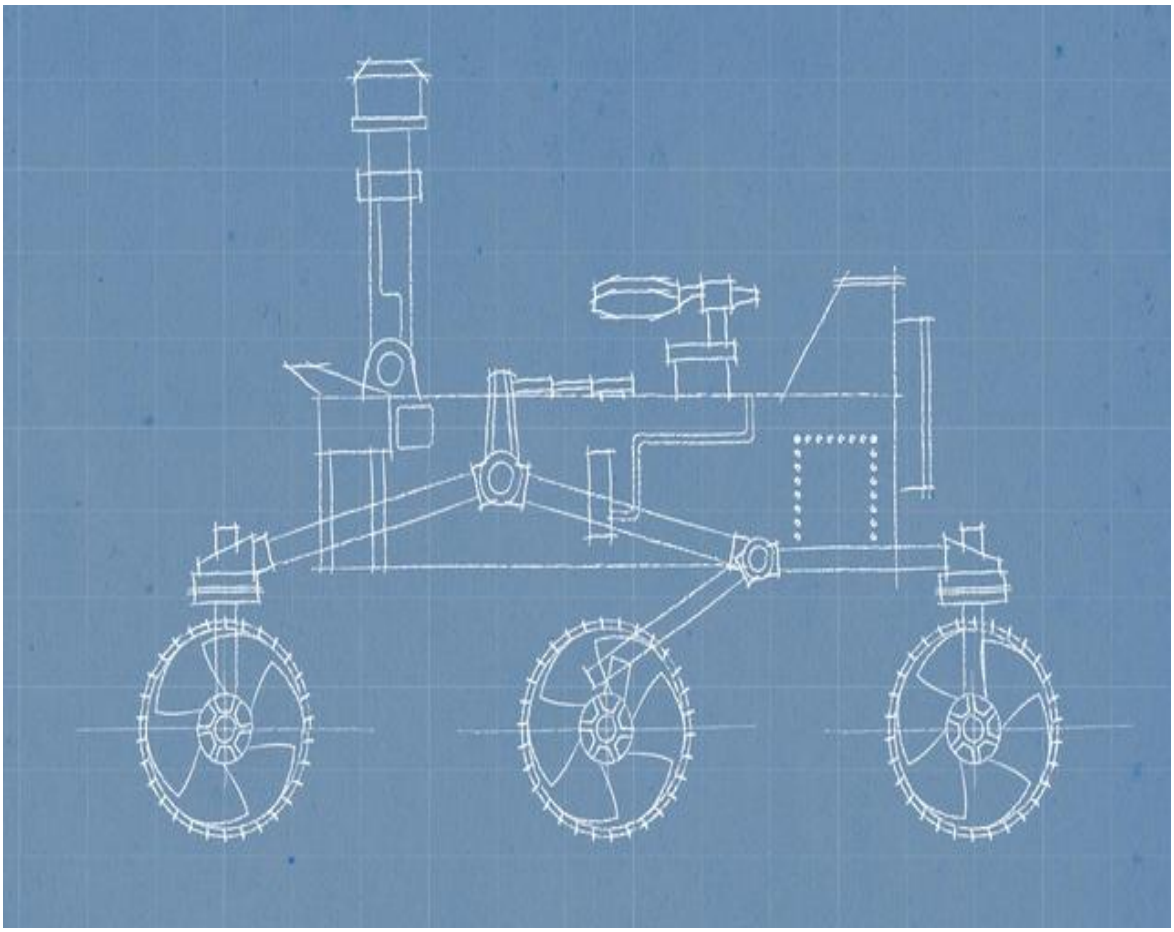
National Aeronautics and Space Administration

Mars Rover Celebration

Curriculum Module

Week 5: Designing and Building

Lesson 12: Final Design



Educational Product	
Educators & Students	Grades 6-8

www.marsrover.org

Week 5: Designing and Building

LESSON 12: FINAL DESIGN
GRADE LEVEL: 6-8
LENGTH: 1 DAY

VOCABULARY: engineering
diagram
prototype

MATERIALS:

- Science Notebooks
- Chart Paper

ESSENTIAL QUESTION:

How will creating a prototype of your rover help you prepare for the Mars Rover Celebration?

