**Lesson Plan #1 – Unit #1**

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| **TOPIC/TITLE OF LESSON** | **PREP for Mars – Curiosity Mission and Communication** (introduction to PREP for Mars student activity) | |
| **AUTHOR(S)** | **Nicole Sassaman** | |
| **GRADE LEVEL(S)** | **8th grade** | |
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| **APPLICABLE PA CORE OR NEXT GENERATION STANDARDS:** | | |
| **S8.A.1.1** Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs)  **S8.A.1.2** Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solutions to practical problems.  **S8.A.1.3** Identify and analyze evidence that certain variables may have caused measureable changes in natural or human-made systems.  **S8.A.2.1** Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.  **S8.A.2.2** Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.  **S8.A.3.1** Explain the parts of a simple system, their roles, and their relationships to the system as a whole.  **S8.A.3.2** Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.  **S8.A.3.3** Describe repeated processes or recurring elements in natural, scientific, and technological patterns.  **S8.D.3.1** Explain the relationship between and among the objects of our solar system. | | |
| **LESSON OBJECTIVES:** | | **ASSESSMENT(S) EVALUATE**  **(formative and/or summative)** |
| 1. Summarize the Curiosity mission (dates of launch/landing, differences from previous Mars landings/rovers, etc.). 2. Identify the length of time delay between Earth and Mars and its implications in communication. | | **Formative:**   * Answers on quiz from article.   **Summative:**   * Discussion of Curiosity mission and article. * Discussion of science and engineering issues with communication from Earth to Mars for space craft and rovers. |
| **ACTIVATION OF PRIOR KNOWLEDGE (RTOP #1) ENGAGE** | | |
| * As students enter the class, display an image of Mars’ surface (with any identifying text covered up) taken from the Curiosity rover. Ask students to hypothesize what the image is, where it was taken and by whom. Guide the discussion as needed to get to correct identification.   Download a panoramic image of Mt. Sharp taken by Curiosity. | | |

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| **TEACHING AND LEARNING APPROACHES EXPLORE, EXPLAIN, EXTEND** | |
| **WHAT IS THE TEACHER DOING?**  **RTOP (# 2-10; #9-12; #21-25** | **WHAT ARE STUDENTS DOING?**  **RTOP (#11-19)** |
| **1. Introduction/Discussion/Curiosity**   * Lead the students in the identification of displayed image of Mars (taken from Curiosity). * Use NASA/JPL Mars Science Laboratory mission timeline for Curiosity landing to begin summary of mission and landing. Allow for student time to investigate the website themselves.   [**http://mars.jpl.nasa.gov/msl/mission/timeline/**](http://mars.jpl.nasa.gov/msl/mission/timeline/)  **2. Article/Discussion**   * Assign the article *“Time Delay between Mars and Earth”* for students to read in partners. * Review answers of student quiz in Socrative and discuss possible issues with communication between Earth and Mars in terms of spacecraft and landing rovers.   [**http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/**](http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/)  **3. Application**   * Introduce the PREP for Mars activity from NASA B.E.S.T. | **1. Introduction/Discussion/Curiosity**   * Students openly discuss and speculate about the image displayed in class. * Investigate the NASA/JPL Mars Science Laboratory website to further understand what the Curiosity mission.   [**http://mars.jpl.nasa.gov/msl/mission/timeline/**](http://mars.jpl.nasa.gov/msl/mission/timeline/)  **2. Article/Discussion**   * Read article *“Time Delay between Mars and Earth”* and answer a set of questions on Socrative. * Discuss answers with classmates and infer what problems scientists and engineers would need to consider when communicating with a spacecraft heading to or landing on Mars.   [**http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/**](http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/)  **3. Application**   * Students will decide which members of their group(s) will be which ‘team’ (ROV,COM, MAP, CAL) |
| **WRAP UP RTOP (#14) EXTEND** | |
| * Ask students to infer when/how each of the teams involved in their activity were a part of the landing and first drive of Curiosity. Guide their discussion to include how individual teams need to collaborate to accomplish a goal. * As students begin to make decision in their groups on who will be part of which teams, have them begin to discuss what teams will need to begin work right away, which teams will need to work very closely with one another, which teams will be responsible for various expectations throughout the activity to accomplish the final goal.   [**http://mars.jpl.nasa.gov/msl/mission/timeline/**](http://mars.jpl.nasa.gov/msl/mission/timeline/)  [**http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/**](http://blogs.esa.int/mex/2012/08/05/time-delay-between-mars-and-earth/) | |

Refer to the RED text in the headings to see how the 5 E’s correspond to the lesson plan components. It is the teacher’s prerogative where extension activities are addressed.