MIND TREKKERS
Depth Perception Challenge: Washers and Cups Lesson Plan

Amount of time Demo takes: 3:00-5:00
Materials:
1. Short glass/plastic clear cup
2. Box of small washers, penny sized (we try to avoid pennies)
3. Small whiteboard and marker

Set up instructions:
1. Set cups on table (ensure that for both trials that the cups stay at same distance).
2. Set out washers

Lesson’s big idea
● The reason you find a difference between one eye open and two is because the brain uses information from both eyes is a little bit different. This is part of where we get our depth perception. When you are only using one eye, this is called monocular vision (mono = one, oculus = eye). Using two eyes is called binocular vision.
● We test the difference between monocular and binocular vision in this experiment.

Background Information:
Depth perception (our ability to judge how far away things are) is the result of three things. The first is based on memory and your retinal. Your eye and brain work together to remember a previous time you saw an object; how far away was it? How large was its image on your retina? The second is called moving parallax: when you move your head from side to side, things that are close to you move quickly across your retina, whereas objects that are far away move comparatively little. Your brain uses this information to gauge how far something is from you. Lastly, and most important to this demonstration, is stereo vision. Each of your eyes receives a slightly different image of an object (your eyes are not in exactly the same spot -- they are separated by a few inches). The difference between the two images is especially great when the object is closer to your eyes. Try closing one eye and looking at your forefinger as you hold it in front of your face. Switch which eye is closed -- did you notice your finger “jumping” to one side? When both eyes are open, your brain combines the two separate images to form a composite, more-correct judgement of where an object is.

Instructional Procedure (to tell students):
1. Sit at a table across from a partner. Have them hold a penny and move it around in the air (about 12-18 inches) above the cup. Keeping your eyes on it, try to gauge when it is exactly over the cup.
2. When you say “drop it” your partner should drop the penny. Did it fall into the cup? Try 5-8 times (maybe less) and write down how many times the penny landed in the cup when you said to drop it.
3. Try with both eyes open and one eye open and compare the results. When were you more accurate? You can also try moving the cup 1-2 feet to each side between drops to see how depth perception may change!

Assessment, sample questions you can ask:
1. When were you more accurate at telling your partner to drop the pennies?
2. When have you noticed your depth perception being better or worse?
3. When does depth perception matter?

Clean Up
Neatly package all the washers, then place them in the bin with the cups.

References:
ZOOM: http://pbskids.org/zoom/activities/sci/pennycupgame.html

National Standards:
K-4: Physical Science -- position and motion of objects
5-8: Physical Science -- motions and forces
9-12: Life Sciences -- behavior of organisms