LESSON OBJECTIVE(S):

Students will be able to:

- Learn about scientific careers to gain a better understanding of a sampling of careers that have contributed to designing and developing Curiosity.
- Draw a detailed, final-design sketch/diagram of the rover that will be built
- Identify missions, requirements and features of the rover using labels and captions when necessary

ENGAGEMENT

1. At the beginning of this lesson, and using the attached documents, present the Essential Question and Key Vocabulary for students to consider during the lesson.
2. After introducing the vocabulary words and allowing students to participate in identifying different engineering careers, students should answer the follow-up questions in their Scientific Notebooks.

EXPLORATION

1. Now that students have been exposed to some of the different careers that have contributed to the design and development of the Mars Rover Curiosity, discuss with students that there are many other careers that contribute to the design of rovers.
2. Using their scientific notebook as a guide, students should brainstorm other careers and how they could have contributed to the design of a rover.
3. Once students have finished, teams should share their answers with the class.
4. Next, present the “Captions and Labels” mini-lesson. Explain to students that as they design and sketch their rovers, they will need to effectively communicate their ideas by providing labels and captions on their chart paper posters.

5. Let students know that as they proceed through designing and building their rovers, each student in the group will have a career:
    - Engineer- selects and gathers the supplies to be used and leads the effort of building the prototype rover
    - Scientist- collects and records data and ensures that appropriate features will be built on the rover to help answer the team's scientific of technological question
    - Designer- works with the engineer to finalize the rover prototype and leads the writing and development of the team's skit
    - Project Manager- manages time and makes sure that the team is making progress and working well together
6. Now that students have chosen or been assigned their careers, students will begin to sketch the final designs of their rovers. Students will use their Scientific Notebooks for guidance and support, but will draw their final-design sketches on chart paper and will include the following elements:
    - Mission (Scientific or Technological question to be answered)
    - Specific Location of the Mission
    - Requirements of the rover (labeled)
    - Features of the rover (labeled)
    - Caption for the rover sketch/diagram

Note: Students will use their team sketches to build their prototype rovers in Lesson 13.

EXPLANATION

1. As students are working in teams to sketch/diagram the final designs of their rovers, the teacher should circulate making sure that students remain on task. While monitoring, the teacher should ask questions to clarify understanding such as:
    - How does _____ feature help your team answer your scientific or technological question?
    - Which supplies will your team use to build _____?
    - What ideas do you have for the skit you will write to educate others about your rover?
    - What problems have you run into? How will you solve them?

ELABORATION

1. Students should continue to add details, labels and/or captions to their rover sketches/diagrams. As students add more details, they should develop and use a systematic process to determine how any new details will meet the criteria and constraints of their scientific or technological question.

EVALUATION

1. During this lesson, the teacher is encouraged to use formative assessments to determine and deepen student understanding. Teachers may wish grade students' science notebooks to establish student understanding or assess student rover sketches/diagrams.
2. Teachers are encouraged to create their own grade-level and ability-level assessments so as to best meet the needs of their students.

SUPPLEMENTAL RESOURCES

Kinds of Jobs People Have at JPL
http://www.jpl.nasa.gov/education/index.cfm?page=131

Astronaut biographies

http://www.jsc.nasa.gov/Bios/astrobio.html

NASA Profiles, Careers in Spaceflight
http://profiles.jsc.nasa.gov/index1.cfm

Historical Photo of Model of Curiosity
http://www.nasa.gov/mission_pages/msl/multimedia/msl20130118i.html

Labeled Rover Sketches
http://www.nasa.gov/mission_pages/msl/multimedia/pia16144.html
http://www.nasa.gov/mission_pages/msl/multimedia/pia16147.html
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http://www.nasa.gov/mission_pages/msl/multimedia/pia16145.html
http://www.nasa.gov/mission_pages/msl/multimedia/gallery/grotzinger1.html

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