Class: Grade 4 Science

Lesson Title: Light Kinulation (Day 1)

Class Size: **24**
Time: **50 mins**

Curriculum Outcomes:
303-2 demonstrate that light travels away from a source in all directions
303-4 investigate how a beam of light interacts with a variety of objects, to determine whether the objects cast shadows, allow light to pass through, or reflect the light

Learning Objectives:
1. Students will gain an understanding of the difference between transparent, translucent and opaque materials.
2. Students will have an understanding of how light travels and the path it travels from the source.

Materials:
- Colored pinnies

Preparation beforehand:
- Make sure a large space is cleared for the activity

Introduction:
1. Introduce the topic. Possible prompt questions include:
    a. What is light made of and how does it travel? (photons, energy in waves away from the source)
    b. Can light travel through anything? (transparent vs. translucent vs. opaque)
    c. If light only travels in straight lines, how do we make sure everything is lit up in a room? (bounce light off of reflective materials)

2. Explain what a kinulation is (broken up into kinesthetic and simulation). Tell them that these are used to help students learn difficult concepts that are otherwise difficult to picture. It allows students to become part of the demonstration, and therefore easier to remember and learn. Ask students if they would like to try one.

Activity: Light travelling
1. Assign 6-7 students as particles of light (photons) and give them pinnies to wear. Group them at one location that will represent the source of the light.
2. Instruct students to act as if they are light from the light source, and choose their path accordingly.
3. Have students offer suggestions on what was good/not-so-good about the "light" students' portrayal of a beam of light.
   Common misrepresentations:
    a. Students all travel in one straight line instead of many straight lines from the source.
    b. Students travel a short distance but then stop (with nothing actually impeding their motion).
    c. Some students travel in a curved line or turn mid-path.
    d. Some students start out fast, but then slow down (or vice a versa).
4. Talk to students about how their path should have been a straight line in any direction from the source, and continuous until they hit something that they could not pass through. The energy level (or speed they were moving) should have been consistent as the speed of light is constant.
5. Complete the simulation again (instruct students to not stop until something stops them from going forward), this time the students are armed with the knowledge and may wish to represent the waves better by having each student walking straight ahead and waving their arms (you may wish to swap out "light" students at this point).
6. Repeat the simulation again, this time opening the door to the classroom and have the "light" students walk toward the door (not all in single file, so that some students will pass through the door, but others will hit the wall around the door).
    a. This will be a good point to discuss why some students were able to go through the door, hitting the outside wall of the adjacent classroom, while others were not (because walls are opaque and

light can't travel through them).

7. Set up the remaining students in the classroom around the room as objects that light cannot pass through (make sure there is no objects students can trip over as the "light" students will be walking with their eyes closed). Have the "light" students gather at the light source, this time walking with their eyes closed and stop when they hit an opaque object.
8. Run the simulation again, this time as "light" students reach another student, they will simply be helped past them (representing transparent objects).

Conclusion – Possible wrap-up questions:

1. When would we want an object to be opaque in real life? When would we want it to be transparent or translucent?
2. How far do you think a photon of light would travel if it never hit anything? (forever)
3. Do you think light can travel in space? (yes! Light energy waves don't need a medium to travel through)