WhoIntroduction to science learning & Smartivity- 10 minutes

Introduce yourself. Tell the children your name, your field of study, and a list of superlatives they must use when addressing you, such as _____

Who is a smart kid?
Gather answers from students and then tell them **the definition of a smart kid.**

What is smartivity?

What is science?
Science refers to a system of acquiring knowledge. This system uses observation and experimentation to describe and explain natural phenomena.

What is technology?
Technology is the application of science, or scientific knowledge for everyday use… or what we call practical purposes.

What is engineering?
Engineering is the branch of science and technology that deals with the design, building, and use of engines, machines, and structures…

What is mathematics?
Mathematics is not just about numbers and addition and subtraction and multiplication and division… Math and science go hand in hand. Math is a subject that helps us think about and experiment with science, technology and engineering concepts, before we actually build something.

What is STEM?
STEM is a shortform of Science, Technology, Engineering and Math… all the modern advances that we as humans have made is a result of these four subjects. These four subjects not only help us discover and invent new things, but also help us look at life in a different way - help us question why and why not… show us a way to find new solutions.

What is a Scientist?

"A scientist is a person who asks questions and tries different ways to answer them."

Then I show a PowerPoint I made, **What is a Scientist?**

Science in Life- 25 minutes

Science has invaded every branch of modern life. It is the noise of machines, cars, mills and factories, etc. which awakens us every-day in the morning. The food we eat, the clothes we wear, the books and papers we read, the recreations we enjoy, the games we play – all have something or other to do with the application of science.

Every person feels the effects of science in every sphere of life. It is not merely the electric light or the electric fan, the radio or the cinema that displays the power of science in our daily life, but everything we do or is done to us is in some way or another connected with science.

The things that we use in our daily life are mostly due to science. Our forefathers put on clothes woven by hand. Our clothes are made in large factories where scientific methods are used. We get so much paper to write on only because the piper mills can turn out huge quantities of it. Cloth and paper we had even before science came on the scene but no one could then think of the huge quantities in which they are produced now.

Science has conquered time and distance. We can travel from one place to another with a quickness which our forefathers could not have dreamt of. In the morning, we get news of events that happened yesterday in all parts of the world. Why should we talk of yesterday? With the help of the radio, we can listen to an American speaking. It would seem that he is before us and we are part of his audience. If we want to send a message to a person in America, we can send an email and he will get it in a few hours. If we want to speak to our friends far from us, there is the telephone that will connect us.

Effect of science of human life: It is, indeed, true that science has added tremendously to the comforts and conveniences of mankind. Unless one is an ascetic, one has no reason to reject the things science offers. By conquering time and distance science has brought mankind together and so far made life richer. By inventing medicines it has made our day-to-day existence relatively free from disease, and has, indeed, added to our length of life.

Examples of use of Science in everyday life: This fan and light works from the application of electricity. Electricity is one of the wonders of modern science. The bus which has an engine works with petroleum. The train is driven by the power of coal. This is possible only because of the application of science. My doctor gives certain injections and the patient soon well enough to come here. Medical science is another achievement of modern science, the marvel of medicine.

From the above, it is clear that science is playing an important part in our everyday life.

Scientists Stay Safe

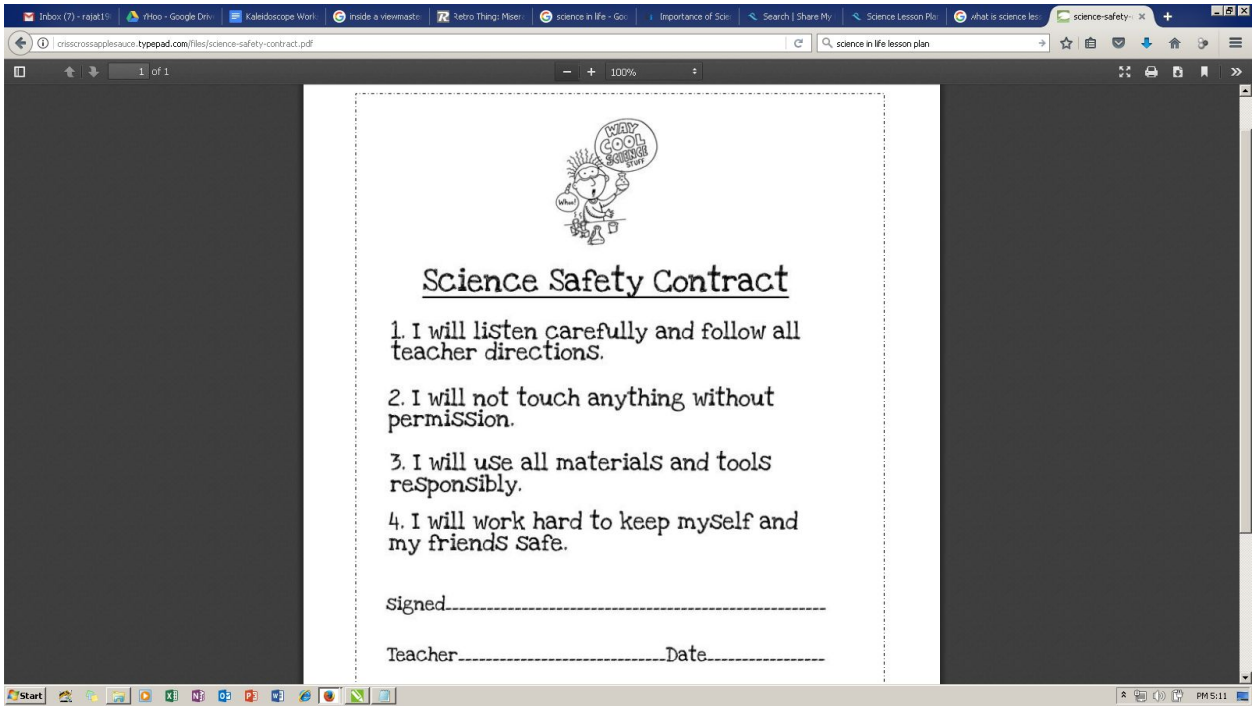
Today we take some time to go over all of the safety expectations in the Science Safety Contract. I start by asking the kids "Why is it important for scientists stay safe? What kinds of things do scientists do to stay safe?"

We watch the PowerPoint What is a Scientist? again. I ask the kids to look for things that these scientists are doing to stay safe. (The chemist is wearing gloves and goggles; The geologist is wearing a hard hat; etc.)

Then I ask the kids about specific slides, for example-- "Do you think the volcanologist plays around with the hot lava? Do you think the chemist tastes the chemicals? Why not?"

We take a few minutes to discuss all the horrible catastrophes that could befall these scientists if they are not safe (the kids are very imaginative that way!) Then I tell the kids that, although we will not be near any volanoes or tornados, it is still very important that ***we*** stay safe while doing science!

I hand out the Science Safety contracts. We go over each expectation--one by one. We talk about why that expectation is important and what could happen if we didn't follow them. When we are done, we sign them and glue them in our notebooks!



To begin this lesson, ask students if everyone sees things exactly the same way. Have them discuss differences they are aware of such as not being able to see things that are far away (nearsightedness) or close up (farsightedness), or not seeing certain colors (color blindness).

Also ask them where they would go in the classroom if they didn't want you to see them. Answers may include behind you, under a desk, or behind a door or wall.

Have students consider these questions:

- What tools or instruments help people see better?
- What do these tools do?

Common answers may include glasses, binoculars, telescopes, and magnifying glasses. Students may indicate that these tools make things seem closer or farther away.

Continue the discussion by asking these questions:

- At what times or in what situations is it impossible for anyone to see anything?
- Why is this so?

Answers may include when there is no light and when something is not directly in line with their eyes. Explain to students that when we see an object, we are actually seeing the light it gives off. So when it is dark or when an object is not in line with our eyes, we can't see it. Point out that light travels only in straight lines—it can't bend around corners. That's why we can only see what is in a straight line from our eyes—or in our line of sight.

Have students experiment with line of sight by testing at what locations around the room they can and can't see each other.

Then ask students if they know of any tool that can help them see an object that is out of their line of sight. Some students will probably mention periscopes. If they don't, introduce periscopes at this point.

Then ask these questions:

- What do you know about periscopes?
- What are they used for in the real world?

Allow students to discuss their understanding of how periscopes are used in submarines. You might ask if they have heard the expression "Up periscope." Explain that this command is used to request the raising of a submarine's periscope.

Tell students that periscopes bring what is around corners, over walls, and beyond into view. Add that they will now have a chance to make their own periscopes and see how they work.

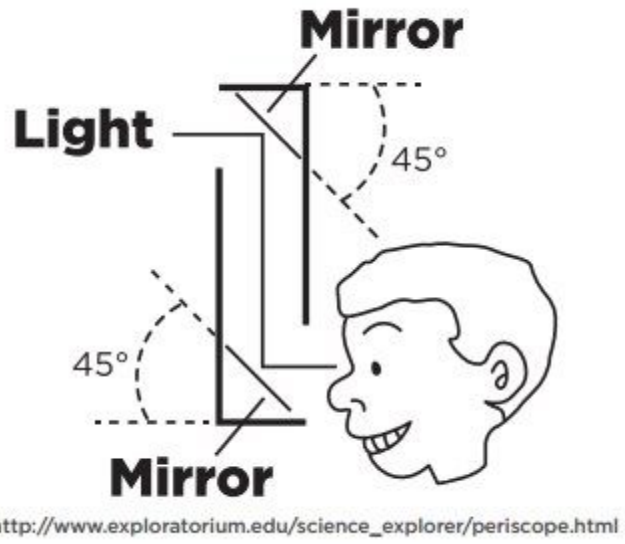
Reading Instruction Manual and identifying parts

(10 minutes)

Constructing the PERISCOPE - 70 minutes

How does a Periscope Work - 15 minutes

Light always reflects away from a mirror at the same angle that it hits the mirror. In your periscope, light hits the top mirror at a 45-degree angle and reflects away at the same angle, which bounces it down to the bottom mirror. That reflected light hits the second mirror at a 45-degree angle and reflects away at the same angle, right into your eye.



http://www.exploratorium.edu/science_explorer/periscope.html

History of Periscopes

Johann Gutenberg, better known for his contribution to printing technology, marketed a kind of periscope in the 1430s to enable pilgrims to see over the heads of the crowd at religious festivals. Johannes Hevelius described an early periscope with lenses in 1647 and saw military applications for his invention.

Tanks use periscopes extensively: they enable drivers or tank commanders to inspect their situation without leaving the safety of the tank.

REFLECTION - 10 minutes

Say: Light can travel from one place to another. If you turn on a flashlight and point it at the wall, the light will travel from the flashlight all the way to the wall. The light beam travels in a straight line. I want you to look at these pictures. What do you notice about the light beams.

I want my students to point out that the beam travels in a straight line. I take a flashlight and point to the wall.

Say: Boys and girls do you think I can point this flashlight at the wall in front of me the light can turn and touch the wall to the left of me? Light travels in a straight line but do you think we can bend the beam of light? Today I want you to try and discover more about the beam of light. As you work you will try and answer this question:

Say: Today we are going to answer the question: Can the beam of light bend? If yes, how? As you are working I want you to think hard about this question and see what you can discover!

Hold the flashlight straight and hold the hand sideways and try to bend the light.

Hold the mirror straight and then shine the flashlight at an angle and see what happens.

