Super Stability Sticks
Investigation #8

Description
Stick to this challenge! “Woodn’t” you like to know what happens?

Materials
• 5 wood meter sticks
• 1 x 2 x 37” piece of wood for stick 6
• Saw
• Measuring tape
• Wood glue
• Metal bracket
• Wood screws
• Wood stand

Procedure
1) Bend the wire and set aside.
2) Prepare a series of wooden sticks so that each stick has two legs. You should have one shorter leg and one longer leg, connected and glued at a 150-degree angle.
3) Stick one – short side = 6 1/2 inches; long side = 16 inches
4) Stick two – short side = 6 1/2 inches; long side = 22 inches
5) Stick three – short side = 6 1/2 inches; long side = 26 inches
6) Stick four – short side = 6 1/2 inches; long side = 32 inches
7) Stick five – short side = 7 1/2 inches; long side = 39 1/2 inches
8) Stick six – short side = 8 inches; long side = 29 inches
9) Place the wire on the end of the shortest stick and then balance the bend on the end of the second stick.  
10) Repeat the process with the next longer stick.  
11) Once all the sticks are balanced, place the entire system on the vertical wooden stand.  
12) Is the stick system balanced?  
13) Can the system withstand a gentle disturbance?  
14) What happens if you remove the wire?  

My Results

Explanation  
For an item to remain balanced, the center of gravity has to be supported. Support is determined by the center of mass in the system. The initial wire adds mass to the stick and offsets the lower part of the stick on the opposite end. Because both ends hang below your finger, the system’s center of mass is lower, which increases the system’s stability. Each time a stick is added, the new stick can be supported at the center of gravity. The sticks continue to get longer and more massive to keep the total center of mass below the base of support.
Eventually, the whole system is placed on the stand to remain balanced. A gentle disturbance may cause the system to shift, but not until the end wire is removed does the system begin to destabilize, and each stick falls in turn.

**Extend and challenge:** In our investigations, we balanced and supported the objects from underneath, but we could have supported the objects from above as well. A mobile is a great example of a hanging balanced system that can remain balanced even when a force acts on it, like a gentle breeze. The challenging part about making a mobile is to evenly distribute the weight around the mobile so that the system stays level. One trick is to build from the bottom up and find the center of each support before adding another level. Curved supports are also more stable than straight ones because curved supports lower the center of mass. A marvelous mobile is beautifully balanced!

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