

When leading this project with students you should work primarily from the curriculum guide (developed at [EDC Inc](#) and available at [Kelvin.com - EDC Products](#)) in order to see how the activities in the project fit together and for detailed coaching on leading the activities and managing materials. The following tips and revisions supplement, but do not replace, the curriculum guide. Further resources, including video, materials lists and professional development tools can be found at the [NPASS2](#) website.

The Main Idea

We are used to the idea that water only flows down hill. But a siphon can make it flow **uphill** – and keep on flowing uphill – without any pumps or other input from us. The “catch” is embodied in these rules; 1) after it goes uphill, the water must end up at a lower level than it began, 2) the water must be contained in a pipe, which has to be full of water all the time. You will discover that the greater the height difference between the top reservoir and the lower end of the tube, the faster the water flows and that there does not seem to be any limit to how high the water will travel up, before coming down to the lower level, as long as the two rules are followed.

Siphons work a) because **gravity** pulls the water in the longer (lower) tube down more than it pulls the water in the shorter side, and b) because water is “sticky” – it won’t separate and allow a vacuum to form in the middle of a pipe. You can’t make a siphon with sand or talcum powder because the particles don’t stick together. You could make one, however, with a string of beads: it works like a Slinky. A lot of people guess at first that it is air pressure that makes the water keep flowing. It’s a good thought exercise to work out why this cannot be the case.

The Activities

Exploration #0

Instead of beginning this project with Exploration #1, as written, start with the activity illustrated on pages 18 & 19 of the guide – just a tube and two water containers. We’ll call this Expl # 0. Ask the students if anyone has ever tried to get water/liquid out of a big heavy container where you can’t tip up or reach into with a scoop or bucket (ex. changing the water of a fish tank, getting gas out of a gas tank.)

Give each team a 30” tube, water and two containers and let them explore how to get the siphon started, how to make the water flow one way and then the other and what happens when you raise or lower the height between the containers. Let the students explore this very simple system for as long as it holds their attention. First they have to figure out how to get the flow started – either by sucking on the tube, or immersing the whole tube and holding one end closed. Let them struggle/play while discovering the basic rules mentioned above. Only when these are well established should you move on to Exploration #1 as it is written.

Exploration #1- 3

These three activities build on one another and reinforce the basic rules already mentioned. You might consider that explorations 2 and 3 are a continuation of one another. Do not let the students rush ahead to highly complicated arrangements, however, until they really understand what is going on in the simple setups.

Exploration #4

The balloon activities are fiddly and therefore optional. For older students the balloon offers a good way to explore water pressure and the reason why the water flows faster as the height difference

Tips and Revisions

Siphon Systems (*Explore-It!*)

from reservoir to end of the lower tube is increased. In this activity you will see the size/width of the balloon increase and decrease as you change raise and lower the height difference. What you are seeing in the balloon is the difference in **water pressure** caused by the height of the reservoir above the balloon. It is this difference in water pressure that causes the flow rate to increase and decrease.

Exploration # 5 – Cartesian Divers

This activity is also included in the Explore-It! “*Sinking and Floating*” curriculum. It’s actually a better fit with that curriculum, so you may choose to hold off doing it for now.

Whenever you chose to do this activity, we have recently found that an ordinary clear drinking straw works better than the rigid pencil tube suggested in the guides. Cut the straw in half and either close up the ends with tape or chewing gum, or fold it in a loop with the open ends downward. In both cases load the bottom down with paper clips or electrical wire. Then allow just enough water into the tube to make it floating ***just below the surface***. Then, put the diver into the bottle, and follow the instructions in the guide books.

And by the way: Ketchup packets or mini candy bars also make excellent Cartesian Divers.

Exploration # 6 – Hero’s Fountain

This activity has nothing at all to do with Siphons, but is included here because it is a fun and interesting side challenge that uses the Hero’s Fountain connectors in the way they were designed.

To be continued.....