LESSON PLAN

OVERVIEW

YouTube Space Lab is a global competition challenging 14-18 year old students to design a space science experiment. A team of world-renowned judges will pick the best of the entries, and the winning experiment will be sent 250 miles into space. Aboard the International Space Station (ISS), astronauts will live stream this experiment to classrooms around the world.

While exploring the effects of gravity on earth within the broader context of other scientific disciplines, students are asked to develop a model for a phenomenon on earth that is dependent on gravity. Once students have identified their models, they generate a hypothesis for how that model or system will operate in microgravity. Finally students will propose an experiment to be conducted aboard the ISS to test their hypothesis and to inform their model.

OBJECTIVES

Students will

- research the effects of gravity within context of current discipline
- work collaboratively on scientific research and inquiry
- identify a particular model or system on earth that is dependent upon gravity
- propose a hypothesis as to how the model will be altered in microgravity
- devise an experiment to gather data to evaluate the hypothesis
- communicate the hypothesis and experiment in a print and/or video presentation

MATERIALS

- Computer with Internet access
- Multimedia and presentation editing tools
- Print and web resources about the space program
- Video resources

PROCEDURES

1. To introduce this activity, begin class by leading a discussion around the general topic of gravity.

SPECIAL THANKS TO DR. KEMI JONA OF NORTHWESTERN UNIVERSITY AND SAM MORRIS OF LENOVO

2. Continue discussion around how gravity might specifically impact current scientific unit (e.g. biology: digestion, chemistry: molecular bonding, physics: friction, earth science: tides)
3. Watch a video depicting the reduced impact of gravity in the microgravity confines of the ISS.
4. Divide the class into groups. Have each group research the impact of gravity on models or systems within the appropriate context.
5. Give students time in class to conduct research and to construct a hypothesis for microgravity.
6. Have groups design an experiment to test their hypothesis.
7. Groups create Proposal for Research. (attached guidelines)
8. Conclude the unit with a discussion of hypotheses.

EVALUATION

- Rubric for student participation and collaboration
- Rubric for Experimental Design and presentation

ACADEMIC STANDARDS

PISA: THE PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT

Scientific literacy is the capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human activity.

This lesson plan addresses:

Knowledge of Science

- Earth and space systems
    - Earth in space
- Technology systems
    - Role of science-based technology
    - Relationships between science and technology

Knowledge about Science

- Scientific enquiry
    - Origin: curiosity, scientific questions
    - Purpose: develop models, evidence to answer questions
    - Experiments: investigations, designs
    - Data Types
    - Measurement
- Scientific explanations

SPECIAL THANKS TO DR. KEMI JONA OF NORTHWESTERN UNIVERSITY AND SAM MORRIS OF LENOVO

- Types: hypothesis, model, law
- Formation: new evidence to extend knowledge
- Rules: logically consistent, based on evidence
- Outcomes: produce new knowledge, lead to new questions and investigations

Scientific Competencies

- Identifying Scientific Issues
  - Recognising issues that are possible to investigate scientifically
  - Identifying keywords to search for scientific information
  - Recognising the key features of a scientific investigation
- Explaining phenomina scientifically
  - Applying knowledge of science in a given situation
  - Describing or interpreting phenomena scientifically and predicting changes
  - Identifying appropriate descriptions, explanations, and predictions
- Using scientific evidence
  - Interpreting scientific evidence and making and communicating conclusions
  - Identifying the assumptions, evidence and reasoning behind conclusions

EXTENSION

1. Have groups "pitch" their hypothesis to partner groups to further develop their case for conducting research and refine their hypothesis.
2. Have students present their proposals to a panel of judges for "funding."
3. Students conduct experiment to demonstrate results with full effects of gravity.

TECHNOLOGY RESOURCES

- Video Editing
  - http://camstudio.org/
  - www.jaycut.com
- Audio Editing
  - http://audacity.sourceforge.net/
  - http://www.aviaryeducation.com
- Presentation tools
  - http://www.prezi.com
  - http://docs.google.com

SPECIAL THANKS TO DR. KEMI JONA OF NORTHWESTERN UNIVERSITY AND SAM MORRIS OF LENOVO

PROPOSAL FOR RESEARCH

SAMPLE ASSIGNMENT

1. Title

a. Does your title capture the essence of the intent of your experiment?
b. Include the names of all members of the team after the title.

2. Abstract

a. Briefly describe the model or system for the inquiry
b. State the hypothesis to be investigated

3. Background

a. What stimulated your inquiry?
    i. Your own observations
    ii. An experiment you discovered during research
b. Why is this question interesting to you?
c. Detail the model or system
d. What is the specific hypothesis you are investigating and how does it relate to the model?

4. Procedure

a. Write it so that anyone reading it will be able to repeat your procedure.
b. Include a diagram of experiment.
c. Detail specific equipment and materials needed.

5. Observations and Outcomes

a. What are your independent and dependent variables?
b. How will these variables be observed, measured, or qualified?

6. Interpretation of Results

a. What is the evidence upon which you make your interpretations?
b. Explain how the observed patterns and data will be used to further explain your model.

SPECIAL THANKS TO DR. KEMI JONA OF NORTHWESTERN UNIVERSITY AND SAM MORRIS OF LENOVO