

SeaKeepers Digital Lesson Plans

Lesson 13: Pip Hare - Sailboats



This activity was created in partnership with Pip Hare Ocean Racing for educational engagement on virtual platforms.

Activity: Sailboats

Preface:

Our oceans face many threats today, including climate change and pollution. In order to protect and preserve our oceans, we need to understand these threats and how the oceans respond to them. The International SeaKeepers Society supports marine research and education by connecting scientists with yacht owners, creating research opportunities for scientists to better understand our oceans – and to create plans to protect them.

In collaboration with Pip Hare Ocean Racing, students will learn more about what has made a sailboat so successful for its many historical uses, including learning about the working parts of the sailboat itself. Students will have the chance to design and create a sailboat from recycled materials, before investigating how their vessel would fare against challenges simulating those faced in the ocean. We will introduce boating terminology and investigate the functions of sailboat parts, with a strong focus on both human and vessel resilience through discussions about trial and error during the boat design process, in order to create a sailboat that can withstand the many challenges of long-distance ocean voyages.

Objectives: Students participating in this lesson should see improvement in the following areas:

- Describing sailboat anatomy and terminology as well as the function of multiple aspects of the boat.
- Identifying why different types of sailboats are constructed differently based on their intended function.
- Understanding the importance of mental and physical resilience in boat design and function respectively, and personal resilience in challenging circumstances.

Age Group: Key Stage 3

Estimated time: 90+ minutes

Required Materials:

Students do not need any background knowledge of sailboats to take part in this lesson. Teaching resources are included for this lesson, but feel free to use other materials you may have to explain these concepts. To design their sailboats, students will need:

- Paper
- Pens/pencils
- Erasers
- Rulers (optional)

To create their sailboats, students will need:

- Glue/sellotape/blu tack
- Scissors
- Building materials, such as paper, cardboard, plastic bottles and containers, lids, trays, sticks or stirrers, magazine pages
- Decorative materials, such as glitter, coloured pens, stickers
- A container of water large enough to fit their sailboat (one large container per class is sufficient, or smaller containers per group if resources not available)
- Objects of various weights, such as pencils, pens, glue sticks, pebbles, stones

Lesson Breakdown:

- Introduction to sailboats, Pip Hare and resilience (15 minutes)
- Activity: Matching photos of sailboat parts to their intended function (10 minutes)
- Discussion about sailboat function (5-10 minutes)
- Main Activity: Design and create a sailboat that can undergo various challenges (30+ minutes depending on available time)
- Wrap up discussion (10 minutes)
- Clean up (5 minutes)

Lesson Vocabulary:

- **Aft** - the rear of a ship, at the direction of a ship's stern.
- **Boom** - a pivoted spar to which the foot of a vessel's sail is attached, allowing the angle of the sail to be changed.
- **Bow** - the front end of a ship.
- **Centreboard** - retractable hull appendage which pivots out of a slot in the hull of a sailboat.
- **Cockpit** - name for the location of controls of a vessel.
- **Foil** - A hull appendage primarily used to produce vertical lift and/or affect leeway, which may be attached to a centreboard, daggerboard, bilgeboard, fin or rudder.
- **Forward** - the most forward side, at the front of a cruise ship, facing the bow.
- **Hull** - the watertight body of a ship.
- **Keel** - the lengthwise timber or steel structure along the base of a ship, supporting the framework of the whole, in some vessels extended downwards as a ridge to increase stability.
- **Lines** - a length of rope used for marine and boating purposes.
- **Mast** - a tall, upright post, spar, or other structure on a ship or boat, in sailing vessels generally carrying a sail or sails.
- **Port** - the side of a ship or aircraft that is on the left when one is facing forward.
- **Rudder** - a flat piece hinged vertically near the stern of a boat or ship for steering.
- **Sail** - a piece of material extended on a mast to catch the wind and propel a boat or ship or other vessel.
- **Starboard** - the right side of a ship or aircraft looking forward.
- **Stern** - the rearmost part of a ship or boat.
- **Tiller** - a horizontal bar fitted to the head of a boat's rudder post and used for steering.

Lesson Introduction/Overview:

History of Sailboats

Throughout history, sailboats have provided people with ocean-wide access to the marine realm. Where previously they were used for the commercial transport of goods and services, nowadays they are more

commonly used as leisure vessels, supporting activities such as snorkelling, diving and recreational sailing. Sailboat structures are widely diverse, with each designed specifically for its function.

