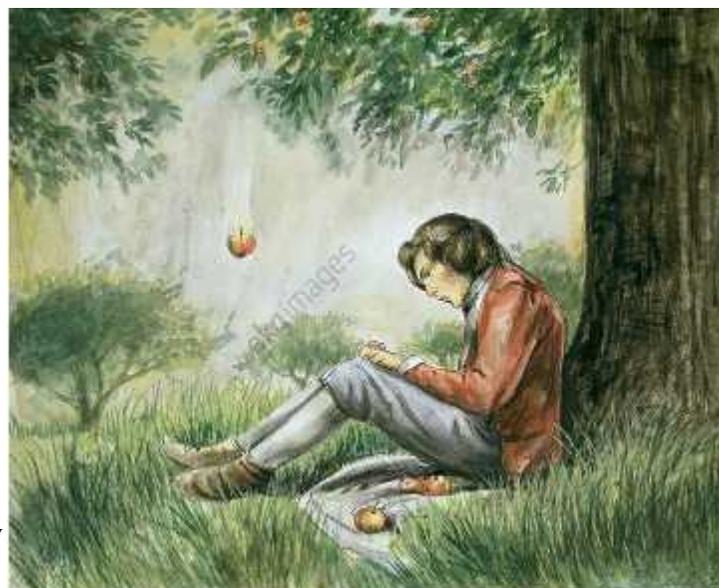
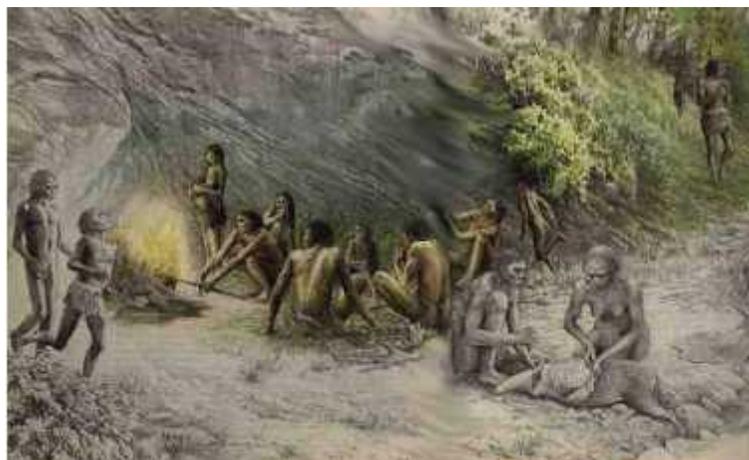


**Boeing STEM Hub
STEM at Home Program Outline**

Program introduction:

In thousands of years humans have evolved from cave inhabitants and deer hunters to robot manufacturers and space astronauts. Only a single question has made mankind evolve unimaginably and is still fueling them to more and more advances: *how*. “*How did this apple fall from the tree?*” is the question that made Newton discover gravity and paved the way to what was later called Newtonian mechanics. “*How do birds fly?*” is the question that bothered philosophers and scientists for long until eventually they built airplanes. This is the very question that this program is willing to answer. There is a lot more to discover and a lot more we still need to explain. This program’s mission is not only to give an answer to this question whenever possible but also to encourage the students to ask themselves this question and know how to search for an answer. The program is intended to help the students appreciate the science in their homes. They shall learn the chemistry of food and cooking. They will also see the chemistry of hand-wash soaps and chemical detergents. Moreover, they will get the chance to appreciate the brilliant engineering applications in their own homes. They will see how refrigerators, air conditioners, televisions, radios and telephones work. The program highlights the science that students witness everyday in their own homes, yet don’t usually care to chase. The program’s main goal is to make the students look at the world with curiosity, the curiosity that brought us every scientific advance that we now enjoy and the curiosity that should be thanked that we don’t still live in caves and have to chase deer for lunch everyday.



Target audience:

The program targets students whose age is between 12 and 14. The program also targets

parents who are willing to know more about the science in their homes.

