Focus

Submarine science

Grade Level

4th – 6th grades

Focus Question

How do subs sink and then rise?

Learning Objectives

Students will be able to recall information about basic ballast and air systems on the Argonaut Jr.

Materials

Transparency of "Key Words"

Copies of "Sub Monkeys" student handout

Downloaded version of *Sub Monkeys* found at www.submarineboat.com/argonaut_jr_2010.htm

Audio/Visual Equipment

Overhead projector

Computer/Projection system with Internet access or copy of *Sub Monkeys* on CD or thumb drive.

Teaching Time

One 30 minute class period

Key Words

Ballast tank
Buoyant
Cubic foot
Hatch
Valve

Background Information for Teachers

Simon Lake and the Argonaut Jr.

Simon Lake is often overlooked in submarine history. Yet, many of his innovations have lead to many features of the modern submarine. For example, Lake's inventions led to the periscope, the double-hulled submarine and the diver's lock-out chamber. Lake designed a wide variety of subs including subs with peaceful uses such as marine salvaging Arctic exploration as well as subs designed for warfare.

The *Argonaut Jr.* was Lake's first sub. It was built as prototype for his *Argonaut 1*. Lake hoped to demonstrate to investors the credibility of his claims that he could build a viable submarine. The *Argonaut Jr*. was only 14 feet long, 4.5 feet wide, and 5 feet tall – room for two people. It was built of wood, canvas, tar and salvaged parts from other boats. The little sub was unique in several ways – it had wheels that allowed it to drive along the bottom and it had a diver's hatch from which a diver could exit.

Over the course of late 1894 and 1895, Lake demonstrated to the public and investors alike that a submarine built the basic premises used by the *Argonaut Jr.* would be feasible.

The *Argonaut Jr 2010*

The *Argonaut Jr 2010* is a built on the premise of how Simon Lake might build the little sub today. It's not a replica but does maintain similarities with the original.

One of the key features of the *Argonaut Jr* and its modern version is that both are ambient submarines. Ambient subs maintain the same air pressure inside the sub as the water pressure outside. Since the inside and outside pressures are equal there is no need to have heavy, thick hulls. The further down a submarine goes the greater the water pressure. So, as the *Argonaut Jr 2010* goes down, air is released into the crew cabin. As it rises to the surface, excess air is released into the sea.

Air and water are both used to control the *Argonaut Jr 2010's* descent and ascent. Ballast tanks can be filled with either water or air. Valves open to allow water to enter the tanks for descending. To go up, another set of valves open that let compressed air from scuba tanks to force the water out of the tanks.

Learning Procedure

1. If you don't have Internet access in your classroom, you can download the full version of the *Sub Monkeys* video at http://www.submarineboat.com/argonaut_jr_2010.htm .
2. Create a transparency of the "Key Words" page.
3. Explain to students that they will be viewing a short video about a submarine called the *Argonaut Jr*. The video uses puppets that represent real people, Simon Lake and Bart Champion. Also, the

Argonaut Jr 2010

model in the video is an accurate version of the *Argonaut Jr 2010*, a real submarine based on Simon Lake's original *Argonaut Jr*.

4. Discuss key words and their meanings with students using the "Key Words" transparency
5. Distribute copies of the student handout.
6. Instruct students to fill in the blanks of the student handout as they view the video. If necessary, pause the video to allow students to fill in the blanks or to discuss key concepts.
7. After watching *Sub Monkeys*, review the correct answers for the student handout. Ask for volunteers to read their answers.
8. Discuss new concepts and facts students learned from *Sub Monkeys*.

EVALUATION

Scoring the student handout – each answer is worth 3 points.

Answer Key

1. 1894; Simon Lake
2. wood
3. lead
4. 65
5. 65
6. 190
7. 10,000; African bush elephant; howler monkeys
8. denser
9. 705
10. 15
11. ballast
12. air
13. water
14. drive
15. divers
16. air
17. junior high
18. water; air
19. portal or window
20. grape
21. air
22. 20,000
23. diver's
24. wheels, bottom
25. air
26. 1,500
27. Jules Vern

RESOURCES

Web sites

The Simon Lake Submarine Web Site
http://www.simonlake.com/index.html

Created by a relative of Simon Lake. Includes a biography of Lake as well as descriptions and pictures of Lake's submarines.

The Submarine Heritage of Simon Lake
http://www.navy.mil/navydata/cno/n87/usw/issue_16/simonlake.html

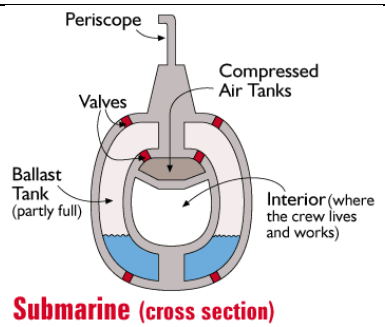
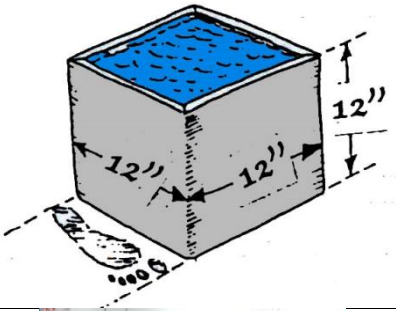
A detailed look at Lake submarines and their impact on submarine development.

Books

Submarine: The Autobiography of Simon Lake
By Simon Lake

The complete version can be found at http://www.submarineboat.com/files/Submarine%20The%20Autobiography%20of%20Simon%20Lake.pdf for viewing or downloading. Chapters 6 and 7 deal specifically with the Argonaut Jr.

Key Words

Ballast tank: part of boat or submarine filled with water or air that's used to go down or up	
Buoyancy: the power to float or rise in a fluid	
Cubic foot: a volume that measures 1 foot (12 inches) tall, 1 foot (12 inches) wide and 1 foot (12 inches) high	
Hatch: an opening in the deck of a boat or submarine	
Valve: a device used to controlling the flow of a liquid, gas, or other material through a pipe, inlet, or outlet