KINECTIC CARS
SNAPSHOT

DRIVING QUESTION: HOW CAN WE BUILD ENERGY EFFICIENT CARS?

Recommended Grades: K – 8; Adaptations and resources are available for 9 – 12.

Video for Project: https://drive.google.com/open?id=1e1sM36f92LQVNjtjLxdQCevbsArD4spy

Classroom or Center Activities	*Outside or Larger Space Activities*	*Technology-Based Activities*	*Stem-to-Go Take Home*	*Field Work and/or Natural Area Needed*
X	X	X	X	

Materials: Measuring tape. Various building materials can be used for the cars, but we suggest: 1 plastic straw cut into (1) 3 inch section, and (2) 1.5 inch sections, 4 water bottle lids with built in sports button cap, 2 bamboo shish kabob skewers that are trimmed so that one is 10 inches and the other is 6 inches in length, 3 Popsicle sticks (one of which should have 1 inch cut off the end), adhesive hook, eyelet picture hanger, glue gun, two wide rubber bands, and one medium width rubber band.

Teacher Prep: <10 Minutes
Participant Activity: 30 minutes to 1.5 hours
Objectives:

1. Explain the difference between potential and kinetic energy. (K-8)
2. Identify, build, and use simple machines: Wheel and axle, pulley, levers, wedge, screw, inclined plane. (K-8)
3. Measure, calculate and graph distances, mass, acceleration, and force. (5-8)
4. Apply Newton's Laws of Motion. (K-8)
5. Evaluate and improve design. (K-8)

STEM Skills

S: Apply Newton's Laws
T: Classify Simple Machines
E: Build, test, and evaluate machine performance
M: Calculate, graph, and evaluate design efficiency.

Teacher Tips

Plan ahead: Ask for donated scrap materials ahead of time. Sports drinks bottle caps work the best for wheels, which is the trickiest part. If you use plain bottle caps, you will need to pre-drill the holes. The Scrap Exchange in Durham, NC has sports bottle lids by the box for $8.

Total prep: < 20 minutes for copies and materials

Safety: Risk factors may be: UFO's (Unintentional Flying Objects, like rubber bands), slips/falls due to objects on the floor, cuts due to scissors, and burns from hot glue. Use tweezers and Popsicle sticks to press things together.

Sensory Integration Issues: This tends to be a noisy activity that requires space to spread out while building and space to race. For participants with fine motor skill issues, teachers may need to provide assistance with hot glue.

Cost: Minimal. The cars can be made from recycled materials, or sports bottle lids can be purchased.

What else do I need? Hot glue guns and duct tape, possibly a box cutter or heavy duty shears, depending on the age of the participants. A kitchen scale is handy for measuring the mass of cars.

Clean Up: Allow extra time. Glue is messy.

NC CAP's Unit Planner

Classroom or Center Activities	Outside or Larger Space Activities	Technology-Based Activities	Stem-to-Go Take Home	Field Work and/or Natural Area Needed
Rube Goldberg's Incredible Machine: Lesson 3	Kinetic Cars Test Drive	Public Transportation and Car Ownership Trip Planning	Simple Machines in My Life	
Kinetic Cars Test Drive				
Cartoon Physics				
Venn Diagram for Muscle Car versus Sports Car				

NC Essential Standards Correlations: Kinetic Cars

K.P.2.1: Classify objects by observable physical properties (including size, color, shape, texture, weight, and flexibility).
K.P.2.2: Compare the observable physical properties of different kinds of materials (clay, wood, cloth, paper, etc.) from which objects are made and how they are used.
1.P.1.1: Explain the importance of a push or pull to changing the motion of an object.
1.P.1.2: Explain how some forces (pushes and pulls) can be used to make things move without touching them, such as magnets.
1.P.1.3: Predict the effect of a given force on the motion of an object, including balanced forces.
3.P.1.1: Infer changes in speed or direction resulting from forces acting on an object.
3.P.1.2: Compare the relative speeds (faster or slower) of objects that travel the same distance in different amounts of time.
3.P.1.3: Explain the effects of earth's gravity on the motion of any object on/near the earth.
3.P.3.1: Recognize that energy can be transferred from one object to another by rubbing them against each other.
4.P.1.1: Explain how magnets interact with all things made of iron and with other magnets to produce motion without touching them.
4.P.1.2: Explain how electrically charge objects push or pull on other electrically charged objects and produce motion.
4.P.2.1: Compare the physical properties of samples of matter (strength, hardness, flexibility, ability to conduct heat, ability to conduct electricity, ability to be attracted by magnets, reactions to fire and water).
4.P.3.1: Recognize the basic forms of energy (light, sound, heat, electrical, and magnetic) as the ability to cause motion or create change.
5.P.1.1: Explain how factors such as gravity, friction, and change in mass affect the motion of objects.
5.P.1.2: Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.
5.P.1.3: Illustrate the motion of an object using a graph to show a change in position over a period of time.
5.P.1.4: Predict the effect of a given force or a change in mass on the motion of an object.
6.P.3.3: Explain the suitability of materials for use in technological design based on a response to heat (to include conduction, expansion, and contraction) and electrical energy (conductors and insulators).
7.P.1.1: Explain how the motion of an object can be described by its position, direction of motion, and speed with respect to some other object.
7.P.1.2: Explain the effects of balanced and unbalanced forces acting on an object (including friction, gravity, and magnets).
7.P.1.3: Illustrate the motion of an object using a graph to show a change in position over a period of time.
7.P.1.4: Interpret distance versus time graphs for constant speed and variable motion.
7.P.2.1: Explain how kinetic and potential energy contribute to the mechanical energy of an object.
7.P.2.2: Explain how energy can be transformed from one form to another (specifically potential energy and kinetic energy) using a model or diagram of a moving object (roller coaster, pendulum, or cars on ramps as examples).

7.P.2.3: Recognize that energy can be transferred from one system to another when two objects push or pull on each other over a distance (work) and electrical circuits require a complete loop through which an electrical current can pass.
7.P.2.4: Explain how simple machines such as inclined planes, pulleys, levers, and wheel and axles are used to create mechanical advantage and increase efficiency.
8.P.2.1: Explain the environmental consequences of the various methods of obtaining, transforming, and distributing energy.
8.P.2.2: Explain the implications of the depletion of renewable and nonrenewable energy resources and the importance of conservation.