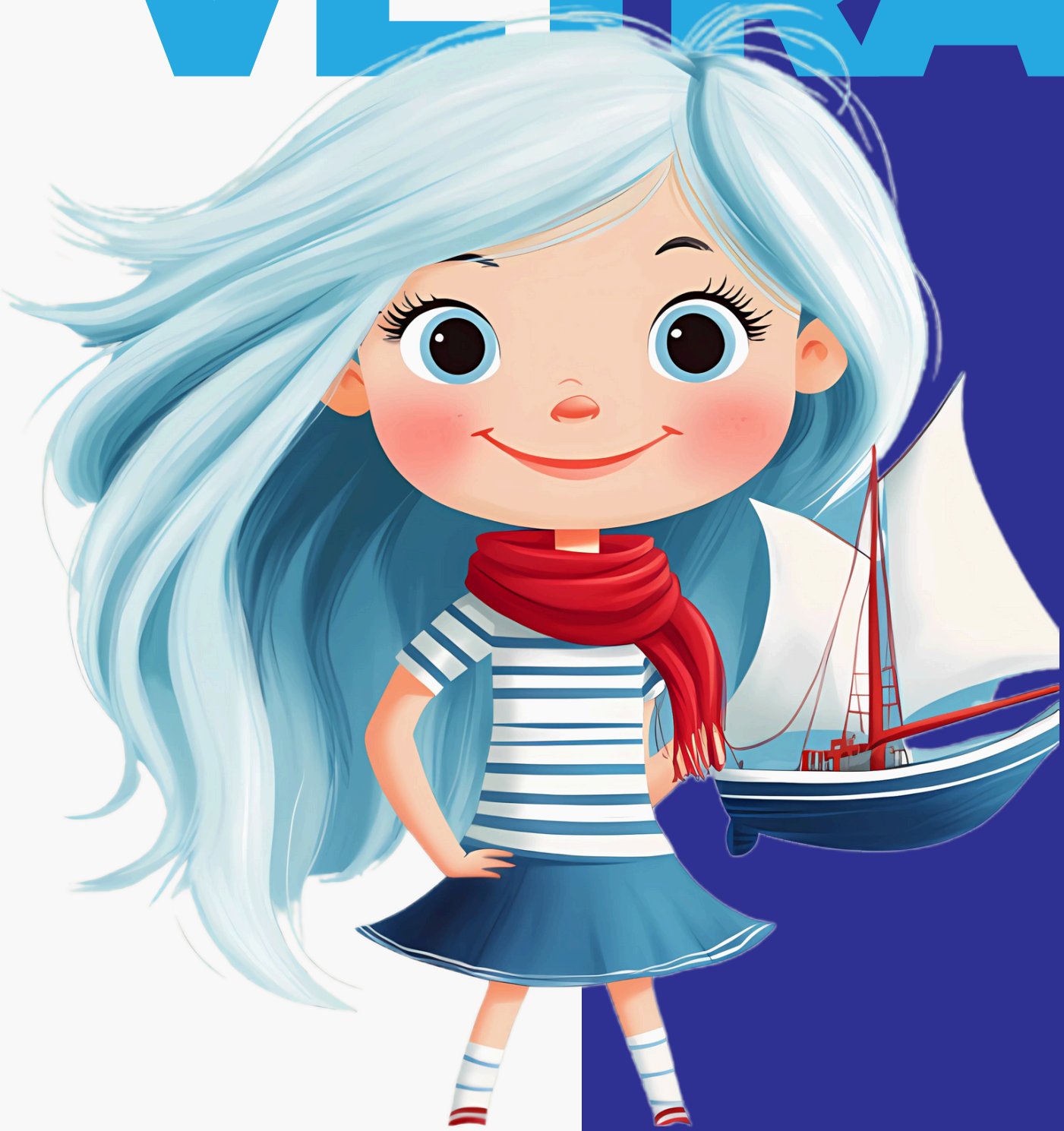
MEET YOUR GUIDE

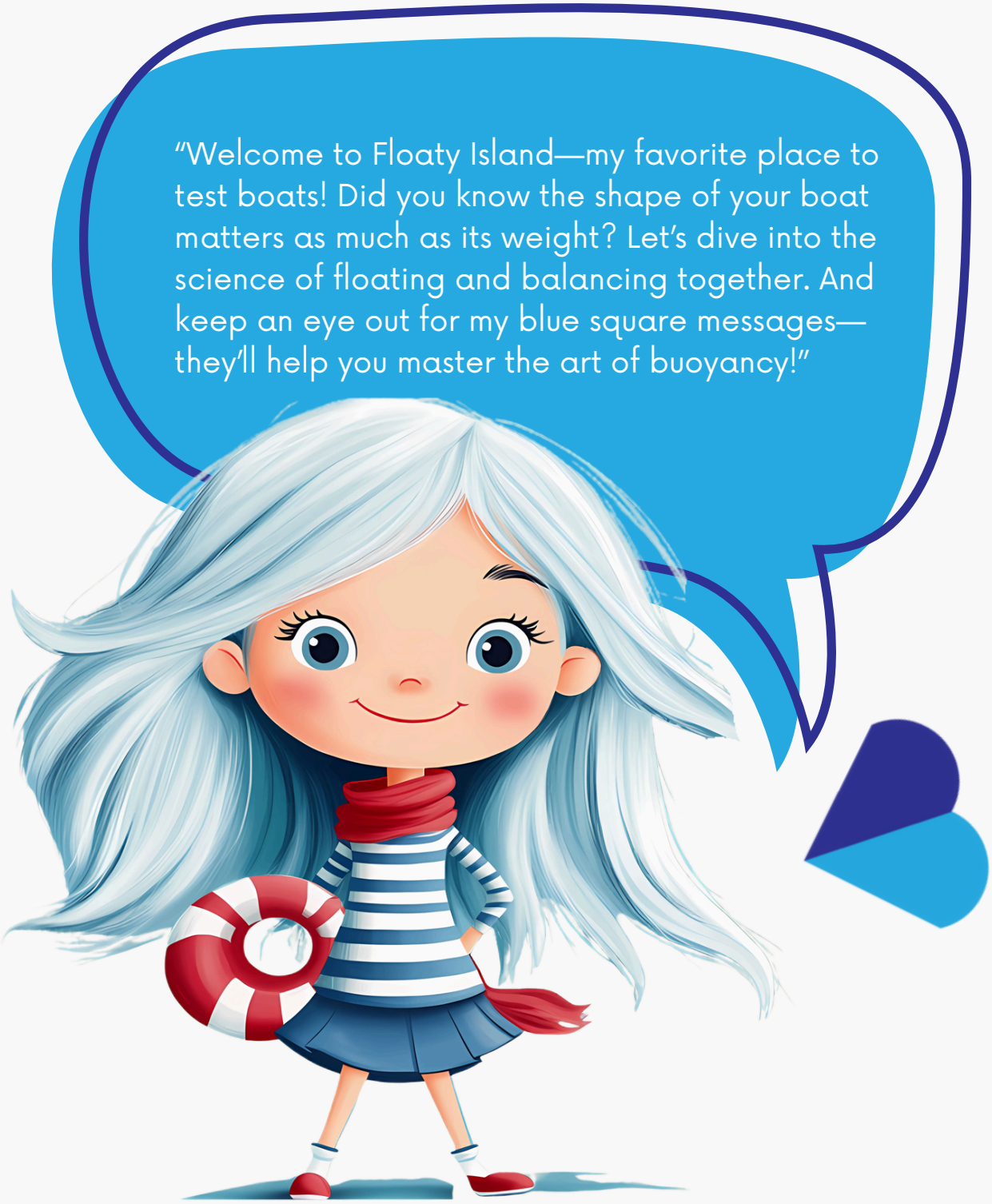
VETRA



FLOATY ISLAND

02

You've landed on Floaty Island, the second stop on your SailingIntoSTEAM adventure! Here, we'll uncover the secrets of why boats float—and what makes them sink to the bottom! Have you ever wondered: Why does a huge ship float but a tiny rock sinks? What keeps a boat from tipping over? How can you build a boat that holds cargo?



MISSION 1: SINK OR FLOAT DETECTIVE!

