

## "The Science of Sailing" - Curriculum



### Learning objectives

Students will:

- Gain an understanding of physics and mathematics concepts in the Science of Sailing
- Apply these concepts to designing a sailboat

**Timing** : Eight 90-minute sessions (can alternatively be presented in 16 45-minute or 24

**Level** : 9th Grade

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### Lesson 1: Vocabulary and Introduction to Sailboats

**Introduction:**  
**What is a Sailboat?**

Provide an introduction to the course and explore the components that make up a sailboat. Explore how

### **Parts of the Boat**

Provide an overview of terminology so the course can progress at the desired pace. Describe the parts

### **Parts of the Sail**

Familiarize students with the various components of sails used. While teaching the vocabulary, explain v

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## **Lesson 2: History of Sailboats and Boat Design**

### **History of Progression of Sailboats**

Sailboats have a long history which provides important insights into why boats have become what the

### **Historical Designs**

Provide a list and set of historical designs for students to reference while designing their own vessel. C

### **Modern Designs**

Provide a list and set of modern designs as well so students can work on improving their design. Agai

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## **Lesson 3: How a Sailboat Works - Part 1**

### **Hulls**

Provide an explanation of different hull types and why designs differ. Introduce students to the differen

### **Sails**

Describe different sail configurations and explain the reasons why some boats have different sail plans

### **Fluid Dynamics**

Provide an introduction to fluid dynamics and theories that will be applied to the boat: lift, drag, Newton's laws

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## **Lesson 4: How a Sailboat Works - Part 2**

### **Buoyancy**

Since boats are designed to be on the water, they need to float. A buoyancy lesson will weed out poor designs

### **Displacement**

Displacement is key in how a boat moves through the water. Without displacing water a boat would sink

### **Forces on the Boat**

Provide a physics lesson on all the forces that have been discussed up to this point as well as any other forces

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## **Lesson 5: Stability**

### **Center of Gravity**

Center of gravity is linked to buoyancy and displacement. Expand the lesson into discussing righting moment

### **Center of Buoyancy**

Center of buoyancy determines where and when the lever arm created by the keel and the boat will trim

### **Initial Stability vs. Ultimate Stability**

When combining the center of gravity and center of buoyancy lessons, you will ultimately discuss initial stability

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## **Lesson 6: Rough Draft and Peer Revisions**

### **Checking Designs**

Assign students to small groups (usually four or less) and instruct them to put the knowledge they have

### **Peer Workshop**

Have students incorporate their classmates' feedback and additional instructor input to brainstorm about

### **Time to Work on Revisions**

Students will be excited about what their classmates have told them and they will want to apply those

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## **Lesson 7: Boat Design and Utility**

### **How Location can Affect Sailing Situations**

Different boats are made for different regions of the world. Remind students of this and allow them to thi

Catamaran cruisers are preferred in the Caribbean due to the space they provide and because they don

### **Activities Allowed**

Certain boats have restrictions on what can be done on them. For example, a pure race boat is not ve

### **Construction Materials**

What materials will be chosen to build their design? Different materials have different properties and c

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## **Lesson 8: Final Paper and Presentations**

### **Final Exam**

The amount of math and science learned in this class allows for a final test to be given. This is an exo

## **Papers**

A final paper should be submitted to demonstrate that this class is teaching cross-curricular skills such as

## **Boat Design Presentation**

Students should give a final presentation to improve their public speaking abilities. This should be bas