Hockey Stick Flex

Amount of time Demo takes: 5 min
Try this at home!

Materials

- Hockey sticks of varying materials
- Weights
- Ropes/etc. to hang weights
- Two tables or chairs
- Measuring stick (not necessary)
- Small white board (not necessary)

Setup instructions

1. Place two tables or chairs opposite each other, separated less than the length of the hockey stick.
2. Set a hockey stick across the gap
3. Get the weights set out so you can hang them on the hockey stick

SAFETY!

- Handle heavy weights with appropriate care, lift with legs
- Purpose of this demonstration is to show flex, not to break the sticks. Do not add more weight than necessary to show the stick flex.

Lesson’s big idea

- When a player bends his hockey stick when taking a shot, it essentially turns the hockey stick into a spring storing energy. When the spring is released (when the stick unbends and returns to straight), the energy is released and it accelerates the puck.

Background information

- Flex - Hockey Stick Flex is a measure of how flexible a stick is when a force is applied to it. Generally you want the stiffest stick you can flex completely to take full advantage of the stick recoil as it snaps the puck
forward.

- Flex is measured by testing how much force (in kilograms) it takes to bend the shaft 1 in, at approximately mid point of the shaft. This flex measurement is generally listed on the stick, and is roughly the same regardless of the composition of the stick.

- Kick point - The kick point is where the shaft flexes when enough pressure is applied to bend it.
  - Mid flex - Mid kick point, or mid/constant flex, sticks have a more traditional flex that allows the stick to be loaded from the bottom hand. This gives you a larger loading and potentially a higher velocity release. Wooden sticks have a constant flex profile that behaves in this manner.
  - Low kick points - Composite sticks are often engineered to have low kick points on the shaft for a quicker release. The loading of the stick happens sooner since there is less distance for the stick to bend before it recoils back and whips the puck forward. This lower kick point is often created with shafts that have tapered ends near the blade.

- Materials used to make sticks - In addition to wood sticks, there are now aluminum shafts, carbon-graphite shafts, and even sticks and blades that are entirely made of carbon-graphite. Graphite, carbon-graphite, and aluminum shafts and sticks provide strength and generally weigh less than wooden sticks. Sticks will come with a flex rating, and show flex at that rating regardless of composition. Generally, less experienced players learn on sticks that have more flex in the shaft, and experts use shafts that are stiffer. Cutting a stick down in size increases the flex in the stick, the change in flex rating by cutting the stick may be listed when purchasing an upper end model.

- Composite hockey stick flex vs. wood hockey stick flex: Does a composite stick flex more than a wood stick? It all depends on how the hockey stick is engineered. A stick flex rating of 100 is the same flex no matter what type of material the hockey stick is made from. The main difference between the wood and composite are where the kick points are (discussed above).

**Instructional Procedure**
1. Explain to participants the various materials in the hockey sticks. Ask them to make guesses about which will be most flexible, which will be the least, and why.

2. Begin hanging weights from the middle of the sticks. Once enough weight is added, a visible end (flex) will become noticeable. Try to reach a 1 inch bend, this is the amount of flex used to test and rate the flex of sticks.

3. Students can measure the distance the stick has bent and discuss how the spring of a stick would affect game play.

4. Discuss with participants the flex of sticks. A stick that is rated 100 (regardless of composition) will flex approximately the same as all other similarly rated sticks because of the engineering that goes into building a stick. A difference between kick points on wooden shafts and composite may be visible. Composites generally flex lower on the shaft and wood sticks will bend through the whole stick.

Assessment/sample questions you can ask
- Why are sticks made to be flexible?
- In what other contexts does something’s flexibility have an impact on its effectiveness?

Clean Up
- Put the hockey sticks and weights away.

References
- Exploratorium: http://www.exploratorium.edu/hockey/gear2.html
- How It’s Made - Pro-Hockey Sticks: https://www.youtube.com/watch?v=G-ueMOMW6mw&feature=player_embedded
- Video describing how shaft, blade, and flex of stick affect accuracy and power in shot: https://www.youtube.com/watch?v=O9ydbx_tkZQ&feature=player_embedded

Next Generation Science Standards
- HS-PS2-6
● HS-ETS1-3