

# 08 Levers and Linkages

Content Area: **Technology**  
Course(s):  
Time Period: **Full Year**  
Length: **3 Weeks**  
Status: **Published**

## General Overview, Course Description or Course Philosophy

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This full year honors course continues to emphasize the application of integrated STEM (Science, Technology, Engineering and Mathematics) principles and the design method to invent solutions to real world problems through robotic applications. Students will identify problems, research, design and fabricate solutions. Problem solving, critical thinking and design skills are taught through a variety of activities. Hands-on themes include structural and robotic systems, as well as system control technology. This course provides all students with valuable skills such as: problem solving, design, creative thinking, systems thinking, team work, documentation, programming and computer applications.

## OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

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Students will understand that *levers are used to increase power in a technological system and how linkages are used to change direction of motion in a technological system. Students will understand how to calculate mechanical advantage in levers and how to design linkages to create different types of motion.*

## CONTENT AREA STANDARDS

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TECH.8.2.12.D.1	Design and create a prototype to solve a real world problem using a design process, identify constraints addressed during the creation of the prototype, identify trade-offs made, and present the solution for peer review.
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## RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

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CCSS.Math.Practice.MP1	Make sense of problems and persevere in solving them.
CCSS.Math.Practice.MP3	Construct viable arguments and critique the reasoning of others.
CCSS.Math.Practice.MP4	Model with mathematics.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP11	Use technology to enhance productivity.

## **STUDENT LEARNING TARGETS**

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### **Declarative Knowledge**

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Students will understand that:

- Levers are used to increase power in a technological system.
- Linkages are used to change direction of motion in a technological system.
- Creating a mechanical advantage in levers increases power.
- Different designs of linkages can be used to create different types of motion.

### **Procedural Knowledge**

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Students will be able to:

- Identify different types of linkages and how they change motion.
- Explain how to change motion in linkages.
- Recognize the difference between fixed and moveable joints.
- Demonstrate the ability to design, build and apply levers/linkages in a system to increase or decrease mechanical advantage and to change motion.
- Calculate the mechanical advantage when using levers.

## **EVIDENCE OF LEARNING**

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### **Formative Assessments**

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- Observation of “Do Now” mechanical advantage problems during and after lessons.
- Observation of hands on linkage project.
- Linkage problem solving assignment (hands on).
- Quiz on Mechanical Advantage in levers.

### **Summative Assessments**

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- Engineering log - Linkages.

### **RESOURCES (Instructional, Supplemental, Intervention Materials)**

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- Teacher notes on levers and linkages.
- Teacher notes on calculating mechanical advantage.
- Mechanical advantage worksheets.
- Foam core, cardboard, pins, fasteners and foam cutting tools.
- Problem solving design brief: Design an end-effector utilizing linkages.

### **INTERDISCIPLINARY CONNECTIONS**

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- Modeling with Mathematics and Make sense of problems and persevere in solving them.

### **ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS**

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See link to Accommodations & Modifications document in course folder.