

Hop to it! Discover Newton's third law and observe kinetic and potential energy in action as you fold a jumping paper frog.

TEKS:

SCI 4.7: Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions. The student is expected to plan and conduct descriptive investigations to explore the patterns of forces such as gravity, friction, or magnetism in contact or at a distance on an object.

SCI 5.7: Force, motion, and energy. The student knows the nature of forces and the patterns of their interactions.

SCI 5.7.A: The student is expected to investigate and explain how equal and unequal forces acting on an object cause patterns of motion and transfer of energy.

SCI 5.7.B: The student is expected to design a simple experimental investigation that tests the effect of force on an object in a system such as a car on a ramp or a balloon rocket on a string.

Materials:

- Paper square (~8x8-inches)
- Ruler or measuring tape (optional)

How To:

- 1. Follow along with the origami instructions pictured below!
 - a. Note: Steps 10 and 11 are very important steps, so make sure to press the frogs down a lot. These folds need to be strong in order to create the jumping action.
- 2. Once your origami frog is complete, place the frog on a hard surface, press down on the back of the frog, and release. Your frog should jump forward!



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Origami Tips:

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- Use the written directions and the photos to help you complete each step.
- Make each fold clean and precise.
- Go over each fold several times to make sure it is strong.
- If you need help completing any steps of the frog-folding, check out this video: http://bit.ly/frogfoldingorigami
- Fold your origami paper in half.
- Fold the top right corner down, then unfold.
- Fold the top left corner down, then unfold.
- The top of your half sheet should now look like it has an X folded into it.
- 5 Repeat steps 2-4 on the bottom half of your origami paper. Your paper should now look like it has two X's folded into it.
- Focus on the top X first. Tuck the two side triangles inward and fold the top triangle down. Your paper should look like it has one triangle above the bottom X.





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STEM Explanation:

How does a paper frog leap across the ground? It's all about physics! The frog is folded in a special way so that when you press down on it, its legs store potential energy. Then, when you release the frog, the potential energy is converted into kinetic energy, or the energy of motion. This causes the frog to spring forward! The frog origami works by using Newton's Third Law, which states that for every action there is an equal and opposite reaction. The more force that is exerted on the frog, the further it will jump! How could you modify the frog to make it jump even farther?

Here's a fun idea: Challenge a friend or family member to a jumping frog competition! Use a ruler or measuring tape to see how far each of your frogs can jump.

Career:

Physicists study the world, from the tiniest subatomic particles to the largest galaxies. They study matter and energy and do experiments to discover the laws of nature.

Resources:

https://origami.me/jumping-frog/ http://www.physics4kids.com/files/motion_laws.html



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