Ahoy, explorer! It's time to solve the mystery: Why do some things float and others sink?

Your educator shows you a bowl of water and a collection of mystery objects. Together, you'll choose a few objects to test!

First, make your best guesses—will they float or sink?

👉 Write your predictions here:

Object	My Guess (Float/Sink)	What Happened?

Test each object in the water one by one. Did it float or sink? Write what happened! Why do you think some floated and others sank?

Let's learn some secrets about floating:

- **Mass** = how much "stuff" is inside an object. A rock is heavy because it has lots of mass.
- **Volume** = how much space something takes up. A big beach ball has lots of volume—even if it's not heavy!

"Do big things always weigh more? Or can a big thing be light?"

- **Density** = how packed the "stuff" is inside. We find density by this simple idea: Density = Mass ÷ Volume

"If an object is heavy but very small, it's dense! If it's light but big, it's less dense."

Time to make and test your shapes!

👉 Now take playdough (or modeling clay) and make a solid ball. Put it in the water. Did it float or sink? _____

👉 Next, reshape it into a boat shape. Try again! Did it float or sink this time?

_____

Why do you think the shape made a difference?

How Floating Works!

When something is in water, two invisible forces act on it:

- Gravity pulls it down
- Buoyancy pushes it up

"If an object's weight (gravity pulling down) is less than the water pushing up (buoyancy), it floats! If it's heavier than the push, it sinks!"

MISSION 2 : THE PRESSURE PUZZLE (CARTESIAN DIVER)

Ahoy again, explorer! We've learned how differences in pressure can help lift something... But can pressure also make something sink?... and float again?

Your educator shows you:

- A plastic bottle filled with water
- A small solid toy diver

Today's challenge: control the diver with just a squeeze!

What do you think will happen if you squeeze the bottle?
👉 Write your guess:

Let's test it!

- Your educator places the toy diver into the water-filled bottle
- The diver just barely floats at the top
- The educator seals the bottle cap tight

Ready? Squeeze the bottle gently! Did the diver sink or float?

👉 Write what happened:

Stop squeezing.
👉 What happens now?

Why does this happen?

> "When you squeeze the bottle, you increase the pressure inside the water. That pressure pushes equally in all directions—including on the little diver."

The diver has a tiny bubble of air inside. When the pressure increases, the bubble gets smaller because air can be squeezed. The diver keeps the same mass but takes up less space—that means it becomes denser. Since it's smaller, it pushes away less water, and the buoyant force becomes weaker.

Less buoyancy → the diver sinks!

- When you let go of the bottle, the pressure goes back to normal.
- The air bubble expands again, the diver pushes away more water → buoyancy increases → and the diver floats back up.

The science behind the puzzle:

- Squeezing the bottle = more pressure
- More pressure squeezes the bubble → the diver gets smaller
- Less space = less buoyancy → the diver sinks
- Releasing = the bubble grows → more buoyancy → the diver floats again

MISSION 3 : ARCHIMEDES' WATER TRICK!

We've reached the final challenge on Floaty Island! Today, you'll discover Archimedes' secret: how water pushes things up!

Your educator shows you:

- A clear tank of water
- A plastic cup filled with rocks (or other small heavy objects)
- A kitchen scale
- A ruler or measuring tape

We're going to test what happens when we put something heavy into water. Make a prediction. What do you think will happen to the water when the cup goes in?

- Will the water stay the same?
- Will the water level rise?

👉 Write your guess:

_____

Let's test it!

Step 1: Weigh the cup

Your educator weighs the cup with the rocks on a kitchen scale.

👉 Write down its weight. Cup weight: _____ grams

Step 2: Measure starting water

Your educator fills the tank with water and marks the starting water level.

👉 **Draw or mark the water level here:**

Step 3: Put the cup in!

The educator slowly lowers the cup into the water.

- **Watch carefully!**
- **Mark how high the water rises.**

👉 **Draw or mark the new water level here:**

What happened?

Did the water level go up or stay the same?

👉 Write your answer: _____

Why did this happen?

"When you put something in water, it pushes water out of the way (displaces it).

The water pushes back with a force called **buoyancy**.

