

# SCIENCE



## SEQUENCE 1

Age group	6-9 y. o.
Prior knowledge	None
Material needed	Air box, tissue, plastic bottle, cup, bowl that can fit the whole cup inside, tape, water.
Subjects	Science
Skills involved	Perceiving air. Observation and logical reasoning.
Time to carry out the sequence	1 hour

### Step 1: Storytelling

Tell your students to write down the most precious thing on earth, and not show anyone. Now read the story to the class. Discuss with them if they agree with the king's decision. What did they write down before the story? Are those things more precious than air?

### Step 2: Introduction

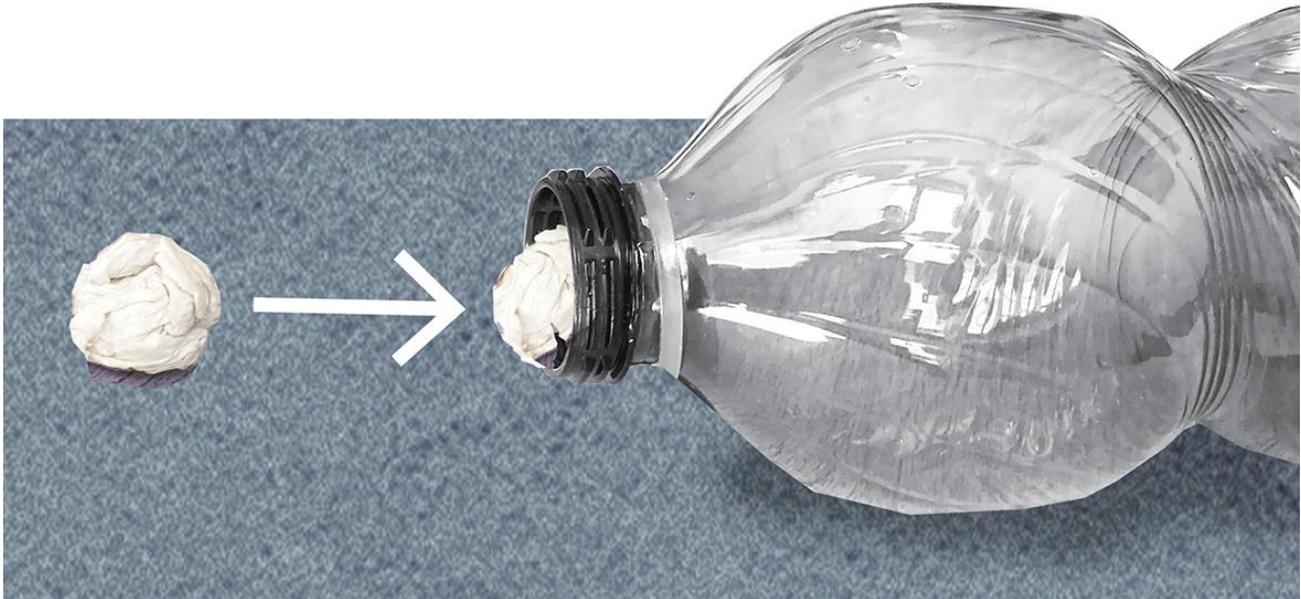
Start by asking your students if the air is real. How do they know it? Can they see it, smell it, touch it? Tell them you are going to do a few experiments to try and prove that it is real.

Take a bottle and a piece of a tissue. Roll it into a ball, hold the bottle horizontally and put the ball at the entrance of the bottle. Ask the students what will happen if you blow on it. After they have made their hypothesis, do the experiments. You will observe that instead of going inside the bottle, the tissue has fallen outside of it.



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Clearly you did something wrong, as it should be easy to blow the small paper ball inside the bottle. Divide the students into groups, give each group the needed material, and tell them to try it themselves. Maybe they need to blow harder. When all of them try to do it, and fail, discuss why it happened. Remind them that you already gave them a hint at the beginning of the class. Explain that even though we can't see it, the bottle is full of air. When you try to blow, you try to force more air inside, and since it can't fit anymore, some air must leave the bottle, and it pushes the paper out.

