

INTRODUCING YOUR CHILD TO STEM

Science, Technology, Engineering and Mathematics (**STEM**) education provides young adults with the opportunity to participate in many themed **hands-on activities**, including those with connections to sports, history, and other subjects.

Activities involving VEX Robotics by Hexbug toys help individuals learn more about **math**, **physics**, and **engineering** by engaging in activities that are useful and enjoyable while providing them with hands-on experiences in those key areas.

This activity with the VEX Robotics Gear Racer by Hexbug provides a fun and interesting way for students to learn about math, **science**, and engineering.

VOCABULARY TO KNOW

POTENTIAL ENERGY

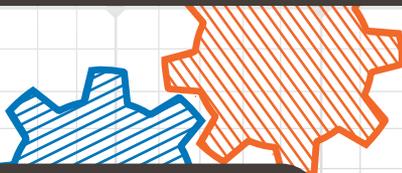
The stored energy of position possessed by an object.

SPEED

The distance traveled divided by the time it takes to travel the distance.

KINETIC ENERGY

The energy of motion.



FORMULAS AND VARIABLES

$$\text{Average Time (seconds)} = \frac{\text{Time for Trail \#1} + \text{\#2} + \text{\#3}}{3}$$

$$\text{Speed (meters/second)} = \frac{\text{Distance (in meters)}}{\text{Time (in seconds)}}$$

GENERAL SOLUTIONS

| DISTANCE (METERS) | TRAIL #1 (SECONDS) | TRAIL #2 (SECONDS) | TRAIL #3 (SECONDS) | AVERAGE TIME (SECONDS) | CALCULATED AVERAGE SPEED (M/SEC) |
|-------------------|--------------------|--------------------|--------------------|------------------------|----------------------------------|
| 1.0 METER | 1.0 | 1.1 | 0.9 | 1.0 | 1.0 M/S |
| 1.5 METERS | 1.6 | 1.6 | 1.5 | 1.6 | 0.9 M/S |
| 2.0 METERS | 2.8 | 2.1 | 2.3 | 2.4 | 0.8 M/S |

EXTEND YOUR LEARNING

DISCUSS

Friction is discussed in Isaac Newton's Second Law of Motion. The Gear Racer can be a great way to introduce young people to the Laws of Motion.

Running different experiments with the Gear Racer and observing its actions is a fun way to discuss these concepts.

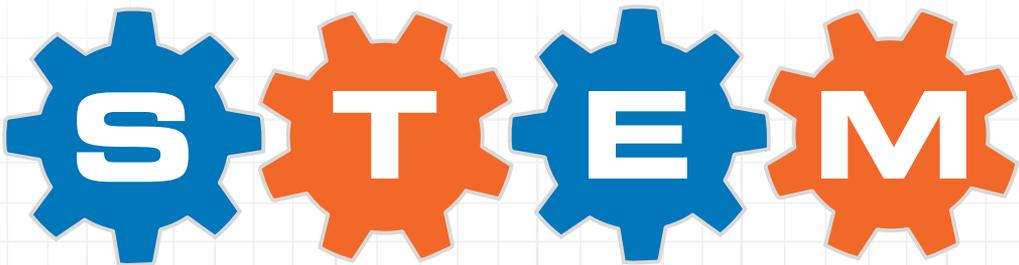
APPLY

There are many different examples of forms of energy and conversion of energy in the world around us. For example, a hydroelectric plant converts mechanical energy to electrical energy. The mechanical energy of the water falling down from a waterfall is used to move the turbines at the bottom of a waterfall. The movement of the turbines is used to generate electricity that is then used in our homes.

EXPLORE

You can explore additional VEX Hexbug builds and investigations here: <https://www.vex.com/help/build-instructions>

STEM STANDARDS ADDRESSED



HS-PS2-1
Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.

MS-PS2-1
Motion and Stability: Forces and Interactions. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-PS2-4
Forces and Interactions. Construct and present arguments using evidence to support the claim that gravitational interactions are attractive and depend on the masses of interacting objects.

HS-ETS1-2
Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-PS3-3
Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

ISTE1.1A
Students articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes.

ISTE1.1D
Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

ISTE3.3D
Students build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

ISTE4.4C
Students develop, test, and refine prototypes as part of a cyclical design process.

ISTE4.4D
Students exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

ISTE7.7C
Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

ETS1.A
Defining and delimiting engineering problems.

ETS1.B
Developing possible solutions.

ETS1.C
Optimizing the design solution.

CCSS.MATH.PRACTICE.MP1
Make sense of problems and persevere in solving them.

CCSS.MATH.PRACTICE.MP4
Model with mathematics.

CCSS.MATH.PRACTICE.MP7
Look for and make use of structure.

CCSS.MATH.CONTENT.8.EE.A.2
Use square root and cube root symbols to equations. Evaluate square roots of small perfect squares and cube roots of small perfect cubes.

CCSS.MATH.CONTENT.6.EE.B.6
Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

STANDARDS REFERENCED

MATH
Common Core State Standards for Math
<http://www.corestandards.org/Math/>

SCIENCE & ENGINEERING
Next Generation Science Standards
<http://www.nextgenscience.org/>

TECHNOLOGY
International Society for Technology in Education
<http://www.iste.org/standards>