

## EDUCATOR'S GUIDE

# NAVIGATION: FINDING YOUR WAY

## Preparation

### Overview and Objectives

This lesson is geared toward students in grades 3-5.

The Intrepid Sea, Air & Space Museum is a former Navy aircraft carrier that served during World War II, the Vietnam War, and the Cold War. While the Intrepid Museum showcases the history of the men who went off to war, this lesson deals with the real-world application of navigation and the technology used on board the ship to help the crew find their way. Additional connections to other vessels, such as submarines and airplanes, are included.

This lesson includes a [slideshow](#) in which an instructor can lead participants through developing a critical understanding of how navigation works and the tools used to navigate at sea. The lesson also includes two activities in which participants make observations about a navigation space on the aircraft carrier *Intrepid* and chart a course.

### Instructional Modalities

This activity was designed for both synchronous or asynchronous instruction.

For **synchronous instruction**, we recommend a platform that allows both for whole class discussion and for students to interact in small groups.

For **asynchronous adaptations**, we provide suggestions for teachers to provide additional support for the activities and for students to share their work with each other.

### Materials

- [Navigation: Find Your Way slideshow](#)
- **Worksheets** (p. 6-9)
- Graph paper, landmark images, scissors, glue, pencil

#### Standards

##### NY STATE P-12 SCIENCE LEARNING STANDARDS:

3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.

##### CROSSCUTTING CONCEPTS:

People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)  
Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. (3-5-ETS1-2)

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## Lesson

### 1. Introductory Activity

- Ask Participants:
  - **What is navigation?**
  - **What methods have you used to find your way?**
  - **How did the crew of *Intrepid* navigate the ship around the world?**
  - **What instruments do navigators need?**

### 2. Core Activity

- Inform participants they will be learning about key elements of navigation on an aircraft carrier and how crew members relied on different instruments to help navigate the ship for the United States during World War II and into the Cold War. Ask participants: *Reflect on a time you had to navigate to find your way. What happened?* Participants will identify the ways in which they tried to find their own way around, and using this background, they will learn about specific tools on board *Intrepid*.
- **What is navigation?** Navigation is simply the process of finding your way around an area. *Intrepid* relied on experts called navigators and quartermasters, who used tools to help guide the ship during its service in World War II, the Vietnam War, and the Cold War. This role was critical in strategizing for battle, in addition to knowing how to keep the crew safe.
- **What methods have you used to find your way?** Have participants discuss ways they have navigated their way, including times when they were lost or needed to follow directions on a map. Be sure to discuss that specific methods for navigating depend upon the situation. One might need to research the location of the local ice cream shop. If it is within walking distance, we can navigate by foot using a digital application on a grown-up's phone. If we find an ice cream shop in another state, we probably need to navigate by using a grown-up's phone in a car.
- **How did the crew of *Intrepid* navigate the ship around the world?**
  - There is a tall structure that rises from the flat flight deck. It is called the island, and it houses the navigation center of the ship.
  - Inside the island is an area called the navigation bridge, also known as the captain's bridge. The navigation bridge offered a good view of the surrounding sea as well as the flight deck. The

- captain's chair was on the bridge.
- The pilot house is a room that contains instruments for driving the ship, like the helm. The captain or another officer in charge (the officer of the deck), gave orders to the helmsman, who steered the ship.
  - An instrument called an engine order telegraph was also important in the pilot house. The lee helmsman used this tool to communicate with the engine room about speed.
  - Watch this [360 degree video](#) to learn more about this area of the ship. Use [Activity 1 worksheet](#) to focus learning about navigation instruments in the captain's bridge. In addition, have participants complete the restroom direction challenge on the following slide following the video. Discuss what they noticed in the precision of their directions.
- **What instruments do navigators need?** To provide a deeper context, discuss that in reality, there are so many different types of instruments, depending on the vessel. Some navigators are astronauts in space. Others are on submarines, helping to steer the underwater vessel. Pilots rely on navigation to fly a plane. Let participants know that the lesson will focus on tools for sea navigation on board the ship. Briefly discuss that planes, submarines, and spacecraft have navigation instruments as well, some of which are very similar to these:
    - Compasses
    - Nautical Charts

Let participants know that this lesson will focus on nautical charts and compasses. Encourage them to explore other navigation tools.

