North America: Behind the Scenery

The activities in this guide are designed to deepen student appreciation of how the disciplines of STEM (science, technology, engineering, and mathematics) can be used to solve problems and find solutions in real world situations. Students will participate in a virtual field trip with the producers of *NORTH AMERICA* and learn what it took to capture the amazing video footage as well as the challenges and surprises the filmmaking team encountered. The pre- and post- field trip activities will provide opportunities for students to engage in a STEM learning activity and apply STEM concepts to documentary film making.

Overview

Topic: The STEM of making a nature documentary

Real World Science Topics:
- Wildlife of North America
- Engineering design process
- Using STEM to solve real world problems

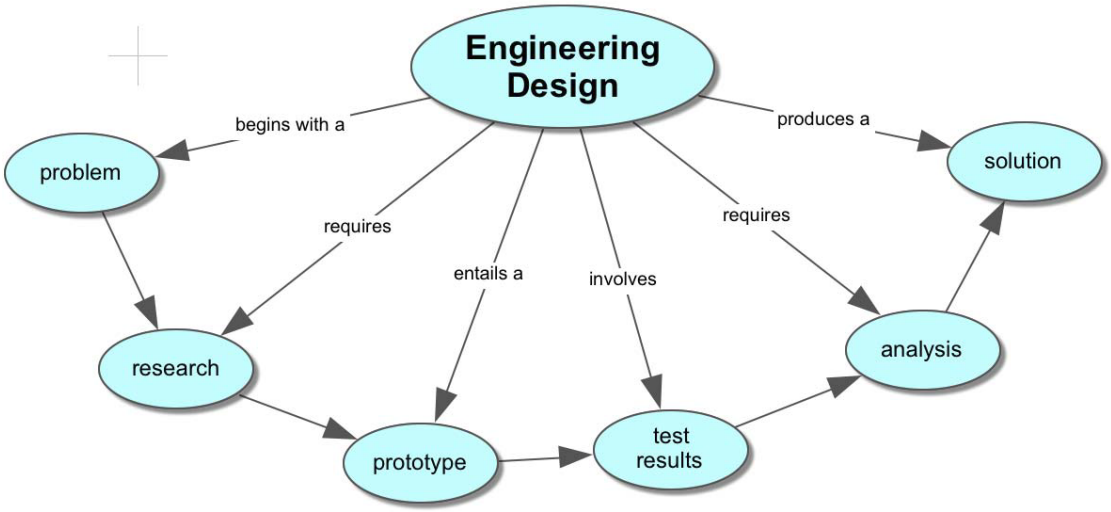
Objective
- Students will be able to explain how science, technology, engineering, and mathematics (STEM) can be used to solve real world problems.

Materials Needed for Student Activities
- Internet access
- Interactive white board or overhead projector
- Miscellaneous waterproof materials such as plastic wrap, plastic bags, etc.
- Different varieties of adhesive tape
- Field guides to local wildlife
- Student Handout #1: Documentary Design Challenge
- Student Handout #2: STEM in Action
- Student Handout #3: You be the Filmmaker

Teacher Preparation

STEM (Science, Technology, Engineering, and Math) instruction is becoming more popular as local, state, and federal institutions seek to improve student performance in these areas and encourage students to pursue careers in these disciplines. Educators are challenged to incorporate STEM into their instructional plans and provide students with hands-on opportunities to apply STEM concepts and skills. Despite these efforts, students often don't realize how the science, technology, engineering, and math (STEM) skills they learn in class can be applied in real world situations. The engineering design process provides an ideal vehicle for students to apply science, technology, and math skills to solve a real world problem. The engineering design process is a cycle that emphasizes trial and error and creative problem solving. Through the proposal and testing of solutions, the design

process demonstrates that failure is a part of the learning process and has value. There are many diagrams that visually represent the design process, but in general the diagram below outlines the foundational steps of the process.



During this virtual field trip your students will go behind the scenes of *NORTH AMERICA*, a new nature documentary by the Discovery Channel, to learn how a documentary film is made. They will also explore how filmmakers use the engineering design process and apply STEM skills to solve problems they encounter while filming in wild and remote locations across North America.

Standards Met

Crosscutting Concepts of the Framework

Systems and system models. Defining the system under study—specifying its boundaries and making explicit a model of that system—provides tools for understanding and testing ideas that are applicable throughout science and engineering.

Resources

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas *(http://nextgenscience.org/next-generation-science-standards)*

Discovery Education Siemens STEM Academy (http://stem.discoveryeducation.com)

Storyboard Examples (http://www.howto.gov/social-media/video/create-your-storyboard)

Pre-Field Trip Activity (40 minutes)

3, 2, 1, Action!
What does it take to make a great nature documentary?

Ask students to imagine they have been hired to make a nature documentary about their school yard habitat. What would they want to film and why?

Explain that great nature documentaries don't happen by accident. Nature doesn't always cooperate, but having a good plan is a must. Explain that in some ways, creating a nature documentary is a lot like the engineering design process.

Use an interactive whiteboard or overhead projector to show a diagram of the design process. (see resources)

Ask your students, "How might a filmmaker apply the design process to film making?"

- Problem
  Filmmakers ask questions like: Why should they make a nature documentary? Who is their audience? What story do they want to tell? What story would interest their audience? What animals, plants, and other features should they include?

- Research
  Next, they do some research, talk to experts, and learn as much as they can about their subject.

