

Tento projekt je financován Evropskou unií v rámci Národního plánu obnovy.

The path of water

Task:

The participants have the task of using a stethoscope to determine where the three water routes lead in the maze.

Description:

The maze contains five columns with three rows of pipes. There are a total of three different paths in the maze. Water flows into one of them when the red faucet is open and the blue faucet is closed, into the second when the blue faucet is open and the red faucet is closed, and water never flows into the third route. In each column there is one pipe of each route.

Using a stethoscope, the participants listen to the acoustic properties of the pipes in the individual holes and draw in the worksheet where the water flows with the given setting of the waterways.

Checklist:

- Before starting and after finishing, check that the set is complete.
- Maze 1 pc
- Stand 1 pc
- Stands 2 pcs
- Wedges 1 pack
- Barrel with lid, penetrations and distributor with two hoses 1 pc
- Submersible pump 1 pc
- Connecting hose for quick couplings 1 pc
- Stethoscope 1 pc
- Bucket 10 l 1 pc
- Disinfection, wipes
- Instructions for use of the pump

Instructions for the experiment

- You must also ensure on site:
- Power supply (220 V)
- Approximately 50 l of drinking water

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- Printed worksheets for drawing routes (1 pc per participant)

Colored crayons/markers of at least three colors



Principle:

When water flows through a pipe, it is mostly silent because it flows smoothly and nothing disturbs it. But as soon as it encounters an unevenness, a sharp bend or a crack, it starts to swirl and hit the walls of the pipe. These bumps and swirls cause the walls of the duct to vibrate, and this vibration is actually sound. Just like when a metal rod is tapped, the

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vibrations spread along the entire length of the pipe. Therefore, it is possible to hear sound even in parts where the water is not flowing, but the pipes are touching or connected - the pipes transmit vibrations much like a guitar string.

Water companies use this phenomenon to find faults. They have special microphones and sensors that they attach to hydrants, valves or directly to pipes. These devices listen to the noise that travels through the pipes and can distinguish the typical sound of a water leak - it sounds like steam hissing, for example. If they have sensors in several places, they measure not only the strength of the sound, but also the time it takes for it to reach them. From the differences in these times, you can calculate where exactly the problem is, just as you can estimate the distance during a thunderstorm by when you hear the thunder after the flash. Thanks to this, it is not necessary to dig up entire streets, but only exactly where the water actually leaks, which saves a lot of money and water.

Preparation: Preparation time:	Environment:	Number of people:
about 15 minutes	quiet quiet place electrical outlet (or extension cord)	2

Choose a suitable place for the experiment. This is an audio test, so choose a quiet place where there will be no distracting noises.

First you need to build the maze. Two stands are inserted into the base. It is necessary to slide the maze into the prepared holes on the stands. Carry out the insertion by two people. If the structure wobbles, secure it with a wedge.

If the pump is not in a barrel, place it in it. Pass the power cable through the grommet in the lid. Make sure the pump float can move freely. Make sure the power cord does not have a plug in the barrel.

Next, you need to connect the hoses between the barrel and the maze. Hoses from faucets belong to the right two connectors in the maze. The left clutch is waste and comes to connect to the barrel lid.

Fill the barrel approximately $\frac{3}{4}$ full with drinking water. Do not use other types of water.

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Set the water path. Close one of the taps completely, open the other one completely. If the valve is only partially open, the path through the maze is difficult to distinguish. Manipulation of the valves must be carried out by a supervisor, and carefully, otherwise there is a risk of damage to the device.

Connect the pump to the electricity. If the pump does not start pumping, check that the float is free to move. Never turn on the pump unless at least one path through the maze is open.

Check the stethoscope - switching the heads is done by turning the metal sleeve, which diaphragm is active can be determined by very lightly tapping the diaphragm while the stethoscope is placed on the ears.

Instructions and rules: Attempt time:	Environment:
1-5 minutes/person	supervised research

After building the maze, setting one path and starting pumping, the experiment is ready. The participant receives a worksheet, a colored crayon and a stethoscope. The supervisor explains the task to him. After that, the stethoscope needs to be placed well in the ears so that the sounds can be heard well.