Archimedes said: "The water pushes up with a force equal to the weight of the water that was pushed out."

The science behind it:

Water pushes back up (buoyancy). The more water you move (displace), the more upward force you get. If the water's push is stronger than gravity → it floats! If gravity is stronger → it sinks.

"That's why a boat can float even if it's heavy—it pushes enough water away to make enough upward force!"

BONUS MISSION : BUILD YOUR BEST BOAT!

Ahoy, engineer! Now it's your turn to design a boat that can carry as much treasure (coins or marbles) as possible without sinking. You'll use recycled materials to build a small boat, then test how many coins it can carry.

Your boat-building supplies:

- Aluminum foil
- Popsicle sticks (optional)
- Corks or bottle caps (optional)
- Tape or glue
- Coins or marbles (for testing)
- A tub of water

(Ask your educator if you can add other recycled materials!)

👉 **Design your boat:** Sketch your boat idea first:

Think: Will it be wide or narrow? Will it have tall sides or flat ones? Where will you put the cargo?

👉 **Build it!**

- Take 15–20 minutes to build your boat.
- Use your sketch as a guide—but feel free to adjust as you build!

👉 **Test your boat:**

- Place your boat gently in the water
- Start adding coins one at a time

👉 **Count how many coins it holds before sinking!**

Write your result: My boat held _____ coins before sinking

What did you notice?

- Where did the boat start to tip or sink?
- Did some coins make it sink faster?

👉 Write what you observed:

A boat floats because it pushes water away (displaces it). A wider boat pushes more water and gets more buoyancy to hold up weight!"

Want to make your boat stronger?

✅ Try folding the foil edges up like walls.
✅ Add popsicle sticks or bottle caps underneath for extra support.
✅ Put tape across the bottom so it holds its shape!"

More structure = better balance = more coins!

BONUS MISSION : THE STABILITY EXPERIMENT

Ahoy, explorer! Did you know that sailors have a special way to help boats stay upright in strong winds? It's called a keel—a long, heavy piece at the bottom of a sailboat that helps keep it from tipping over!

Today, you'll discover how adding weight below the boat makes it more stable. Let's test it!

Materials you'll need:

- A small wooden, plastic, or foam boat model
- A toothpick, craft stick, or wire (to be the keel fin)
- Small screws, nuts, washers, or playdough (to add as keel weights)
- String or thin rope
- A pulley or smooth edge (to guide the string sideways)
- A small cup or container to hold weights
- A set of small weights (like washers, coins, metal nuts)
- A tub or basin filled with water
- Towels (for spills—sailors know water goes everywhere!)

"Try to reuse old materials for your boat, weights, and strings—it's great for the planet!"

Step 1: Build Your Keel

Stick a toothpick, craft stick, or wire under the center of your boat to act as the keel fin. Attach a small nut, washer, or ball of playdough to the bottom of the keel—it's your first keel weight! Put your boat in the water. Does it float upright? Good

Step 2: Set Up Your Balance System

Tie one end of a string to the top of the boat's mast (or a toothpick "mast"). Run the string over a pulley or smooth spot on the side of the tub. Tie the other end of the string to a small container (like a paper cup).

"As we add weight into the cup, the string will pull sideways on the mast —just like the wind tries to tip a real sailboat!"

Step 3: Measure Tipping Force

- Slowly drop small weights (coins, washers) into the cup one by one.
- Watch the boat carefully!
- Stop adding when the boat tips over or stays tilted without standing back up.

👉 Write down how many weights it took to tip the boat:
"With my first keel weight, it tipped over with _____ weights."

Step 4: Add More Keel Weight

- Stick another nut, washer, or more playdough to the keel.
- Put the boat back upright in the water.
- Repeat Step 3—add weights into the cup again until the boat tips.

👉 Write your result: "With more keel weight, it tipped over with _____ weights."

Try at least three different keel weights and record how many weights it took to tip each time!

"The heavier the keel under the boat, the harder it is to tip over! The keel acts like a counterweight, pulling the boat back upright when the wind tries to push it over." But... if the keel is too heavy, the boat gets slower and harder to turn! That's why real boat designers must balance stability (so the boat doesn't tip) and speed (so the boat can move fast).