

# Floating Butterfly

**Category:** Physics: Electricity & Magnetism

**Type:** Make & Take

## Rough Parts List:

1	Baseboard
10"	Dowel, 1/4" diameter works well
1/2	Paint paddle
1	Small magnet
1	Small nail
12"	Fishing line
1	Paperclip
	Paper and crayons for decorations

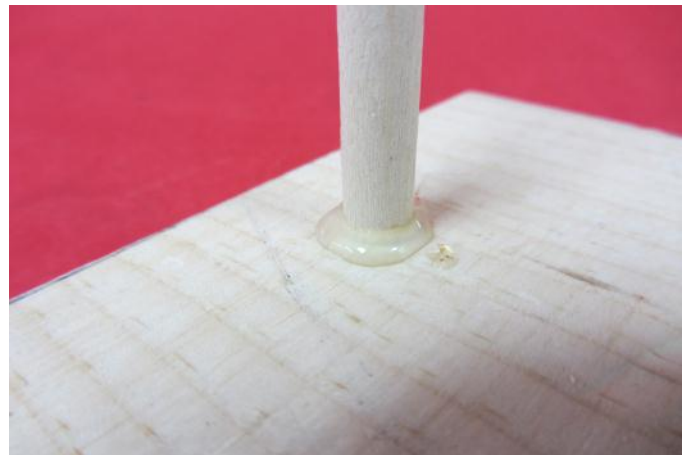
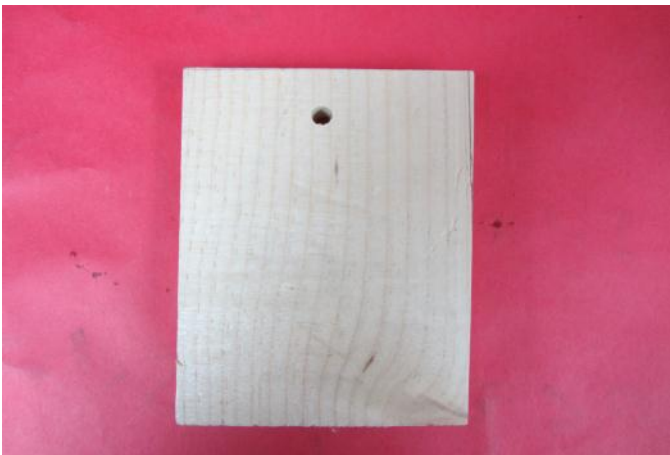


## Tools List:

Scissors
Hammer
Hot glue gun
Drill bit, same diameter as dowel

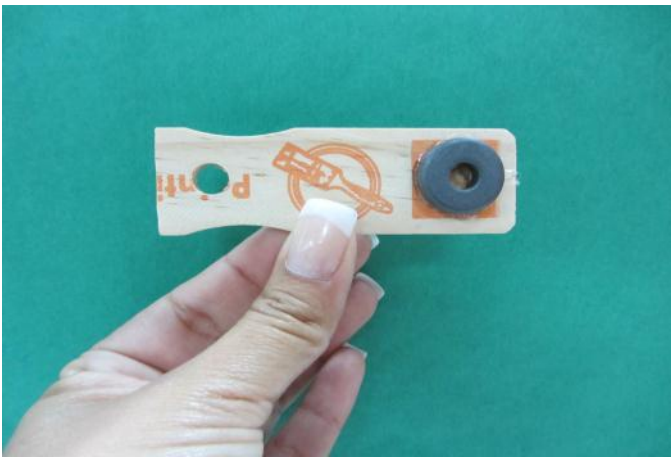
**Video:** <http://www.youtube.com/user/FresnoCSW>

## How To:



Drill a hole through one end of the baseboard.

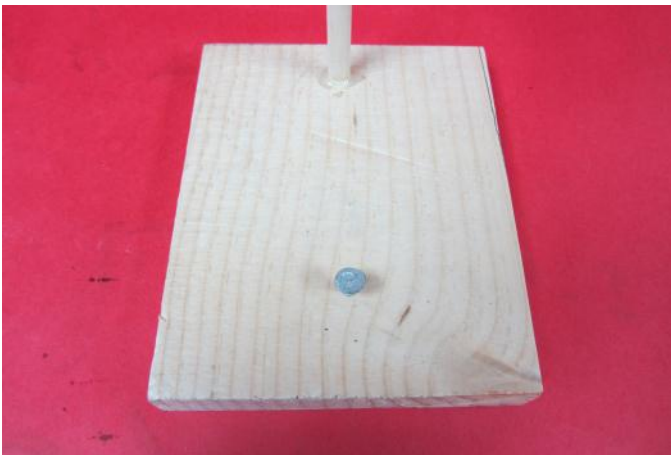
Push a dowel through the hole and glue in place.



Drill a hole through one end of the paint paddle.  
Glue a magnet onto the other end.