In the early 12th century, oceanic navigation became a priority in the UK, when British crusaders began to expand their reach to the Mediterranean sea. At this time, rowed boats were more commonly used as fighting ships, while 2-masted sailboats acted as trading vessels.

Over the following centuries, technical developments enabled designers to create multiple different vessels, such as the full-rigged ship that could support 3 masts with a combination of both square and lateen sails. Full-rigged ships, named Carracks, were essential for long-distance voyages as they provided more space for both crew and cargo, enabling explorers like Columbus and Da Gama to undertake their ocean-wide 14th and 15th century explorations respectively.

Galleons, consisting of 3 to 4 masts with square and lateen sails, and multiple decks, were more widely used throughout the 16th to 18th centuries. These vessels resembled the Carrack, but with an elongated hull and lowered upper deck to improve stability in the water, lower wind resistance and ultimately increase vessel speed. As such, the Galleon was a prominent feature of marine warfare during this period, while Carracks remained as trading ships.

After the establishment of American independence in the latter part of the 18th century, American sailboat designers created longer vessels that were able to travel more quickly across the ocean, enabling them to supply the European market with perishable goods before their neighbours, giving them an economic advantage. These vessels were called Clipper ships, formed with projecting bows and wide-spreading sails to increase movement speeds across the ocean. However, these vessels lacked the cargo storage of previous trading vessels as additional weight would slow their activity.

The invention of steam ships in the 19th century led to a decline in sailboat use for commercial and pedestrian transport, as steam-powered ships were able to support larger cargos and, after technological developments, travel more quickly. Modern day sailboats are predominantly used for recreational, sporting and educational purposes, such as Pip Hare's vessel, *Medallia*.

Medallia and Pip Hare

Pip Hare is a global ocean racing yachtswoman who is only the 8th woman ever to finish the Vendee Globe; a non-stop solo race spanning approximately 24,000 nautical miles across the world. With a professional career of over 25 years, Pip has made sailing her life. Her passion, determination and hard work have enabled her to succeed where others might struggle. After racing through the world's toughest environments and overcoming many challenges along the way, Pip uses her experiences and accomplishments to inspire others to aim high and strive to achieve their goals. Her story shows one of grit, determination and resilience beyond what some may say is humanly possible. Having achieved her life-time goal of completing the Vendee Globe at 46, and in a male dominated environment, Pip proves what is possible when you are determined, ambitious and resilient in the face of adversity.

In 2020, Medallia joined Pip's team as title sponsors for her Vendee Globe campaign. Her 60ft IMOCA 60 vessel, *Medallia*, is fast and well-built for long-distance races. Pip Hare Ocean Racing's 2023 refit involved changing the old foils for the latest design, doubling the size of the foils and subsequently increasing the potential boat speed by over 25%. It is a strong, full carbon race boat that is robust and capable of achieving great success as a result. The resilience of both Pip and Medallia will be essential if Pip is to achieve success in her 2024 Vendee Globe campaign.

What is Resilience?

Resilience is defined as “the capacity to withstand or to recover quickly from difficulties.” Resilience is required in many situations that people face, whether these be in their daily lives or during extreme challenges, like for Pip Hare during the Vendee Globe. In both situations, two forms of resilience are most commonly needed: Mental and Physical.

Mental resilience refers to someone’s ability to cope with difficult events and situations, and how they recover from them. For example, trying to have a positive mindset can help to process a challenging circumstance. When Pip experienced obstacles during her many global ocean races, she relied on her mental resilience to keep her focused and allow her to succeed in her voyages.

Physical resilience focuses on someone or something’s ability to resist external physical pressures without becoming damaged or broken, and the subsequent ability to adapt to these challenges. For example, a sailboat would need to be physically resilient to remain functional in the extreme weather conditions experienced in the open ocean. Similarly, the sailor onboard would also need to be physically resilient to withstand these challenges, while also using that resilience to adapt and subsequently thrive if these conditions became prolonged or recurred.

When creating a sailboat, mental and physical resilience are both required throughout the design and manufacturing processes. Without these, designers would give up the first time their design doesn’t look as they expected it to, and manufacturers would admit defeat when their first creation doesn’t float, for example. Sailors rely on their mental resilience to enable them to keep going when faced with challenges, such as technical and navigation issues, while their physical resilience allows them to withstand the harsh conditions that they encounter out in the open ocean. Similarly their vessel must be physically resilient to withstand these conditions and remain afloat, allowing the sailor to continue on their journey. Learning to adapt in both positive and negative situations allows us to become better problem-solvers and create more effective solutions.

