit an argument for which is the best machine to do the job.
2. Identify one other complex machine that you use every day and identify all of the sub-systems and simple machine components that make it work. Explain how this machine makes your life easier or better.