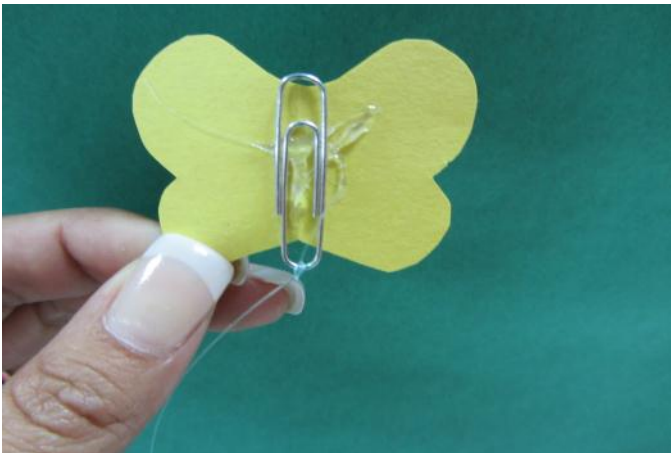
Push and glue the dowel through the hole in the  
paint paddle. Be sure the magnet is facing down.



Hammer a nail into the wood block.



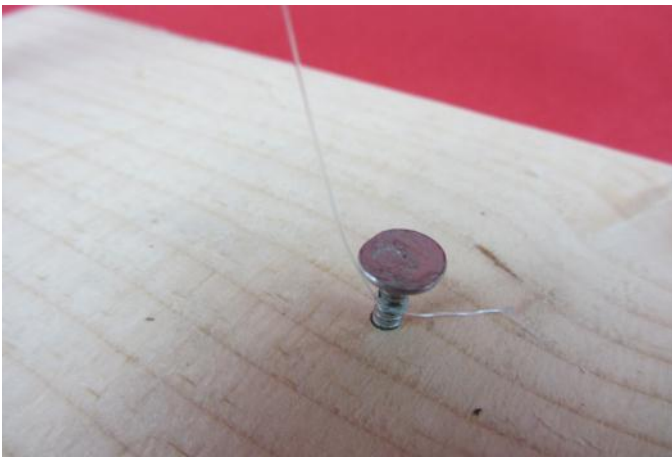
Tie a double knot of fishing line  
around the paperclip.



Cut out your floating object  
and glue it to the paperclip.



Let the paperclip touch the magnet, then slowly  
pull it down and hold it in a position where the  
force of the magnet continues to hold it up.



Tie the other end of the fishing line to the nail.  
Watch the paperclip float!

### **Fine Points:**

- When adjusting the fishing line, it is easiest to wrap the loose end of wire around the nail before tying a knot.
- A staple also works to fasten down the fishing line to the base board.

### **Concepts Involved:**

- A force is a push or pull on an object.
- When a piece of magnetic metal or another magnet enters a magnet's field, there is a force between the two.
- A magnet's field is most concentrated at its poles.

### **Focus Questions:**

1. What two forces are acting on the paperclip?
2. Instead of a paper clip, what other material could be used?
3. If you wind the fishing line around the nail to increase the gap between the paperclip and the magnet, what happens to the floating butterfly?

### **Elaboration:**

A magnet contains a force that attracts certain metals such as iron, steel, cobalt, and nickel, or objects containing these metals. Iron has the strongest magnetic attraction of all. Aluminum, copper, and gold are three metals that are nonmagnetic.

The magnetic force around a magnet is not visible, but the effects of its presence can be seen when a magnet is slowly pushed toward a nail. There will come a point when the nail “jumps” and sticks to the magnet. Scientists use the concept of an invisible magnetic field around a magnet to describe how it influences objects from a distance – causing a pushing or pulling force on other objects it isn't actually touching.

Every magnet has one north pole and one south pole. When a bar magnet is broken down into two pieces, each piece will again have a north and south pole. If those pieces break into two again, each of the smaller pieces will also have a north and south pole. No matter how small the pieces of the magnet become, each piece will have a north pole and a south pole.

A magnet's field is most concentrated at its poles creating its strongest forces there. Force is a push or a pull. Magnets can pull metal objects, and push or pull other magnets. Like poles repel (North-North or South-South) and unlike poles attract (North-South). With this project, the attraction is strong enough to hold up the paperclip, pulling it towards the magnet, so that it appears to float. In order to keep the paperclip from falling, the force must be stronger than the force of gravity. At a certain distance from the magnet the upward force is no longer stronger than gravity and the paperclip falls.

### **Links to k-12 CA Content Standards:**

#### Grades k-8 Standard Set Investigation and Experimentation:

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations.

#### Grades k-12 Mathematical Reasoning:

1.0 Students make decisions about how to approach problems:

- 1.1 Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, sequencing and prioritizing information, and observing patterns.
- 1.2 Determine when and how to break a problem into simpler parts.

2.0 Students use strategies, skills, and concepts in finding solutions:

- 1.1 Use estimation to verify the reasonableness of calculated results.
- 1.2 2.2 Apply strategies and results from simpler problems to more complex problems.
- 1.3 Use a variety of methods, such as words, numbers, symbols, charts, graphs, tables, diagrams, and models, to explain mathematical reasoning.
- 2.5 Indicate the relative advantages of exact and approximate solutions to problems and give answers to a specified degree of accuracy.

3.0 Students move beyond a particular problem by generalizing to other situations:

- 3.1 Evaluate the reasonableness of the solution in the context of the original situation.
- 3.2 Note the method of deriving the solution and demonstrate a conceptual understanding of the derivation by solving similar problems.
- 3.3 Develop generalizations of the results obtained and apply them in other circumstances.