- Prototype:
  Then they create a "story board" or outline of what they want to film, and determine what materials/technology they will need, who will narrate, etc. After all the planning they go on location and film! Then they organize their film clips in an order that is interesting and fun, but that will also make sense to the viewers. They create a rough cut of their film.

- Test and Analyze:
  Next, the filmmakers do a screening. They ask colleagues, producers, and select audiences to give them feedback and suggestions. Then they go back and edit the film, reshoot or add new scenes.

- Solution:
  Finally, they release a documentary film that educates and inspires students like you!

Next, pose the following challenge to your students: ***"****Imagine that you are a documentary film maker and you have the opportunity to get some underwater shots of an endangered fish in a pond near where you are filming. This is footage you had not planned or prepared for. Unfortunately, your camera is not*

waterproof and you need to find a solution so you don't miss the opportunity to capture these once-in-a-lifetime images!"

Explain that students will be given 15 minutes to plan, create, and test, a prototype which would allow them to take pictures underwater and keep their "camera" dry. Distribute Student Handout #1: Documentary Design Challenge. They will use this handout to record their ideas for waterproofing a camera. Provide students with a variety of commonly found materials that could be used for creating a waterproof container for a camera – plastic wrap, plastic bags, tape etc. Rather than using real cameras, provide students with small objects of similar size and shape that will not be damaged when immersed underwater. Give students 15 minutes to plan and create a prototype. Using large basins of water or clean fish tanks let each student test their design. Students should record their results and write down modifications they would make to improve their design. Conclude the student challenge with a discussion about the process of trial and error and unexpected factors they encountered when creating and testing their design.

Explain that today's virtual field trip will give students the opportunity to learn what it is really like to be a nature documentary film maker. Often when filming in the field, filmmakers have to find innovative solutions to problems that arise. They apply science, math, engineering, and technology skills to solve problems!

Grade 3-5 Adaptation: Provide younger students with a simplified explanation of the design process and emphasize how it can be used to solve real-life problems. Explain that even filmmakers use the process when they encounter unexpected problems while filming wildlife. Allow younger students more time for the design challenge.

Virtual Field Trip - North America: Behind the Scenery (30 minutes)

During the virtual field trip, students will join the producers of *NORTH AMERICA* and learn what it took to capture the amazing images of this landmark series. Using behind the scenes video clips and firsthand accounts, the producers will share how they use science, technology, engineering and math to deal with the challenges and surprises the team encountered -- including a grizzly bear playing with their camera equipment.

Before joining the virtual field trip, distribute Student Handout #2: STEM in Action. Explain that students should use the table provided to write down examples of how the producers used science, technology, engineering, or math to solve problems while filming.

Following the virtual field trip, ask students to share their examples of how the film crew used science, technology, engineering, and math to make the *NORTH AMERICA* documentary. Lead a discussion on how the engineering design process can be used to creatively solve real-world problems.

Grade 3-5 Adaptation: For younger students, taking detailed notes might not be appropriate. Instead, explain that their goal is to find one example of how the film crew used science, technology, engineering, and math during the filming.

Post-Field Trip Activity (40 minutes)

Ask students to imagine they have been hired to make a nature documentary about their school yard habitat. What would they want to film and why? Make a list of all school yard organisms offered by the students.

Explain that before heading out into the wilderness to shoot video, filmmakers do a lot of research and planning – just like the first two steps of the engineering design process. To help them organize their efforts, they may use a tool called a story board to help plan and prepare for each segment of their film.

Explain that students should select a local organism from the class list and they will be the expert on that organism. Their task is to learn about the organism and create a "story board" that could be used to create a video segment on their selected organism.

Distribute Student Handout #3: You be the filmmaker. Using field guides for local wildlife or the internet, students will gather basic information on their organism and answer the questions on Student Handout #3. After doing research, they will complete a six panel story board that describes what they would want included in a video segment on their organism.

Grade 3-5 Adaptation: Provide younger students with specific examples of local organisms to be included in a documentary of their school yard. Provide the necessary background on each organism for students to use when creating their story boards.

Extension: As a class project, students could make a nature documentary of their local environment or school yard and host a film festival for parents and community members.

Student Handout #1: Documentary Design Challenge

Challenge: Imagine that you are a documentary film maker and you have the opportunity to get some underwater shots of an endangered fish in a pond near where you are filming. This is footage you had not planned or prepared for. Unfortunately, your camera is not waterproof and you need to find a solution so you don't miss the opportunity to capture these once-in-a-lifetime images!

My solution: (draw and label a picture of your design prototype in the box below)

Materials I used:

1.

2.

3.

4.

5.

6.

My results: (what happened during your prototype test? What improvements or modifications could you make?)

Student Handout #2: STEM in Action

As you watch the virtual field trip, please record examples of how the film crew uses science, technology, engineering, and math to solve problems.

How does the crew use:	Examples
Science?	
Technology?	
Engineering?	
Math?	

NORTH AMERICA

Discovery EDUCATION

Student Handout #3: You be the Filmmaker

My Organism:_____

Gather Research: Where does it live? What does it eat? How does it get food? Does the animal have predators? How does it protect itself? Other fun facts about my organism

My Story Board:
Draw a picture of what you want the camera to capture in each shot. Then write a brief description and add narration.

Shot #1

Description:

What the narrator will say:

Shot #2

Description:

What the narrator will say:

Shot #3

Description:

What the narrator will say:

Shot #4

Description:

What the narrator will say:

Shot #5

Description:

What the narrator will say:

Shot #6

Description:

What the narrator will say: