



ONE TEAM | EDUCATOR

Links to Next Generations Science Standards |

MS-ETS1-1: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

Links to Common Core Standards |

CCSS.ELA-LITERACY.RST.6-8.7
Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually.

CCSS.ELA-LITERACY.SL.6.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

STEM

Pacing | 1-2 class periods (45 minutes each)

Background Needed | Reasons why humans explore the ocean, Nautilus Exploration Program, basic STEM concepts, career counseling

Assessment | Extended Response Rubric provided

Materials/Resources |

- Access to an internet connected computer
- A set Ocean Exploration Team Cards (<http://nautl.us/2bimupx>) per student group

Overview

This module is designed to introduce students to the many STEM role models who sail on E/V *Nautilus* as part of the Corps of Exploration. There are more than 150 explorers who sail with the ship per expedition season. This module will give students guiding questions and information on how each member arrived at their current STEM career and what role they fill aboard the E/V *Nautilus*. During the live expedition season, students can visit www.NautilusLive.org to send in questions for these mentors and join the conversation live.

Objectives & Learning Outcomes

- Students will be able to examine different STEM careers involved with ocean exploration.
- Students will understand different positions aboard a ship of exploration.
- Students will meet members of the Nautilus Exploration Program's Corps of Exploration.
- Students will be able to explain various pathways to highlighted STEM careers.
- Students will be able to formulate compelling interview questions that address some of the challenges ocean explorers face.
- Students will use supporting scientific evidence and engineering designs to present an argument for why their own method and or designs could be a solution to a given problem.

Guiding Questions

- Why do we explore the ocean?
- What types of jobs are needed on a ship in order to successfully explore the world's oceans?
- How did successful STEM role models achieve their current positions?
- What are some common themes in the pathways for different STEM careers?



Extensions & Adaptations

Introductory I

Enlarge the cards.

Give each student a card (the instructor can also limit the number of cards, for example, choose to use only one tool card per expedition job instead of all three). Allow the students to physically move around and get into groups or partners. Instructor can lead by calling a student with a job card up and reading or helping to read to the class what's written on the card. The instructor can then take class suggestions for what tools might this team member need and any student who has a card with a matching tool can come up. The instructor can continue in this way until all students and their cards are matched up.

Activity/Tasks

Students will:

- ▶ Meet and learn about various STEM careers featured in the Nautilus Exploration Program.
- ▶ Learn about what pathways exist to pursue careers in STEM.
- ▶ Discuss the duties and responsibilities for each role on the ship.
- ▶ Formulate interview questions that they would ask of an explorer that would answer scientific questions and engineering challenges.
- ▶ Decide if they are a scientist or an engineer; students will answer one challenge question and in written and/or verbal form craft an argument that supports with clear reasons and relevant evidence why their design and/or method is a feasible solution to the question.
- ▶ Interact with a current STEM role model onboard the E/V *Nautilus*.

Lesson Procedure/Directions

1. Introduction

- If the class has not discussed ocean exploration, consider examining how humans and the ocean are interconnected; the relationship between the ocean and humans and the goals of ocean exploration. If needed an overview of the Nautilus Exploration Program using season highlights and program videos would benefit students about to meet the members of the Corps of Exploration.
- If your class has not discussed STEM previously, begin the lesson with a short discussion asking students how Science, Technology, Engineering and Mathematics impact their lives.

2. Inquiry

- Give each group a set of ocean exploration team cards and have students match the tools with the roles of the ocean explorers.
- Have students complete student worksheets 1 and 2.

3. Interaction

- If you are delivering this lesson during the expedition season, visit www.NautilusLive.org. While the team is exploring students can submit questions to the live feed and listen directly to members of the Corps of Exploration inside the control van.



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Extensions & Adaptations

Advanced I

Integrate geography into the lesson. Give students a map with latitude and longitude lines. Ask students to plot exploration points within the season's exploration goals. (www.nautiluslive.org/expedition/2016).

Have students research additional equipment that might be used in the onboard wet lab.

Extension I

Meet the Team! Read short biographies of members of the Corps of Exploration www.nautiluslive.org/people. Watch video video interviews; have students work together to research a famous explorer of the past and present their results to the class. Alternatively, students could research an important ocean discovery of the past and present their research to the class.

www.nautiluslive.org/

Student Procedure

1. Read student sheet instructions.
2. Select a role aboard the E/V *Nautilus* and follow questions on the sheet in order to research that role.
3. Share with your group and then the class the role and responsibilities of the team member you researched.
4. Choose a role and formulate interview questions that you would ask of an explorer that would answer scientific questions and engineering challenges ocean explorers face.