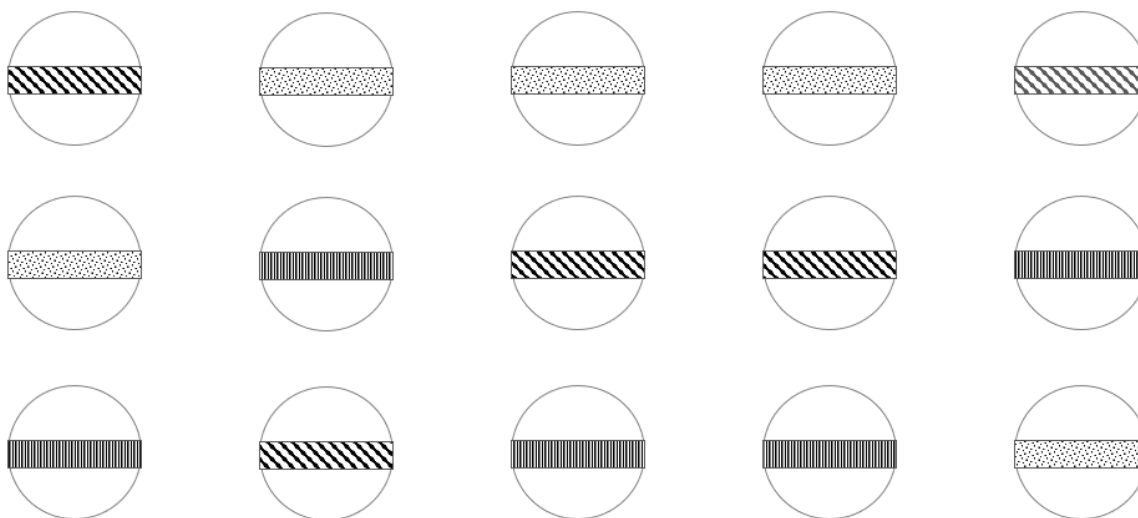
The participant gradually places the stethoscope on the pipes in individual columns, compares the sounds they hear and evaluates where the water is flowing. A pipe with flowing water is noisier and the sound is louder than a pipe without water flow. Draws a pipe with running water in a worksheet. The center of the stethoscope needs to be placed on the center of the pipe. You really need to put the stethoscope down and press down slightly, but be careful not to tear the membrane. After evaluating the first route, it is possible to open the second route to the participant and then close the first route and let him repeat the listening and draw the route in the worksheet with a different color.

When changing participants, disinfect the stethoscope using a disinfectant solution and wipes.

The experiment is more demanding for correct execution and good hearing of the participants.

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Řešení



Cleaning:
Cleaning time:

approx. 10 min

After finishing, you need to turn off the pump. Then disconnect all the hoses with quick couplings and let the water from the maze flow into the bucket. The water from the barrel needs to be poured out (it can be used, for example, to water plants). Leave the pump in the barrel, twist the cable. After that, two people can take the maze off the stand and disassemble the stand. Used wedges are collected and returned to the bag.

At the end, everything is checked with a checklist.

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This material was created as part of the project solution:

Title: From the faucet to the toilet - environmental education for children and youth with a focus on the production of drinking water and wastewater treatment

Number: 5230200047

Investigator: Association for Water of the Czech Republic z.s.

Call number: NPŽP-NPO 2/2023 - NPŽP-NPO 6.1.J

Support provider: State Environmental Fund of the Czech Republic

Component name: 2.5 Building renovation and air protection

Name of measure: 2.5.3 Pre-project preparation and education focused on environmental

education, upbringing and enlightenment

Od kohoutku do záchodu

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Projekt cílí na zlepšování kvality odborných exkurzí a odborných přednášek či demonstrací v oblasti vody. Primárně se zaměřuje na poskytnutí podpory a materiálů pro učitele, odborníky a pracovníky vodo hospodářských společností, kteří provádějí exkurze.

Realizace projektu: únor 2024 – červenec 2025