Fram Motivation - Teacher Guide

Setting the Stage

The Fram expedition (1893-1896) was the first attempt to reach the North Pole by freezing a ship in sea ice and drifting with ocean currents. While the crew was unsuccessful in their goal of reaching the North Pole, their persistence, imagination, and creativity as scientists and explorers helped them safely navigate the Arctic as they returned to Norway after three years aboard the Fram, having gathered more information about the polar region than anyone before them. In this lesson, students experience the Fram expedition through a VR Google Expedition and learn why science truly is a “human endeavor”.

Photo Credit: National Library of Norway

Lesson Overview

- *Part 1 – (10 minutes) Introduction to the Fram expedition*
  Watch a short video to learn about the Fram expedition
- *Part 2 – (35 minutes) Fram Google Expedition*
  Learn about the science, engineering, and daily life aboard the *Fram* in this virtual reality tour.
- *Part 3 – (15 minutes) Exit Ticket/Update Summary Table*
  Students reflect on their learning by completing an exit ticket and updating the whole class summary table.

The materials were developed by CIRES CEEE at CU Boulder with support from NSF OPP 1839104.

Instructional Overview	
Grade Level	Middle/High School
Instructional Time	60 minutes
Standards Alignment	**NGSS Science is a Human Endeavor:** • Scientists and engineers rely on human qualities such as persistence, precision, reasoning, logic, imagination and creativity **NGSS Science and Engineering Practices:** • Obtaining, evaluating, and communicating information
Unit Driving Question	• How have scientific questions, methods, technologies, and our knowledge of the Arctic changed over time?
Driving Question For This Lesson	• What was the motivation for the Fram expedition? • What human qualities did crewmembers display during the expedition?
Learning Goals	• Identify human qualities that helped the Fram expedition successfully navigate the Arctic
Materials	❏ Fram Motivation PPT ❏ Fram Motivation student worksheet (1 per student) ❏ Exit Ticket Rubric ❏ Answer Key ❏ Fram Expedition video ❏ Computer/ipad (1 per student) ❏ "Explore the Arctic Aboard the Fram" virtual reality tour ❏ Summary Table - *if using entire unit* (butcher paper or digital copy, 1 per class)
Material Preparation	❏ Cue and test web links ❏ Print student worksheets ❏ Review speaker notes from the Fram Motivation PPT ❏ Create and display a whole-class summary table - *if using entire unit* (butcher paper or digital copy, 1 per class)
Vocabulary	Celestial Navigation - the use of angular measurements between celestial bodies (e.g. sun, moon) and the visible horizon to determine your location. Sextant - Instrument used to measure the angle between celestial bodies (sun, moon) and the visible horizon. Dredging - digging/excavating material (mud, weeds, rubbish) from the bottom of a water environment.

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Part 1 - Fram Expedition video (10 minutes)
Driving Question(s):

- What was the motivation behind the Fram expedition?
- What human qualities did crewmembers display/possess that enabled the Fram expedition to be successful?

Refer to Part 1 slides included in the Fram Motivation PPT. See PPT presenter notes for additional information.

1. Introduce and watch "Fram Expedition" video
    a. Students answer questions during the video.
    b. Review video questions as a whole class
        i. Refer to PPT slides #4-5, that show old maps of the Arctic, when reviewing question 2.

Part 2 - Fram Google Expedition (35 minutes)
Driving Question(s):

- What was the motivation behind the Fram expedition?
- What human qualities did crewmembers display/possess that enabled the Fram expedition to be successful?

Refer to Part 2 slides included in the Fram Motivation PPT. See PPT presenter notes for additional information.

1. Students use the "Explore the Arctic Aboard the Fram" VR tour to learn more about the Fram expedition. Students answer Part 2 questions on their Fram Motivation student worksheet as they move through each of the 8 scenes and review each point of interest (white icon).

2. Review questions as a whole class highlighting times when crewmembers displayed human qualities persistence, precision, imagination, creativity, logic, reasoning (which will come up again in "Part 3 - Exit Ticket").

Part 3 - Exit Ticket/Update Summary Table (15 minutes)
Driving Question(s):

- What was the motivation behind the Fram expedition?
- What human qualities did crewmembers display/possess that enabled the Fram expedition to be successful?

Refer to Part 3 slides included in the Fram Motivation PPT. See PPT presenter notes for additional information.

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1. Exit Ticket - Students provide a short explanation and create an annotated sketch that describes the six human qualities displayed by crewmembers that enabled the Fram expedition to be successful.
    a. Project and describe the Exit Ticket Rubric to the class before they begin the assessment as this is what you will use to grade their exit tickets.

2. Update Summary Table ***(if using entire unit)*** - Gather student ideas to update the Fram's Motivation, Navigation, and Investigation boxes in the summary table (see Answer Key).

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