Student Data: Write which tools each explorer uses. Select one tool and write two to three sentences describing how that tool helps the explorer.

Chief Scientist: *Sample collection box, microscope, lab supplies, specimens*

Video Engineer: *Cables, cameras, white/color balance arm*

Argus Pilot: *ROV Argus, A-frame, winch, control room*

Hercules Pilot: *ROV Hercules, ROV shop, tether and fiber optic cable*

Navigator: *Sonar, bridge communication, satellite and GPS systems*

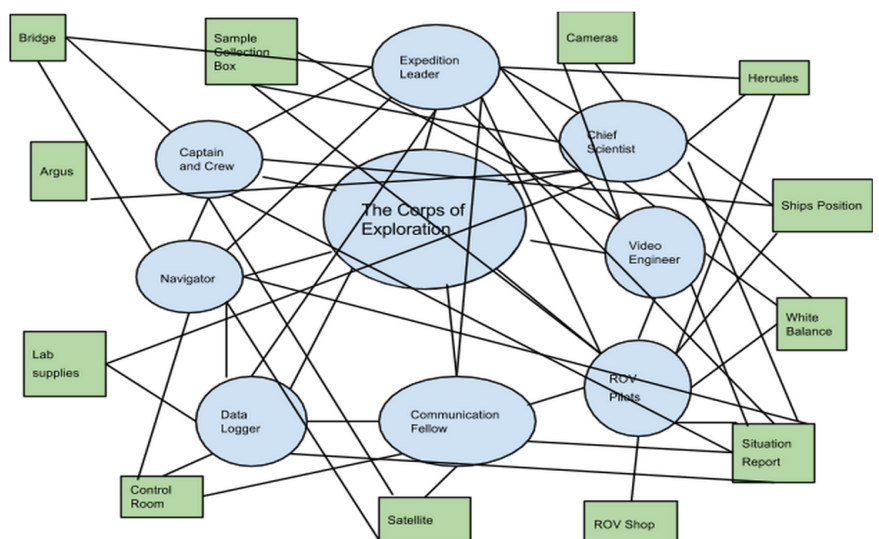
Data Logger: *computers, data programs, note taking, saving images*

Expedition Leader: *Situation Report, dive site maps,*

Captain and Crew: *life rafts and immersion suits, bridge, engine room*

Science Communication Fellow: *Satellite, studio camera, ship to shore interactions*

Sample concept map:





ONE TEAM | STUDENT

Learning Goals

- ⦿ Examine different STEM careers involved with ocean exploration.
- ⦿ Understand different positions aboard an exploration ship.
- ⦿ Get acquainted with the many members of the Corps of Exploration.
- ⦿ Explain various pathways to highlighted STEM careers.
- ⦿ Formulate compelling interview questions to address some of the challenges ocean explorers face.
- ⦿ Use supporting scientific evidence and engineering designs to present an argument for why your own method or designs could be a solution to a given problem.

Challenge: What do ocean explorers do and what tools do they use? Read the roles of the explorers and decide what tools they use to carry out their responsibilities. Match the cards. Explorers can use more than one tool.

Introduction |

Ocean exploration at sea is a complex challenge that requires planning and organizing a highly-skilled and collaborative team of people and providing them with the necessary equipment. Explorers on the team have different roles, mixed skills, and diverse backgrounds. They need a multitude of tools to do their jobs. While some roles may share tasks or equipment, everyone relies on one another to successfully complete the expedition.



The Corps of Exploration works from the Exploration Vessel (E/V) *Nautilus* to explore parts of the ocean that are poorly understood. The ship can be home to up to 48 people: 31 in the science team that includes engineers, watch leaders, scientists, interns, and educators and 17 professional mariners as the ships' crew. In this module, you will read the explorer cards to introduce yourself to some of the explorers' roles and the equipment they use to successfully complete an expedition.

Key Terms:

- ▶ Ocean exploration, teamwork, remote operated vehicle

Materials:

- ▶ One set of ocean exploration team cards per group (<http://nautl.us/2bimupx>)

Procedure:

1. Obtain a set of cards from your instructor.
2. Read all the explorer roles and look at all the tools cards.
3. Match the cards.
4. Record your matches and complete worksheets 1 & 2.
5. Discuss your match choices as a class.
6. Complete the concept map.



You Become the Reporter!

What kinds of questions would you ask different members of the Corps of Exploration?

Write at least three questions for an explorer who has sailed on E/V Nautilus.

Check out the “Meet

Create Your Own:



the Team” page of Nautilus Live to meet the many STEM rolemodels on the team.

www.nautiluslive.org

Which videos or bios are your favorite highlights of people in STEM careers?