- **How do compasses work?** While the nautical charts serve as road maps out at sea, there are not really any road signs floating in the water. Tools such as compasses are needed to keep track of the ship's course. Compasses show the cardinal directions used for navigation, by pointing north. This is important since crew members could not see anything out the windows other than open ocean. Plus, they were not doing their jobs if they took their eyes off the compasses. *Intrepid* sailors mainly used two different type of compasses in their work:
  - Magnetic compass
  - Gyrocompass

- Identify key elements of both types, noting the benefits of both:
  - Magnetic compasses point to a magnetic north. Earth's magnetic field causes a magnetized needle of iron or steel to move into a north-south position. It is a strong power source, but there can be interference from things like the metal on the ship.
  - Gyrocompasses use a fast-spinning disc that is built into the system. They point to true north, Earth's axis of rotation. Magnetic north and true north are not the same. True north is a fixed point, while the location of magnetic north shifts over time. True north is more useful for navigation. The other advantage of gyrocompasses is that certain materials, like the steel of the ship's body, do not affect the gyrocompass.
  - The helmsman steered the ship by relying on these instruments, mostly the gyrocompass repeaters. The helmsman received orders from the officer of the deck regarding course change and rudder movement. When given a new heading, or direction, the helmsman used the gyrocompasses to bring *Intrepid* to that heading. There were two repeaters in case one failed. The helmsman also called out the magnetic heading provided by the magnetic compass, located between the two gyros.
- **What is a nautical chart? How are they used?** Ask participants to think about a time they needed to use a chart to find their way. Validate all responses, as students might connect to behavior charts to help navigate their choices. Then discuss the reality of ships needing to navigate unknown areas with underwater obstacles that may not be visible. Like road maps at sea, nautical charts aid navigators because they help identify shorelines, large rocks, underwater mountain ranges, and even shipwrecks that are otherwise in the way of the path and help guide ships around these potential problems. Crew members worked in the chart house on the navigation bridge to help determine *Intrepid's* location. Charts, drawing instruments and reference books were stored in the chart house.

### 3. Complete the Landmark Map Challenge and Reflect

- As a culminating activity, have students connect navigation to finding their way around their own neighborhood. [Activity 2](#) allows participants to chart a course from their house to another location in their neighborhood, using landmarks. Have participants share their maps.

- Have participants reflect on the use of these various navigational tools. In particular, ask students:
  - How do you find your way if you are lost?
  - What other instruments can be used to navigate?
  - What would you include in a new navigation system today?

## Asynchronous Adaptation

Have participants go through the slideshow on their own. Using their worksheets, participants can practice the reality of requiring precision in navigation. Participants can then share their thoughts on a Padlet or Google Doc.

## Extension Activities

To deepen participant engagement with this content, you may choose to add the following activities :

### **Exploring Time and Navigation**

Have participants view this navigation [link](#), to explore the various methods of navigation in different environments.

### **STEM in 30**

Have participants view and discuss components from this [30-minute video](#).

## Additional Resources/ References

<https://www.ion.org/outreach/lesson-plans.cfm>

<https://ny.pbslearningmedia.org/resource/webcast-episode-timeandnavigation-stem-in-30/time-and-navigation-webcast-stem-in-30/>

[https://www.nasa.gov/directorates/heo/scan/communications/outreach/students/navigation\\_activities](https://www.nasa.gov/directorates/heo/scan/communications/outreach/students/navigation_activities)

<https://timeandnavigation.si.edu/navigating-at-sea>

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## ACTIVITY 2: LANDMARK MAP CHALLENGE

Directions: Draw or use icons to create a map showing how to get from one place to another in your neighborhood! Remember to use landmarks, or familiar objects that help you know where you are, such as:



Big Trees



Roads



Important Buildings



Useful Signs

Mark anything you would like to remember to avoid like:

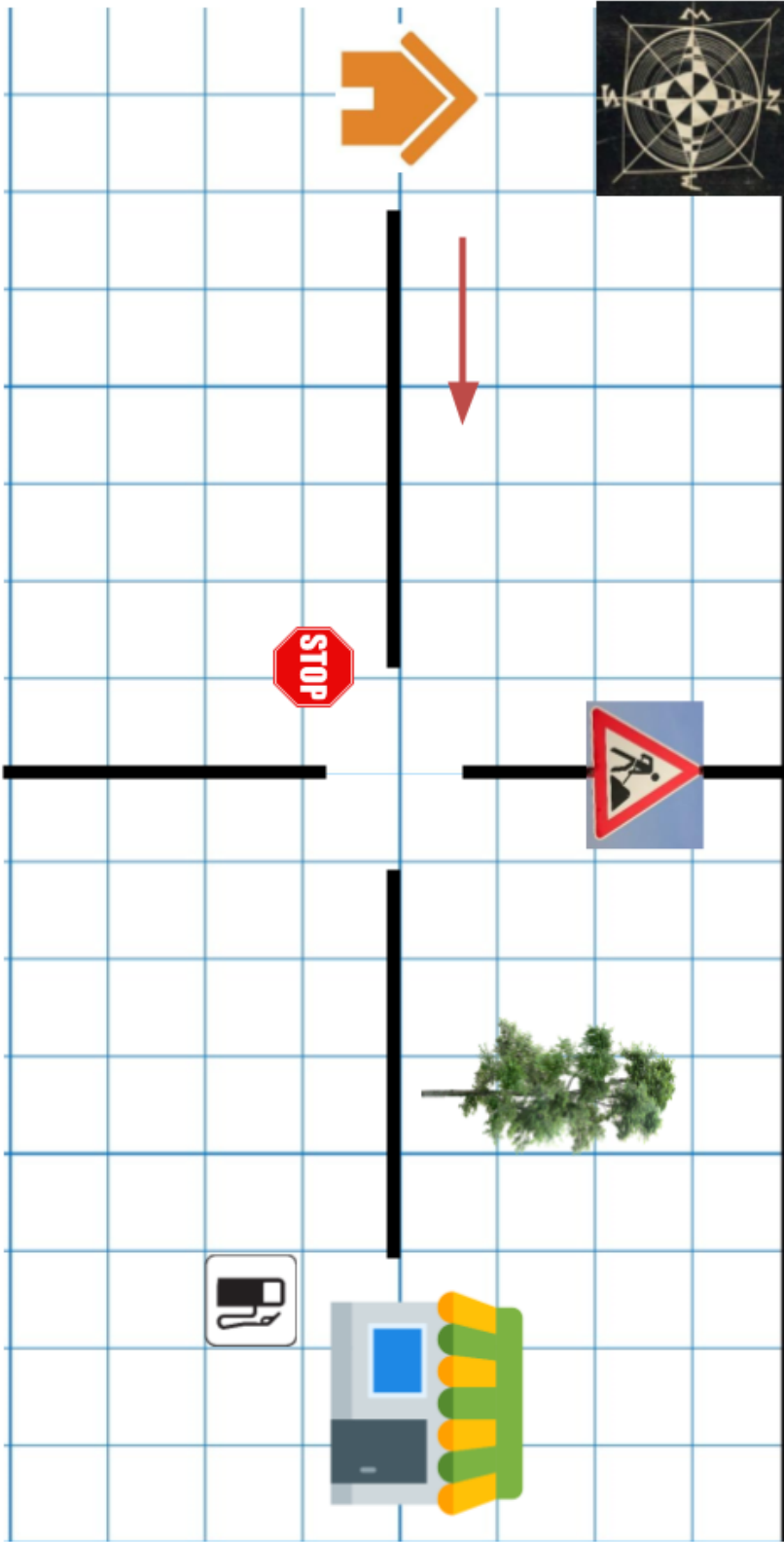


Noisy Construction



Traffic

# Sample: My course from My House to the Gas Station



If you do not want to use icons, you can draw your map on a piece of paper!