Program skills structure:

This program is not concerned with the concepts and the amount of the scientific knowledge delivered as much as it is concerned with the skills that the students develop throughout the course. The skills that this program intends to develop go in harmony together and complete one another. These skill sets are:

Scientific and knowledge skill set:

This is the main core of any program we provide. The program is designed to give the students a scientific background about the operations of many products that they find in their own homes. From soaps and chemical detergents to televisions and air conditioners, the program intends to explain the science and the engineering applications of these products as well as engage the students in a series of hands-on and practical activities.



Engineering and hands-on skills:

This is the set that students enjoy the most. This is when they are actively participating in creating products and seeing science in action. The students will learn the safety precautions needed when working with chemicals and electricity. Moreover, they will learn to measure, observe, record data, represent data and draw conclusions.



Personal and team work skills:

This is a crucial part of the program. One of the program's main goals is to develop communication and collaboration skills that are essential in any successful project work. The students will learn how to organize tasks, communicate and integrate their tasks together. The program consists of two main projects and checkpoint activities. All of these projects and activities are team work based and instructors will make sure that the students develop the required collaboration and leadership skills while building their projects.



Program progress phases and structure

Phase 1 – Preparation

In this phase students will be introduced to chemistry and physics concepts that are the basis of most of the scientific ideas behind most of the products they find in their own homes.

1.S: Scientific and knowledge content

Students will learn the concept of chemical reactions and their kinetics. They will be introduced to the concepts of heat, reactants and products. They will learn how to control, monitor and observe chemical reactions. Moreover, they will learn how to separate the products from the reactants and they will learn how to preserve and improve the quality of the obtained products. In this stage, students will be also familiar with the chemistry of cooking and how the human body processes different types of food.



1.E: Engineering Practices

Case studies for selected products. These are chemical detergents, personal hygiene products like shampoos and toothpastes, televisions, refrigerators, air conditioners, telephones and radios. Students will research with the aid of the instructors the ideas behind these products and do presentations for their research findings.



1.H: Hands on Activities and checkpoint assignment

Students will have two main checkpoint activities. In the first assignment, student groups will make their own hand-wash soap product and test it. In the second checkpoint, students will make their own chemical detergent and test it on an unclean piece of cloth.

Phase 2 – Design

The major project that students will have to complete is to make a furnished house prototype. In this prototype they will have hand-wash soaps that they developed and tested and samples of chemical detergents that they developed and tested. They will design and build a prototype design of this house and implement it with the aid of laser cutters and 3D printers. They will also design and make their products packages. The house should be composed of 1 bedroom furnished, 1 living room furnished and a bathroom.

1.S: Scientific and knowledge content

Students will know more about the ways of effective packaging and designs. Their designs should be demonstrative and self-marketing for their products. Instructors should help the students with going through the designs.

1.E: Engineering Practices

Students will learn more about using software CAD programs to design objects. They will also be introduced to some Fabrication lab machines like Laser Cutters and 3D printers.



1.H: Hands on Activities and checkpoint assignment

Students will design the packages and the structure of their mini home and the instructors will review the designs and give feedback.

Phase 3 – Implementation

This is the stage where the students will put together the parts they have already completed. They will start building the packages they designed using laser cutters and 3D printers. The last session will be a parents day, where the students parents will be invited to watch their work and watch their children present their work.

1.S: Scientific and knowledge content

Students will learn about testing, recording tests and project modifications. In this phase, students shall have prototypes that they test and they should record their test results and represent it graphically. They should also modify their prototypes if necessary and suggest recommendations.

1.E: Engineering Practices

Students will learn how to apply modifications to an existing prototype. They should also be able to spot the limitations of the suggested solution/project and suggest recommendations for future researchers.

1.H: Hands on Activities and checkpoint assignment

Students last assignment is to present their work in the exhibit which in which they will represent their posters and projects. Parents will also be invited to watch and review their children's work.