



Navigation Education Modules

In order to foster interest in navigation, and to encourage the development of the next generation of members of the navigation community, the Satellite Division of the Institute of Navigation sponsored the development of educational materials for students related to navigation. It is the hope of the ION Satellite Division that these materials will facilitate the introduction of navigation in middle school curricula and encourage the involvement of ION members in educational outreach activities.

The Satellite Division selected the University of Colorado, Boulder to develop a set of 10 lessons on a variety of navigation topics. The lessons are designed to be used by middle school teachers on their own -- or with the assistance of an ION member volunteer. They can be used in the classroom or as part of a club or outreach program.

Each lesson includes motivations for the students, background and assessment material for the teacher and mentor, activity descriptions and worksheets, and additional tips and resources. The activities are designed to have minimal cost and to be completed in 1-3 hours by a class of 28 students. Suggestions for scaling up and down are included. The lesson materials comprise several electronic files that are all hyperlinked from the main lesson document.

Click on lesson titles below to view the lesson materials. Each lesson is comprised of several documents. The PDF files below contain all documents in one file for each lesson, unless otherwise noted.

Lesson 1: [Where is Here?](#)

Introduction to navigation, latitude, longitude, maps and compasses.

Lesson 2: [How to be a Great Navigator!](#)

Dead reckoning and celestial navigation.

Lesson 3: [Navigating by the Numbers](#)

[Also requires: [Excel File 1](#) & [Excel File 2](#)]

Trigonometry in navigation, time-distance formulas and triangulation.

Lesson 4: [Getting it Right](#)

Effects of errors, corrections and geometry in navigation.

Lessons 5-7: *Currently under development.*

Lesson 8: [Navigation at the Speed of Satellites](#)

Global Positioning System (GPS) basics: ranging and trilateration.

Lessons 9-10: *Currently under development.*