

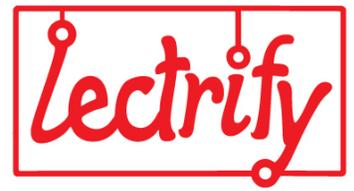
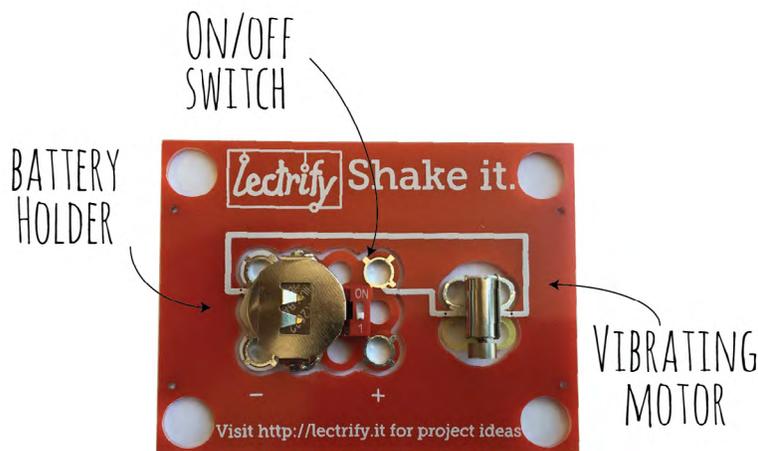
Teacher Guide Shake it Critters

Shake It Kit:

The kit includes a battery, switch, and a vibrating motor.

The board has a functioning circuit that allows students to explore basic electronics concepts including **simple circuits**, circuits in **series**, **resistance**, and when removed from the board, **conductivity**.

The kit also lends itself to projects that explore the **engineering process** as well specific engineering concepts including: **friction**, **transfer of energy**, the relationship between **force** and **mass**, and **centripetal force** (from the eccentric rotating mass motor).



Grade Level:

Elementary (Grade 3-5)

Materials:

1 Battery
1 Switch
1 Vibrating motor

LEGO Bricks
Copper Tape
Googly Eyes
Pom poms
Glue
Pipe cleaners

Additional Resources:

[Brain Pop video](#)

(subscription required for certain content)

How vibration motors work [video](#)

Once students have explored the desired concepts using the board, they can then remove the components from the board and embed them into their own projects. Note, once the components are removed from the board, they cannot be placed back on.

Lesson Scope & Concepts:

The kits allow learners to explore a broader range of engineering concepts. The scope and complexity can scale to the age, grade, and skill level of the learners. This lesson will cover circuit basics & conductivity, identification and understanding of basic components, testing ideas & prototyping, and engineering systems & variables.

Project Sequence:

Here is a sample project sequence designed for 4th grade students.

1. Review the basics of circuits
2. Explore the components on the board
3. Build a prototype with components intact on the board
4. Test and Iterate. (If desired, use the attached worksheet to have the stu-

dents reflect and plan.)

5. Snap off components to create custom DIY projects off the board

Duration:

1-2 hours

1. Review the basics of circuits

Review our Quickstart Guide which has detailed tips & tricks about the circuits. We also have some suggested videos in the sidebar to help you and your students review core concepts about electricity.



2. Explore the Board



Next Generation Science Standards

2-PS1-1

Plan and conduct an investigation to describe and classify different kinds of materials by their observable properties.

2-PS1-2

Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose.

K-2-ETS1-2

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

3-PS2-1

Plan and conduct an investigation to provide evidence of balanced and unbalanced forces on the motion of an object.