### Step 3: Feeling the air

Now talk to the students and ask them if they are strong enough to squish the bottles that they have. Have them test that hypothesis. Talk to them about how hard it was. It should be easy at this point.

**Note:** If needed, they should first blow in the bottles to make them regain their original shape before going to the next step.



Now tell the students to put the cap on the bottle and try again. Discuss what happened this time. Were they able to squeeze the bottle the same way? Why not?

If they don't conclude themselves, explain that as we have seen in the first experiment, there is air in the bottle. When they first squeezed it, the air just left the bottle, and it was easy. But the second time around, the air had no way to get out, because of the cap, so they couldn't press it completely. To make it more visual, have them imagine that the bottle was filled with sand instead.

## Step 4: Put it into practice

Fill the bowl with water so that the level of water is higher than the cup that you are using in this experiment. Place the bowl somewhere visible to all the students.

Give each group of students a tissue ball, a piece of tape and a cup. Tell them that their task will be to make the ball go into the bowl, below the water level, without it getting wet. Give them time to think about it and make their prototypes.

If the students can't figure out how to do it, you can give them the instructions from the "Creation of elements".

Talk the students through the experiment and discuss how it was possible for the paper to be submerged without it being wet. At the beginning of the experiment, even though we couldn't see it, the cup was filled with air. By pushing it straight down, the air was trapped in the cup, and didn't allow any water to come in, hence the paper stayed dry.

Ask the students what would happen if you had tilted the cup while underwater. After they have made their hypothesis, you can redo the experiment and try it. They will notice bubbles coming out of the cup and water coming in. Why is that? You can explain that it is the air leaving the cup, making room for the water.



## SEQUENCE 2

Age group	10 -12 y. o.
Prior knowledge	None
Material needed	Air box, tissue, bottle, A4 paper, computers with internet connection.
Subjects	Aerodynamics Air pressure
Skills involved	Perceiving air. Understanding air pressure. Fine motor skills.
Time to carry out the sequence	1.5 hour

**Note:** The first two steps are the same as in the previous sequence

### Step 3: Air pressure

Now that the students have gotten a better sense of air all around us, you can talk to them about air pressure. Have they ever heard about it? What is it?

Most likely the only place that the students have heard about air pressure is the weather forecast.

Explain to the students that the air pressure is the force with which the air is constantly pushing us. But, since the air is all around us, it pushes from all sides, not just from the top. As this can be hard for the students to visualise, have them imagine themselves in a swimming pool. The water is then all around them in much the same way, and it is pushing from all sides. If we want to move anywhere, we need to overcome that force and push the water aside.

### Step 4: How do aeroplanes fly?

Using the knowledge that we just acquired is essential to understand how the plane flies.



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You can ask the students to give their own ideas on how this happens. Most likely all the answers will be that it flies because of its engines. And while the engines are important, they are only part of the solution. The other part is hidden in the shape of its wings and the air pressure.

To help demonstrate what happens, you should first research the internet and find pictures of how the wings of an aeroplane look. You will notice that the wing is curved on the top side, while it is flatter on the bottom. Why is it shaped so strangely?

To find that out give each students a piece of paper, have them hold it near the edge on both sides and put it in front of their mouth. Now blow on top of it horizontally. You will notice that the paper is rising. The reason is that the fast-moving air creates less pressure on the object, that the slow moving one, so in this case, the air from the bottom of the paper is pushing it upwards.

The same principle is used with the wings of an aeroplane. The curved shape makes the air on top of the wing go faster than the air below it, so the plane goes up.

## Step 5: Crafting your planes

To end the lesson with something creative and fun, you can have the students use the sheets of paper that you gave them and make a paper plane competition. You can have different categories like the plane that went furthest, the one that came closest to the target etc.

If you want to make it more scientific, you can come up with a scoring system, measure everything and create a table where you will input all the data. Afterwards you can analyse it and find out what the ultimate plane is.



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