Teach #	T**arget Audience/recommended course(s)** High School Students- General, Honors, AP, and IB Science/Space/Physics
Teach Date:	**Title of Lesson:** Mission to Luxor

Main Idea of the Lesson:
Through an investigative activity, students will explore the problems related to space travel. Students will design a rocket that will reach a target (Whatever planet we choose) using the least amount of fuel.

Next Generation Science Standards for the Lesson:

HS-ESS1-1. Develop and use a model based on evidence to illustrate the relationships between systems or between components of a system.

HS-ESS1-2. Energy cannot be created or destroyed—it only moves between one place and another place, between objects and/or fields, or between systems.

(HS-ESS1-2), (HS-ESS1-4). Science and engineering complement each other in the cycle known as research and development (R&D). Many R&D projects may involve scientists, engineers, and others with wide ranges of expertise.

Florida State Standards

SC.912.E.5.7. Relate the history of and explain the justification for future space exploration and continuing technology development.

Engagement: Estimated Time: 10-15 minutes Description of Activity:		
What the Teacher does:	**What the Student does:**	**Possible questions to ask students-** ***think like a student and consider possible student responses***
1. Show a video clip. https://www.youtube.com/watch?v=ii6D1R6lXVA 2. Ask probing questions.	Observe the video, and then propose answers to the teacher's questions.	What do you think are the pros and cons to those wanting to participate in the manned flight to Luxor? Considering the cost of travel to Luxor, is worth it?

Resources Needed: Internet Access, Projector

Safety Considerations: N/A

Exploration:
Estimated Time: 1 hour

Overview of the Activity:

What the teacher does:	**What the student does:**	**Possible questions to ask students- *think like a student and consider possible student responses***
1. Place the students in groups of 3-5 students. 2. Instruct the students that they will be making a bottle rocket and guide the students in how to make the initial set-up to complete the experiment. 3. Pass out worksheet.	Follow the teacher's guidance to set-up the initial experiment. Part A: 1. Research the viability of space travel and decide if it is worth the cost/risk. 2. Obtain materials. 3. Create bottle rocket based on research. Try to use the least amount of fuel and materials. Part B: 1. Test it in field/open space. 2. Measure the amount of fuel (water) used for final analysis. 3. Collect data, make adjustments.	How would you redesign your bottle rocket if you could do it over? What design was the most fuel efficient? What forces are acting on the rocket? What can be determined about the data we are collecting? (eg. acceleration, fuel efficiency, forces, momentum, gravity)

Materials Needed: Empty 2 Liter bottle, scissors, air pump, water, cardboard, markers, construction paper, duct tape/masking tape, staplers, glue, 1000 mL plastic beaker, bucket of water

Safety considerations: safety goggles, stand back from the bottle rocket when ready to launch

Explanation:
Estimated Time: 15 minutes

Overview of Activity:

What the teacher does:	**What the student does:**	**Possible questions to ask students- *think like a student and consider possible student responses***
1. Have the student come up with their final budget. 2. Have the students analyze their data that they obtained from testing the rocket. 3. Have students create a data table and graph based on their results.	1. Record final budget in a spreadsheet format. 2. Analyze data. 3. Create data table and graph based on the results of the group's rocket.	Are your results what you thought they would be?

Material Needed: Paper, pen/pencil, markers (optional for graph)

Safety Considerations: N/A

Elaboration:
Estimated Time: 10-15 minutes

Overview of Activity:

What the teacher does:	**What the student does:**	**Possible questions to ask students- *think like a student and consider possible student responses***
1. Discuss why or why not we should go to Luxor. 2. Make a list of the pros and cons on the whiteboard. 3. Show the class an example of why we shouldn't and why we should make the leap of traveling to Luxor. Pros: http://www.smithsonianmag.com/science-nature/buzz-aldrin-on-why-we-should-go-to-mars-66260324/?c=y&story=fullstory http://www.mars-one.com/faq/mission-to-mars/why-should-we-go-to-mars Cons: http://www.telegraph.co.uk/news/science/space/10200818/Dangers-of-a-manned-mission-to-Mars.html	1. Participate in discussion. 2. List pros and cons. 3. Observe examples.	What would affect the passengers of this rocket if there were any? (G-Force, acceleration, blood flow, bodily functions, risk) Why should we go to Luxor? Why should we not go to Luxor? Is it worth the cost? Is it worth the risk? How can it benefit our future?

Materials Needed: Computer, projector, whiteboard

Safety Considerations: N/A

Evaluation: Estimated Time: 10 minutes Description of Activity:		
What the teacher does:	**What the student does:**	**Possible questions to ask students- *think like a student and consider possible student responses***
1. Discuss the results of the Elaboration portion. 2. Discuss what the students' data and graphs. 3. Interpret data and come to a conclusion. 4. Let each group will vote whether or not they will go to Luxor. 5. Have the groups explain why/why not.	1. Discuss results. 2. Discuss data and show graphs. 3. Interpret data and come to a conclusion. 4. Vote on whether or not the group is going to Luxor. 5. Explain why/why not.	Based on the results in the Elaboration portion, what do you think is our biggest issue in not traveling to Luxor? Based on the results in the Elaboration portion, what do you think our best benefit of going to Luxor would be? What is the overall decision on whether or not we should go to Luxor?

Materials Needed: N/A

Safety Considerations: N/A