Activity Instructions:

Setup

1. In preparation for this activity, fill the container with water for later in the session, and print out and separate the parts of the sailboat and their functions.
2. Begin the activity by randomly laying out the pictures of the parts of the sailboat and their functions in front of the class.

Activity and discussion

3. Students will take turns matching a sailboat anatomy picture with a function.
4. Begin a discussion about why the specific parts of the sailboat are well built for their functions.
 - a. Why do you think that part would be good at performing that function?
 - b. Would that part be the same on every sailboat? Why, or why not?

Main Activity

5. Divide the class into smaller groups and provide them with the materials available to design their sailboats. Allow the groups to make mistakes with their designs and have the opportunity to restart or adjust their design as often as they wish within the time constraints of the lesson.
6. Groups should consider whether their boat is designed to perform a specific function, such as racing, transporting goods, recreational use, or whether they want to create a boat that could potentially be used for multiple purposes.

7. Once they have designed their boats, groups will be given materials to turn their designs into models.
8. Students should again be given the opportunity to make multiple adjustments within the time constraints of the lesson. If students use multiple attempts and excessive materials to build their model, discuss why this might not be possible when creating a real-world vessel.
 - a. What would you need to consider when making multiple versions of a boat in reality?
 - b. What costs might you need to consider (e.g. environmental, economic, timescales)?
 - c. How could you make this process more sustainable and less wasteful?
9. Bring the groups back together and collect their models. Groups take turns to discuss their boat designs and the challenges they faced through the design and making process, including discussing how their boat is tailored to its intended function.
 - a. Did you use your original design to create your model, or did you make adjustments?
 - b. What adjustments did you make?
 - c. Why do you think your original design wouldn't have worked?
10. One student from the group will place their boat in the water container to test whether it floats. From here, the groups will see how their vessel fares against a range of challenges that simulate real-world experiences:
 - a. Students swirl their hands in the water to create turbulence, to see whether their boat can endure conditions that resemble those found in the open ocean or during storms.
 - b. Students push their boats (if the container is large enough) to see whether their boat moves quickly or slowly, to determine whether it would function well as a racing boat.
 - c. Students present their boat to the class as if selling the vessel to potential buyers, to determine its attractiveness and appeal.
 - d. Students take turns balancing increasingly heavy items on their boats to investigate whether their designs would be effective for commercial transport.
 - e. Introduce any other simulated real-world challenges that students/teachers think of here.
11. Repeat steps 9 and 10 for all the groups in the class, before ending the activity using the wrap-up discussion questions.

Wrap up Discussion:

To conclude the session, ask the students to share what they think are the biggest challenges associated with designing and creating a sailboat, incorporating the idea of resilience. These questions can be used to focus the discussion and use Pip Hare's experiences to bring in real-world scenarios:

- How are sailboats built to perform their intended function effectively?
- Was every boat effectively designed to succeed in every challenge? Why not?
- Why is Pip's vessel, *Medallia*, well built for its function?
- Did every group create a boat entirely based on their first design? How many changes did you make?
- Why is resilience important during both the design and manufacturing stages of creating a sailboat? Did you have to be mentally or physically resilient, or both?
- Why was it important for Pip to be mentally and physically resilient when racing across the global oceans?
- To what extent is it important for students to be resilient? When might they need to be resilient?

For more information, here are some useful websites:

Pip Hare:

- <https://www.piphare.com/>
- <https://www.vendeeglobe.org/en>

Sailboats:

- <https://www.britannica.com/technology/ship/Passenger-liners-in-the-20th-century>
- <https://interparus.com/en/sail-history/>
- <https://blog.viravira.co/important-information-about-sailboats/#:~:text=They%20come%20in%20a%20variety,and%20propel%20the%20boat%20forward>
- <https://www.marineinsight.com/naval-architecture/types-of-sailboats/>

Resilience:

- <https://www.mind.org.uk/information-support/types-of-mental-health-problems/stress/managing-stress-and-building-resilience/>
- <https://www.redcross.org.uk/get-help/get-help-with-loneliness/wellbeing-support/resilience-building-activities>

Media:



Carrack



Galleon



Clipper



Credit: Pip Hare Ocean Racing



Credit: Pip Hare Ocean Racing

Pip Hare's vessel, *Medallia*