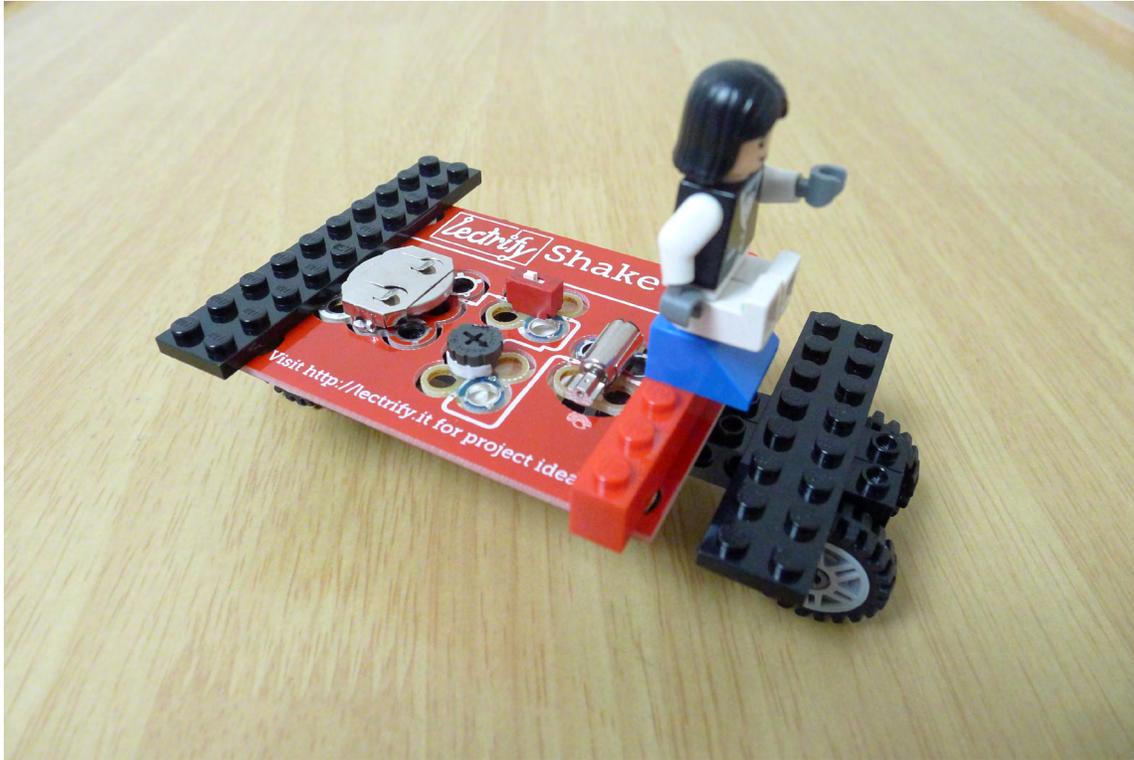
3-PS2-2

Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion.

If you place the vibrating Shake It board onto a hard surface and turn the switch to on, you will see it shaking. You can harness this motion to make bugs and machines that crawl along the floor. The board has holes in all four corners for straws, pens and pencils, LEGO bricks, or any small object to pass through. You can use these holes to attach the board to your own creations, causing them to shake and move on their own.

3. Build your first prototype

Use craft supplies, toys, and other simple materials to create bugs, beasts, vehicles, and whatever you can imagine using the Shake It board as a base. When you flip the Shake It switch on, see where and how your creation moves.



4. Test and iterate

There are a number of engineering challenges students can explore with this kit. Sample prompts include:

- Can you design something that moves very quickly?
- Can you make a robot that moves straight forward?
- Can you make one that moves backward?
- Could you design one that runs in circles?

Here are some ways to tinker with your design that might yield interesting results:

Change the surface material to see how that affects how the robots move. Have students document the differences between smooth and rough surfaces. Ask them to consider how the force of friction affects the movement.

Make some of the "legs" on your design shorter than others. Ask students to observe what happens when the board is off-balance.

4-PS3-2

Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4

Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

3-5-ETS1-2

Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

3-5-ETS1-3

Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Vary the weight of your project and see if that has any effect on the strength of the vibration or the speed of the movement. Ask students if they can observe how the center of gravity affects movement and speed.

Use a cardboard box and masking tape to create a race track. Have students race their engineered robots to the finish line.

5. Snap off Circuits

The circuits can be snapped off of the board and embedded into other projects. You can attach and combine them in exciting different ways to create more exotic moving creatures. Try an alternate body like a cork, a paper box or LEGO bricks.

A good place to start using the components is by creating a small, self-contained circuit on a LEGO board. If you firmly attach that board to



your design, or even put it inside, it can shake the whole structure. In the top photos, a tiny circuit was assembled using copper tape on LEGO bricks. Try adding a motor and putting the circuit into a paper box to make a moving creature! You can also embed the circuits on a cork, pins and pipe cleaners. Take a look at the www.lectrify.it/projects for more ideas!

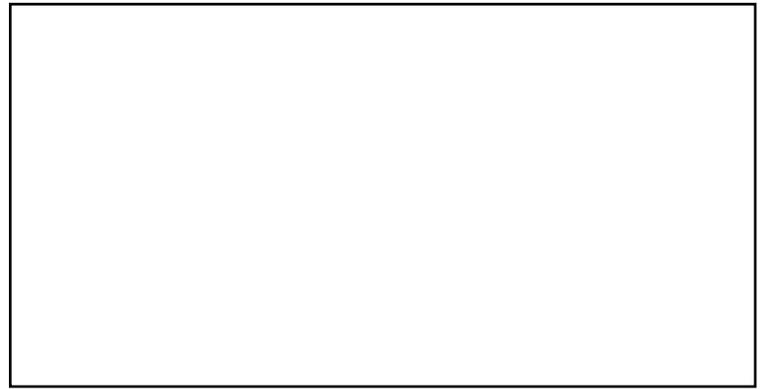
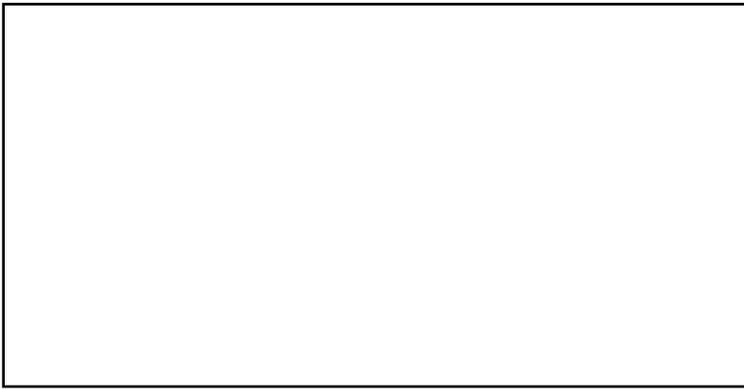
2-PS1-3:

Make observations to construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object.

Student Worksheet

Name: _____

Describe and sketch out 4 ideas for designing your robot. What materials did you use and why?



What did you notice when you tested each idea?

Which idea was most successful and why?

How could you change your design to make your robot go faster? forward? backward?