Put the mirror at the edge of the flashlight and then shine the flashlight onto the mirror and see if it goes to the ceiling.

Point the flashlight at the mirror and see if it bounces back.

Shine the flashlight at the mirror and see what happens.

Say: Boys and girls you learned all about ways to bend light beams today. I want to teach you a new word. It is called reflection. Can you say reflection? Great! Reflection happens when you shine a narrow beam of light at something, you get a beam of light reflected back off it. For example when you shined the flashlight into a mirror, you got a beam of light bouncing back towards you. Have you ever heard the word reflection? What does this make you think of?

Video: https://www.youtube.com/watch?v=cxsI0Av5624

Say: Boys and girls in this video you learned a lot about light reflection. We have learned that you can reflect light off of a pond, a mirror and even a tray. Can you think of some other examples where light is reflected?

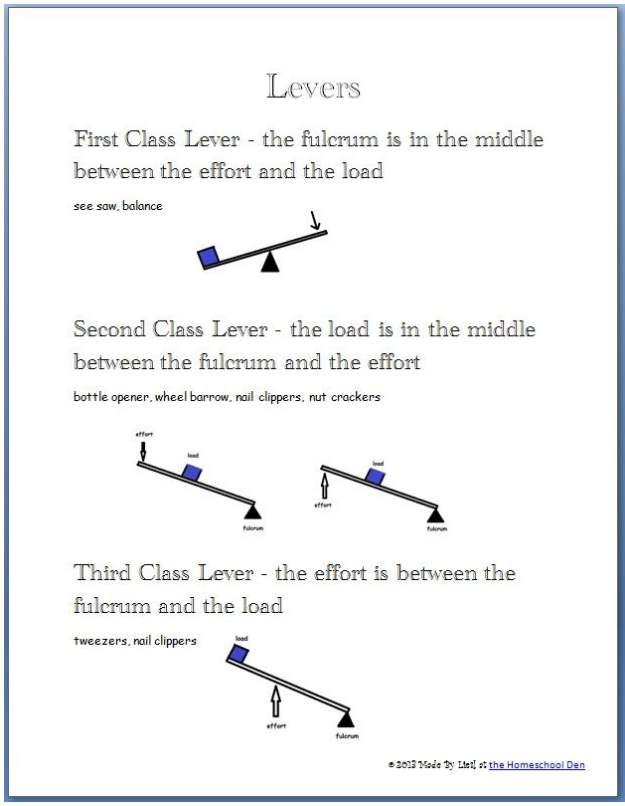
Record their thinking on our "Reflections" anchor chart.

LEVERS - 10 minutes

Video: https://www.youtube.com/watch?v=D23IZxYaiLHs

What do a seesaw, tweezers, scissors, and your arm have in common? They're are all examples of levers!

3 types of levers:



Levers

First Class Lever - the fulcrum is in the middle between the effort and the load

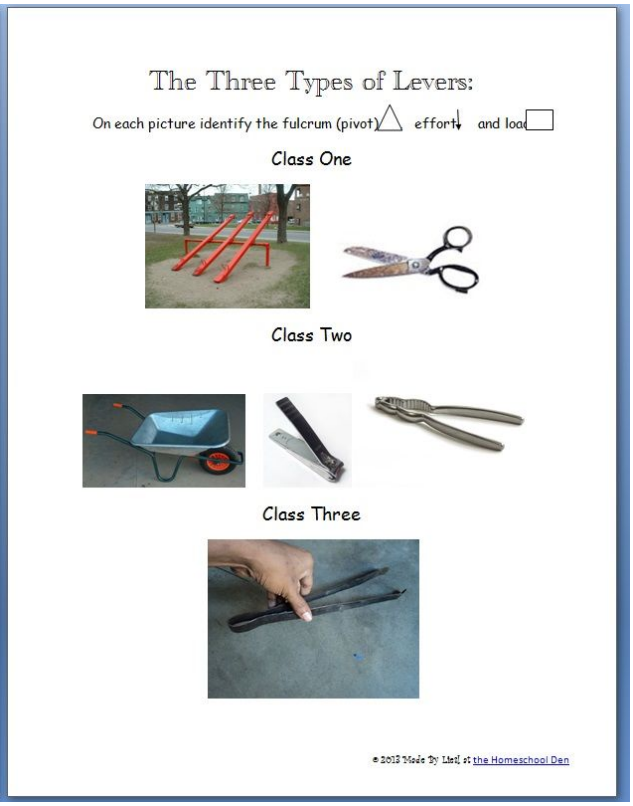
see saw, balance

Second Class Lever - the load is in the middle between the fulcrum and the effort

bottle opener, wheel barrow, nail clippers, nut crackers

Third Class Lever - the effort is between the fulcrum and the load

tweezers, nail clippers



The Three Types of Levers:

On each picture identify the fulcrum (pivot) △ effort ↓ and load □

Class One

Class Two

Class Three

Colouring a project - 20 minutes

Answer the following questions to show what you learned about periscopes.
How does a periscope let you see around corners and over and under things?

How does the periscope affect the size and shape of the objects you see?

How could you make a periscope that would let you see behind you? (Hint: Look at the diagram of how a periscope works and think about where the light has to enter it.)

What ways could periscopes be used in real life?

CHALLENGE QUESTION: Can you read writing through your periscope? Why or why not? (Hint: Think about what writing looks like in a mirror.)

Sample Answers:

Following are sample answers to the assessment questions:

1. How does a periscope let you see around corners and over and under things?
   (The angled mirrors in the ends of the periscope bend light rays. When you look through a periscope, light coming from objects at right angles to your eye is bent so the object comes into your line of sight.)
2. How does the periscope affect the size and shape of the objects you see?
   (The periscope doesn't affect the size or shape of objects viewed through it. It only allows you to see objects that are out of your line of sight.)
3. How could you make a periscope that would let you see behind you? Hint: Look at the diagram of how a periscope works and think about where the light has to enter it.
   (You could tape the two milk cartons together with the holes facing in the same direction.)
4. What ways could periscopes be used in real life?
   (Answers may include situations in which someone needs to see something that is out of the line of sight, such as underwater in submarines, for security in buildings, or inside the body.)
5. CHALLENGE QUESTION: Can you read writing through your periscope? Why or why not? Hint: Think about what writing looks like in a mirror.
   (You can read writing with a periscope because it is reflected in two mirrors. The first mirror makes it appear backwards and the second makes it look normal again.)

Pop Quiz - 10 minutes

PERISCOPE

1) How many mirrors does a Periscope have? (b)
   a) One
   b) Two
   c) Three
   d) Four

2) Does the light always reflect at the same angle that it hits the first mirror? (a)
   a) Yes

b) No
c) May be

3) Does the angle of the light change after it passes the second mirror? (b)
a) Yes
b) No
c) May be

4) Who marketed a kind of periscope in 1430s? (c)
a) Mark Nicholas
b) Stone Willis
c) Johann Gutenberg

5) When was the first periscope with lenses described? (b)
a) 1847
b) 1647
c) 1649
d) 1947

6) Can light be bent? (a)
a) Yes
b) No
c) May be

7) When you shine a light on something and it bounces back, it is called _____. (b)
a) Refraction
b) Reflection
c) Diffusion
d) Retraction

8) How many types of levers are there? (c)
a) One
b) Two
c) Three
d) Four

9) What is the lever where the load is in the middle between the fulcrum and the effort called? (d)
a) First Class Lever
b) Third Class Lever
c) Fourth Class Lever
d) Second Class Lever

10) A scissor is an example of what type of lever? (a)
a) First Class Lever
b) Third Class Lever
c) Fourth Class Lever
d) Second Class Lever