Guiding Questions |

1. Why do we explore the ocean?
2. What types of jobs are needed on a ship in order to successfully explore the world's oceans?
3. How did successful STEM role models achieve their current positions?
4. What are some common themes in the pathways for different STEM careers?



ONE TEAM | STUDENT

Worksheet 1

After reading through the explorer cards, write which tools each explorer uses. Select one tool and write two to three sentences describing how that tool helps the explorer.

1. Chief Scientist:

2. Video Engineer:

3. *Argus* Pilot:

4. *Hercules* Pilot:

5. Navigator:

6. Data Logger:

7. Expedition Leader:

8. Captain and Crew:

9. Science Communication Fellow:

II. Scientific Practice: Acting as chief scientist formulate a question that can be analytically answered by doing ocean exploration.



ONE TEAM | STUDENT

Worksheet 2- The Complexity of a Team

Did your group/class match any tools to different roles? Did you feel that more than one explorer might use the same tool(s)?

Starting with the Corps of Exploration in the middle create a concept map below depicting the complexity of the team.

II. Writing Assignment: If you could take on the role of one of the team members of the Corps of Exploration, which position would you pick? Explain why.



ONE TEAM | ASSESSMENT

Extended Response Rubric

OBJECTIVE	CRITERIA			
	4 Exemplary	3 Commended	2 Emerging	1 Developing
Content and Vocabulary 	Explanation uses appropriate vocabulary. Student is able to provide clear examples of the content or justify their response. Student is able to discuss application of the content. Response contains no content errors.	Explanation uses appropriate vocabulary. Student is able to provide some examples of the content or justify their response and is able to discuss application of the content. Response may contain minor errors that do not detract from overall understanding of the topic.	Student attempts to use appropriate vocabulary. Student attempts to provide some examples of the content or justify their response. Application of the content may be weak. Response may contain some errors.	Use of appropriate vocabulary is weak. Student does not attempt to provide examples of the content or justify their response. Application of the content is weak or nonexistent.
Language and Conventions 	Student produces clear and coherent writing in which the development, organization and style are appropriate to task, purpose and audience. Demonstrates an exemplary command of standard English conventions.	Student produces writing in which the development, organization and style are appropriate to task, purpose and audience. Demonstrates a command of standard English conventions; errors do not interfere with understanding.	Student produces writing in which some development, organization and style are appropriate to task, purpose and audience. Demonstrates a limited and/or inconsistent command of standard English conventions; errors may interfere with understanding.	Student produces writing in which there is limited development, organization and style appropriate to task, purpose and audience. Demonstrates a weak and/or inconsistent command of standard English conventions; errors interfere with understanding.
Total Score: <hr/>	Comments:			

HOW LARGE IS NAUTILUS NATION?

Tracking the reach of Ocean Exploration Trust's education programs is essential in ensuring we are funded to continue making discoveries and inspiring the next generation of explorers.

Name: _____ **My Community (City, State):** _____

Email Address: _____

School's Name: _____

Instruction date: _____ **Grade level instructed:** _____

Subject area: _____

My education space is a...	Who did you engage in your teaching?
<input type="checkbox"/> Classroom	# Students
<input type="checkbox"/> After school program / Club meeting	
<input type="checkbox"/> Fair / Festival / Event	
<input type="checkbox"/> Museum / Science Center	# Community Members
<input type="checkbox"/> Other. Tell us more: _____	

Select all the OET materials you used in your instruction:

- ☐ STEM Learning Modules. Which ones? _____
- ☐ Digital Resource Library materials. Which ones? _____
- ☐ Nautilus Live website: photo albums ☐ highlight videos ☐ live stream
- ☐ Meet the Team STEM mentor profiles
- ☐ Facebook (NautilusLive) ☐ Twitter (@EVNautilus) ☐ Instagram (@nautiluslive)
- ☐ Other. Tell us more: _____

What made working with OET resources valuable to your instruction (select all that apply)?

- ☐ Hands-on activities ☐ STEM career connections
- ☐ Easy to use lessons ☐ Standards-based lessons
- ☐ Website resource access ☐ Real world application of curricula topics
- ☐ Excitement of cutting-edge discoveries / Unfamiliarity of deep ocean
- ☐ Another reason. Tell us more: _____

Using OET resources increased my confidence in teaching my science, technology, engineering, or math subjects.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
OET provided me with helpful and relevant teaching resources.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Using OET resources increased my awareness of STEM careers.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
If yes, how so? How can we improve?		

Please scan this document or snap a picture of it with your phone. Email the feedback or questions to education@oet.org. You can also submit feedback online: <http://nautl.us/2cp3PNu>

THANK YOU FOR ALL YOU DO!