“FROM ROCK ‘N’ ROLL TO A MARS SPACE SCIENTIST”
SCIENCE LESSON PLAN

IS A FEATURE OF

A NEWS BROADCAST FOR HIGH SCHOOL AND MIDDLE SCHOOL STUDENTS
BY MACNEIL/LEHRER PRODUCTIONS
“FROM ROCK ‘N’ ROLL TO A MARS SPACE SCIENTIST”:
SCIENCE CURRICULUM

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LETTER TO THE EDUCATOR

“FROM ROCK ‘N’ ROLL TO A MARS SPACE SCIENTIST”: SCIENCE CURRICULUM
Dear Educator,

the.News online video reports for the.Gov and the.Sci provide middle and high school students with a valuable exercise in language arts, science and social studies with this 7:43 segment “From Rock ‘n’ Roll to a Mars Space Scientist” at www.pbs.org/newshour/theforers/thegov. Correspondent Spencer Michels gets a lesson in space technology and career education from NASA Team Leader Adam Steltzner of the Mars Rover mission. You can also view this report in the “For Educators” section of the website. All videos and curricula have been informed by the.News instructional design that can be found on the website www.pbs.org/newshour/theforers/foreducators. The curriculum includes content-based standards, discussion questions, student activities, vocabulary and primary reference sources. A complete transcript of each video report includes time codes to assist in isolating specific segments of the video and to augment the instruction of media literacy and multimedia production. All of this material is presented as options to fit teachers’ instructional needs.

References to Larry Bell’s “The 12 Powerful Words” are highlighted in bold in the lesson plans and in the “thought starter” questions on the home page and educator’s page, and in the transcript (to denote where they are used in the video segment). We also include a section called general topics to correlate to the lessons and video as well as concept based standards with conceptual lens and enduring understanding.

We welcome our partners at the Omaha Public Schools who have joined the.News in the fourth year of a special pilot project, as well as the Collective for Youth afterschool Middle School Learning Center initiative in Omaha. the.News has developed a special authoring tool for students called YOU.edit, which gives students an online tool to remix the content of the.News reports, so they can create their own multimedia presentations. This editing tool can be found by clicking on the YOU.edit button on the home page of the website. Currently used with our OPS teacher consultants, it is password protected so that it can serve as a viable educational asset that allows classroom teachers to assign multimedia projects within the security and content safety of the.News website.

Answers to student “thought starter” questions listed below the video.

1. They needed to analyze the correct speed of the crane that lowered the Rover otherwise it would have crashed upon landing. Made of rockets, it lowered the Rover on tethers, then flew away before landing, not disturbing Martian dust.
2. Curiosity.
3. Are we alone in the solar system, in the universe? Was there ever life on Mars? Could life have been supported in the environment of Mars?

Sincerely,

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www.pbs.org/newshour/thefors
“From Rock ‘n’ Roll to a Mars Space Scientist”
This lesson was designed to support the News video “From Rock ‘n’ Roll to a Mars Space Scientist.” The video can be found online at: www.pbs.org/newshour/thenews/thesci

Omaha Public School Standards

INFORMATION TECHNOLOGY:
GRADE 9 – 12

ACADEMIC, CAREER, AND TECHNICAL LITERACY
Standard 01: Develop academic literacy skills.
Conceptual Lens: Change
Enduring Understanding: Advances in technology have changed our understanding of the universe

Standard 02: Develop and evaluate academic and career plans.
Develop and demonstrate technical literacy.

Key Vocabulary:
✓ Engineering: field of science and technology that deals with design, construction, and functioning of engines, machines, structures, and computer code.
✓ Exobiology: study of what life on another planet or other object in space might be like
✓ Mars Rover: mobile laboratory that collects data and samples on the surface of Mars
✓ STEM: science, technology, engineering, and math

Source: Derived from the New Oxford American Dictionary

Time Frame: 5 class periods – 2 for researching STEM careers, 2 for compiling a career profile, and 1 to share and discuss profiles with the class

Lesson Topics:
✓ Careers

Grade Level: 7 – 12

Concept Areas: Math, Science, Technology

Key Concepts: Students will identify science, technology, engineering, and math (STEM) careers that are represented on a mission such as the Mars Science Laboratory. They will conduct research into the requirements of entering a STEM field of their choosing and be able to describe where they might work and what sorts of projects they might be involved in.

Key Objectives:
The student will:
✓ Be able to define STEM.
✓ Be able to identify various STEM careers.
✓ Conduct research to learn about a specific STEM career.
✓ Compile a profile of a STEM career and share it with the class.

Common Core State Standards Initiative
http://www.corestandards.org/

SCIENCE AND TECHNICAL SUBJECTS: GRADES 6 – 8

Key Ideas and Details
RST.6 – 8.1. Cite specific textual evidence to support analysis of science and technical texts.
RST.6 – 8.2. Determine the central ideas or conclusions of a text; provide an accurate summary of the text distinct from prior knowledge or opinions.

Craft and Structure
RST.6 – 8.4. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6 – 8 texts and topics.

Integration of Knowledge and Ideas
RST.6 – 8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).
RST.6 – 8.9. Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic.
Common Core State Standards Initiative cont…

http://www.corestandards.org/

SCIENCE AND TECHNICAL SUBJECTS: GRADES 9 – 10

Key Ideas and Details

RST.9–10.1 Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

Craft and Structure

RST. 9–10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Integration of Knowledge and Ideas

RST.9-10.7 Translate quantitative or technical information expressed in words in a text into visual form (e.g., a table or chart) and translate information expressed visually or mathematically (e.g., in an equation) into words.

SCIENCE AND TECHNICAL SUBJECTS: GRADES 11 – 12

Key Ideas and Details

RST.11-12.1 Cite specific textual evidence to support analysis of science and technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.

Craft and Structure

RST. 11–12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

Integration of Knowledge and Ideas

RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

Materials:

✓ engineering
✓ mathematics
✓ science
✓ space exploration
✓ STEM
✓ technology

Background:

So you’ve got students who really do want to be rocket scientists. It’s an achievable goal, as proven by NASA’s Adam Steltzner. Who could guess that a kid who flunked high school geometry would someday be in charge of designing the system that would safely land the Mars Rover Curiosity on the Red Planet?

Steltzner’s path to becoming an engineer wasn’t typical; he first needed to find something that, as he put it, totally turned him on. That something was the physics that govern the universe.

Your students don’t have to wait until they graduate to launch on a STEM career path. But they do need to know what STEM careers are, how they might go about getting into a field, and what their prospects might be once they complete their training or education.

Chances are, your students love gaming. They may be surprised to learn that game development takes the work of numerous STEM workers. Game programmers, designers, and artists all use STEM skills. According to the Bureau of Labor Statistics, the number of STEM careers has exploded over the last several years, but the number of workers qualified to fill such positions isn’t keeping up with demand. That means that students who specialize in a STEM field have good prospects and can expect to earn better salaries than workers in non-STEM careers. Plus they might get paid to game!

Here are just some of the types of jobs in the STEM realm. A more complete list, as well as descriptions of typical tasks and required knowledge for each occupation, is at O*Net Online (http://www.onetonline.org/find/career?c=15):

✓ computer and math: programmers, software engineers, systems analysts, network administrators, mathematicians, statisticians
✓ engineering: aerospace, biomedical, civil, electrical, environmental, materials, mechanical, drafters, surveyors, cartographers
✓ physical and life sciences: agricultural scientists, biologists, astronomers, physicists, chemists, geoscientists, physicians, veterinarians, scientific technicians
✓ art: game design, medical illustration, animation, computer aided drawing

Materials:

✓ the News video “From Rock ‘n’ Roll to a Mars Space Scientist” available at: http://www.pbs.org/newshour/thenews/thesci
✓ computers with Internet access
✓ paper and pens
✓ copies of the KWL chart

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✓ computer and math: programmers, software engineers, systems analysts, network administrators, mathematicians, statisticians
✓ engineering: aerospace, biomedical, civil, electrical, environmental, materials, mechanical, drafters, surveyors, cartographers
✓ physical and life sciences: agricultural scientists, biologists, astronomers, physicists, chemists, geoscientists, physicians, veterinarians, scientific technicians
✓ art: game design, medical illustration, animation, computer aided drawing
This lesson will get students to identify STEM careers and look in depth at a career of their choosing. The earlier students begin planning for a STEM career, the better. The first steps are here.

Lesson Plan

1. Allow students time to view “From Rock ‘n’ Roll to a Mars Space Scientist” at http://www.pbs.org/newshour/thenews/thisci. Talk about the video as a group. What main obstacle did Adam Steltzner need to overcome in landing the rover? What was the solution he and his team came up with? What kind of training do students think members of the rover team might need to do their jobs? Explain that many of the careers at NASA are STEM careers—science, technology, engineering, and math.

2. Before digging into the research, ask students to fill in the first column of the KWL chart, to list things they think they know about STEM careers. As they progress in their research, they should also fill in the second column, listing things they want to know.

3. Ask students to begin their evaluation of STEM careers by looking at NASA’s Career Information page at http://www.nasa.gov/audience/forstudents/9-12/career/index.html. There they will find profiles of jobs in various mission programs, advice about courses to take, and interviews with employees. Brainstorm a list of occupations once students have had a chance to do some exploring.

4. Students will probably think a career at NASA is cool, but they may not realize that there are many more opportunities available in STEM fields. The following sites can help them find careers, companies, and industries that hire STEM workers, as well as the coursework or degree required.
   ✓ STEM Career for Students: http://stemcareer.com/students/
5. As students compare and contrast various STEM careers, they should select one career field to focus on for more in-depth study. Once they’ve made a choice, they will prepare a profile of that career that includes:

- a description of the occupation and what someone in that job does,
- a brief interview with someone in the field*,
- why the student thinks he or she would enjoy or be successful in the career,
- what companies or industries hire workers in the field,
- what high-school courses will help prepare for the career,
- what special training or college degree should be pursued and what schools offer them, and
- what salary the job pays.

*NOTE: If students are not able to conduct a personal interview, they may also use a written or recorded interview or similar profile found on the web.

6. Encourage students to use free online technologies or apps to formulate their profiles. They might include an audio or video clip of the interview, charts or graphs to illustrate salary expectations or required courses, or interactive photo galleries and text. The services or apps listed below are free, although you or your students may need to register to access them and some may have ads. Using these and other tools gives students a taste of the kinds of technologies they might use in a STEM career:

- Animoto, creates presentations with images, video, music, and text: http://animoto.com/education
- Glogster EDU, creates interactive posters and displays: http://edu.glogster.com
- PhotoPeach is a slideshow tool: http://photopeach.com/education/premium
- Prezi is a tool to create presentations: http://prezi.com

7. When everyone has completed his or her profile, it’s time to reveal them to the group. Share the profiles by having students make presentations to the class or view them on your online platform.

Assessment:
Ask students to summarize the results of their investigation by finishing the final column in the KWL chart: What I Learned.

Extension:
1. Invite someone in a STEM profession to give a talk to your students. He or she can discuss what the work entails, what kind of training was needed, and what he or she likes about the job. Encourage the presenter to bring visuals or hands-on samples to share with the group.

2. Give students a chance to be an engineer by trying their hands at actual engineering tasks. Students in grades 7 and 8 can learn the engineering process as they design, test, and improve vehicles and equipment for a lunar mission. Download NASA’s BEST educator guide, grades 6 – 8, at http://www.nasa.gov/pdf/630754main_NASAsBESTAc

National Science Education Standards

GRADES 5 – 12

Science and Technology
Standard E. All students should develop:
- Understandings about science and technology

Science in Personal and Social Perspectives
Standard F. All students should develop understanding of:
- Science and technology in society (grades 5 – 8)
- Science and technology in local, national, and global challenges (grades 9 – 12)

History and Nature of Science
Standard G. All students should develop understanding of:
- Science as a human endeavor
- Nature of science (grades 5 – 8)
- Nature of scientific knowledge (grades 9 – 12)

Resources:
CandidCareer.com features video profiles of people in numerous STEM occupations: https://www.candidcareer.com/index.php

Curiosity Explores Mars from NASA’s Jet Propulsion Laboratory: http://www.jpl.nasa.gov/msl/

Mars Science Laboratory at NASA’s Jet Propulsion Laboratory: http://marsprogram.jpl.nasa.gov/msl/


PBS Teachers STEM Education Resource Center: http://www.pbs.org/teachers/stem/


STEM Education Coalition: http://www.stemedcoalition.org


Activity Designer:
Rhonda Lucas Donald is a freelance writer and educational consultant.
KWL
Topic: STEM Careers

What I Know

What I Want to Know

What I Learned