Introduction 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- 10 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

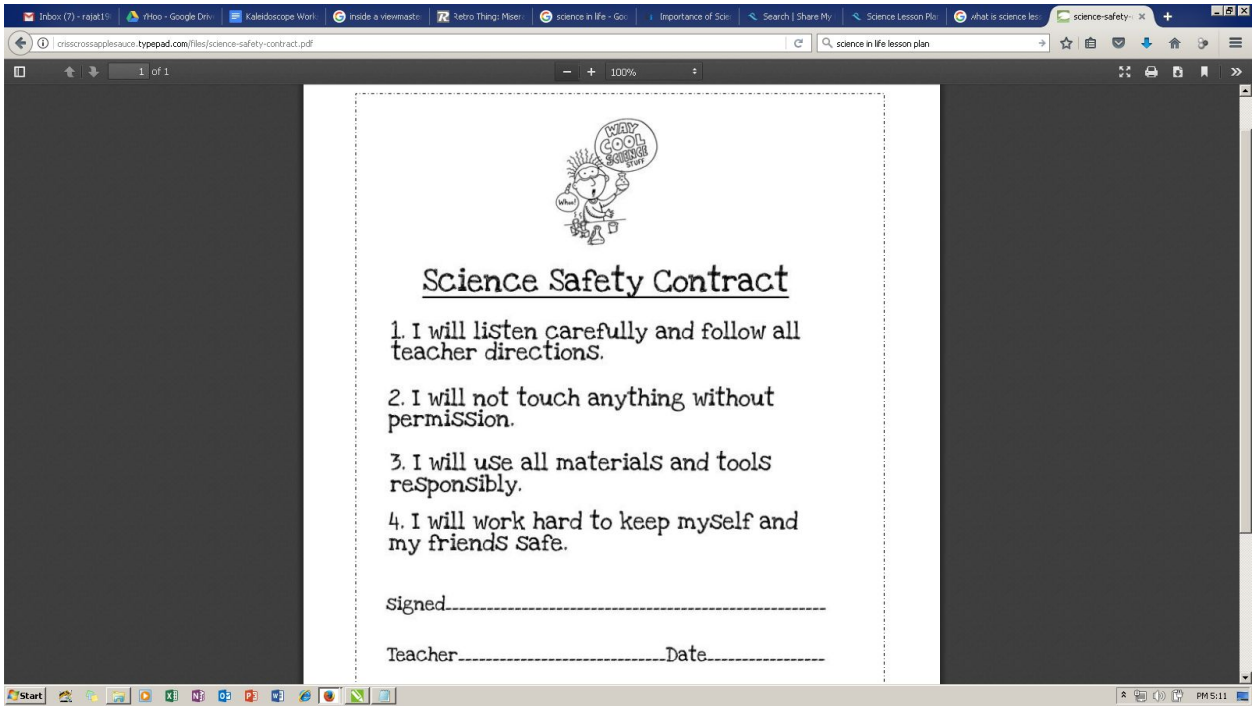
Today we take some time to go over all of the safety expectations in the Science Safety Contract. I start by asking the kids "Why is it important for scientists stay safe? What kinds of things do scientists do to stay safe?"

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!



CONCEPTS EXPLAINED - 10 Minutes

Guide students to the scientific concept they will be learning through the activity which is

Video:
http://www.sciencechannel.com/video-topics/engineering-construction/machines-rollercoaster/

Today's lesson is all about roller coasters and the science and engineering behind them. Before we start talking about physics, though, I'd like you to share some of your experiences with roller coasters. (Listen to a few students describe their favorite roller coasters. Point out some of the unique features of each coaster, such as hills and loops, that relate to the lesson.)
Does anyone know how roller coasters work? You might think that the roller coaster cars have engines inside them that push them along the track like automobiles. While that is true of a few roller coasters, most use gravity to move the cars along the track. Do any of you remember riding a roller coaster that started out with a big hill? If you looked closely at the roller coaster track (on which the cars move), you would see in the middle of the track on that first hill, a chain. You might have even have felt it "catch" to the cars. That chain hooks to the bottom of the cars and pulls them to the top of that first hill, which is always the highest point on a roller coaster. Once the cars are at the top of that hill, they are released from the chain and coast through the rest of the track, which is where the name roller coaster comes from.

The underlying principle of all roller coasters is the law of conservation of energy, which describes how energy can neither be lost nor created; energy is only transferred from one form to another. In roller coasters, the two forms of energy that are most important are gravitational potential energy and kinetic energy. Gravitational potential energy is the energy that an object has because of its height and is equal to the object's mass multiplied by its height multiplied by the gravitational constant ($PE = mgh$). Gravitational potential energy is greatest at the highest point of a roller coaster and least at the lowest point. Kinetic energy is energy an object has because of its motion and is equal to one-half multiplied by the mass of an object multiplied by its velocity squared ($KE = 1/2\ mv^2$). Kinetic energy is greatest at the lowest point of a roller coaster and least at the highest point. Potential and kinetic energy can be exchanged for one another, so at certain points the cars of a roller coaster may have just potential energy (at the top of the first hill), just kinetic energy (at the lowest point) or some combination of kinetic and potential energy (at all other points).

Reading Instruction Manual and identifying parts

(10 minutes)

Constructing the Roller Coaster - 125 minutes

PLAYTIME - 10 minutes

CONSERVATION OF ENERGY - 5 minutes

https://www.youtube.com/watch?v=C1w_-hL6mag

ACTIVITY -

Drop marbles from different heights of your instruction manual or any other surface. In which case does the marble go the farthest? Is it because the marble at a greater height has more potential energy and hence when it reaches the bottom it has more kinetic energy or motion energy and that's why it moves faster in the end!

BANKING - 5 minutes

From learner's log

ACTIVITY
Change the orientation of Big H Pillar and H Pillar so that left becomes right and right becomes left. What happens? Does your marble fall off the tracks while rolling? Why does it happen?

Because whenever an object is in a circular motion it experiences an outward force which is called a centrifugal force. This force pushes the object outside. Have you ever observed that when you are rotating a string with an object attached to its one end and you let go off the string then that object moves outside. It is because of the centrifugal force.

COLLISION - 5 minutes

From learners log

ACTIVITY

What happens when a marble is hit in the center? Does it move in the direction of the hitting marble? Why? Because the point of contact of 2 marbles lies on the line connecting centers of the 2 marbles. When a marble hits the other marble sideways a part of speed of hitting marble is given to the other marble.

Colouring a project - 20 minutes

Pop Quiz - 10 minutes

Roller Coaster

1. The law of _____ is the underlying principle of all roller coasters. (a)

a) Conservation of energy
b) Conservation of mass
c) Inertia
d) Conservation of electric charge

2. According to the law of conservation of energy; energy can neither be _____ nor _____ but can only be transferred from one form to another. (c)

a) lost , destroyed
b) created, gained
c) Created , destroyed
d) Present , absent

3. Which two forms of energy are most important in roller coasters? (b)

a) Elastic and Kinetic
b) Kinetic and Gravitational Potential
c) Motion and Nuclear
d) Gravitational Potential and Motion

4. Gravitational potential energy is greatest at what point of a roller coaster? (b)

a) Lowest
b) Highest
c) Both lowest and highest
d) Neither of above

5. What is the formula for Kinetic Energy? (b)

a) KE= mv^2
b) KE = 1/2 mv^2
c) KE = 1/4 mv^2

d) $KE = 2\ mv^2$

6. What is the formula for Gravitational Potential energy? (a)
a) PE = mgh
b) PE = gh
c) PE = ½ mgh
d) $PE = mgh^2$

7. _____ energy is the energy an object has because of its motion and _____ energy is the energy an object has because of its height. (kinetic, Potential)
a) Kinetic, Potential
b) Potential, Kinetic
c) Mechanical, Kinetic
d) Kinetic, Mechanical

8. Can potential and kinetic energy be exchanged? (a)
a) Yes
b) No
c) May be

9. Kinetic energy is lowest at which point? (c)
a) Lowest
b) Both Lowest and highest
c) Highest
d) Neither of above

10. During a collision, a body exerts _____ on the other body. (b)
a) Weight
b) Force
c) Nothing