

Investigating waterproofing and breathability

Below some suggestions for testing waterproofing and breathability are presented. They come from the ideas of **students** and are expressed in their own words.

"This is our plan to test waterproofing:

- 1. fill a glass jar with water,*
- 2. put a piece of one material on the top of the jar, holding it with a rubber band,*
- 3. overturn the jar and observe whether the water goes through the fabric or wets it."*



"After carried out our investigation, we found that we needed a narrow cylinder to measure the quantity of water poured in the jar. For those materials that absorbed water, as leather, we needed also a stopwatch to measure the time taken by water to go through them. In this way we could compare materials that at first seemed waterproof and after some time were not so."

"To test breathability, among the different resources provided by the teacher, we choose a conical flask with a connector. We put the material to test – at first a piece of fabric – on the top of the conical flask. To do this well, we used a rubber band to hold the material on the top. After putting a drinking straw into the connector of the conical flask, Maria began to blow into the drinking straw and I hold my hand over the fabric to perceive if air went through it"

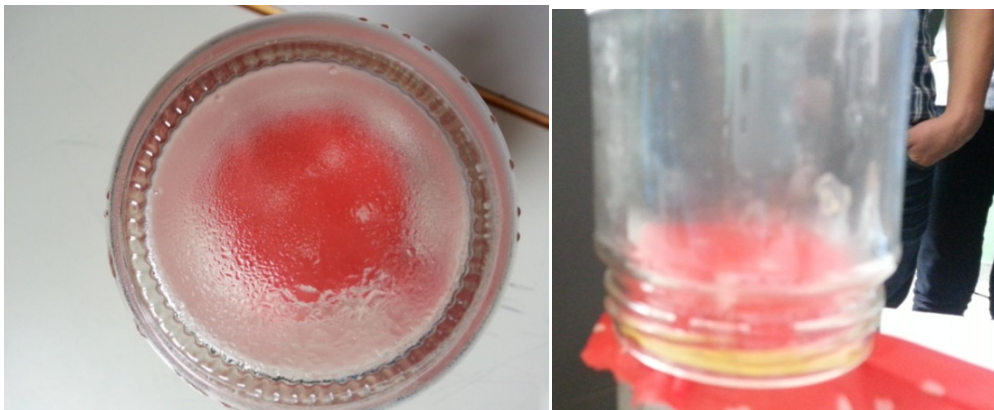


"To do the test of breathability, at first we heated some water. After the water began to boil, we poured it into a thermos, because we needed to keep it hot while we were arranging the materials for the test. Then, we spent some time to find two glass jars with quite similar size but different diameter among the resources provided"

"When all materials were ready we started our test. We poured some hot water in the glass jar with the smallest diameter and immediately covered it with the cotton fabric. Then we put the second jar with the biggest diameter on the first one."



"Before the investigation we made this hypothesis: if the material tested is breathable - that is water vapor went through it - then some drops of water will appear on the top of the second jar. I mean that if the water vapor is not stopped by the material, it goes from the first jar into the second one and condenses in drops of water into the second coldest jar."



The investigation carried out by a group of Secondary **teachers**, involved in a CPD session, is described below.

A group of teachers was surprised to find ammonia solution and litmus paper among the resources provided. They spent a little time to discuss whether these resources could be used to test breathability. The teachers considered that ammonia vapor flows through breathable materials, and that the basic nature of this vapor causes the color change to blue of the litmus paper.



Therefore the teachers planned their test in the following way: after pouring some ammonia solution into a conical flask, cover it with the tested material, holding it with a rubber band. Then put a piece of litmus paper over the top of the material that covered the flask, and observe if the litmus paper changes its color to blue. The teachers predicted to observe a similar color change when testing a breathable material.



The test was performed using cotton fabric, gore-tex and faux leather. The litmus paper changed its color when testing cotton fabric and gore-tex, while any color changing was observed with faux leather. Therefore the teachers concluded - as expected – that the first two materials were breathable unlike the last one.

All the activities were carried out respecting the safety rules.