ACTIVITY 4

# WHICH MATERIALS ABSORB LIQUIDS THE BEST?

## EXPERIMENT OBJECTIVES AND CONTENT

In this activity, students discover that it is possible to absorb a liquid using various materials and techniques.

## ESSENTIAL KNOWLEDGE

- Conservation of matter
- Absorption

## SUGGESTED MATERIALS

**Scientific equipment:**
- Dropper
- Beakers
- Graduated cylinders
- Magnifying glasses
- Stopwatches

**Perishable non-scientific materials:**
- Food coloring
- Water
- Soapy water
- Vegetable oil
- Juice

**Household materials:**
- Plastic plates and glasses
- Large plastic tubs
- Samples of various fabrics (waterproof fabric, cotton, silk, linen, synthetic dish towel, etc.)
- Newspaper
- Loose leaf paper
- Brown paper
- Cotton wadding
- Natural sponges
- Artificial sponges
- Paper towels
- Diapers
- Cardboard

**School supplies:**
- Scissors
- Rulers
- Clocks

## CONTEXT: SITUATIONAL PROBLEM OR RESEARCH QUESTION

*Both at home and at school, we sometimes spill a liquid by accident. Imagine you just knocked over a glass of water. What material would you use to soak up the liquid? How can you determine which materials absorb liquids the best?*

IT IS POSSIBLE THAT THE STUDENTS BELIEVE THAT THE THICKEST MATERIALS ARE THE MOST ABSORBENT AND THAT PAPERS DO NOT ABSORB LIQUIDS.

## SUGGESTED PREPARATORY ACTIVITIES (INTRODUCTION)

The teacher piques the students' curiosity with a fun experiment on absorption. Start by cutting out a six- or eight-petalled flower out of a piece of paper and color the centre of the flower on one side with a felt pen. Next, fold the petals toward the middle of the flower, hiding the colored side. Then place the flower in a bowl of water and let it soak up some water. The petals will open up and the color in the middle will travel into the petals. This demonstrates the phenomenon of absorption, in which small cavities in the paper fill with water, forcing the petals to expand and open outwards. After the experiment, it is suggested to lead a discussion about what can be used at home or at school to absorb a spilled liquid. The teacher introduces the available materials and invites the students to observe the texture of the materials under a magnifying glass.

## INITIAL IDEAS AND HYPOTHESES

Here are a few examples of hypotheses the students might formulate based on their initial ideas:

**Example 1**
I predict that among paper towel, a piece of loose leaf paper, brown paper and newspaper, the paper towel will absorb liquid the fastest. I predict this because on TV, paper towel is used to mop up liquids.

**Example 2**
I predict that among cotton wadding, an artificial sponge and a natural sponge, the artificial sponge will absorb liquid best. I predict this because that is what my parents use to clean up a liquid spilled on the kitchen floor.

**Example 3**
I predict that wool fabric will absorb water best. I predict this because it is the thickest fabric.

RECORD ALL YOUR IDEAS AND OBSERVATIONS IN YOUR EXPERIMENT WORKBOOK.

TO MAKE THE EXPERIMENTS MORE FUN, THE STUDENTS CAN DYE THE WATER WITH FOOD COLOURING. TO AVOID MAKING A "REAL MESS," HAVE THE STUDENTS DO THEIR EXPERIMENTS IN A LARGE PLASTIC TUB.

## WORK PLAN AND EXPERIMENTATION

Here are a few examples of experiments the students can carry out to verify their hypotheses:

**Example A**
The students pour the same amount of water, measured using a graduated cylinder, into several plastic glasses, and place a sample of different papers into each glass. To add an element of rigor to the experiments, the students record the time it takes each sample to absorb the water. To double check the effectiveness of the materials tested, the students redo the experiments using different liquids (soapy water, oil, juice, etc.).

**Example B**
The students place samples of various sponges in beakers or plastic containers. They then gradually add a fixed amount of water and observe at what point the sample becomes completely saturated.

**Example C**
The students pour the same amount of water into three plates. They next try to absorb the water by drying each plate with a different fabric.

**Example D**
The students pour water into beakers and measure the level of the water with the ruler. They next place a piece of diaper into one of the beakers, a piece of cotton wadding in another, and a piece of sponge in the third.

### EXPERIMENTAL FACTORS

To ensure scientific rigor, the students should evaluate the experimental factors that might influence the experimental results.

- Size of samples
- Amount of water
- Shape of container
  (a plate lets water move around)
- Porosity of material
- Absorption time
- Water temperature
- Type of liquid
  (oil, water, juice, soapy water, etc.)

## DISCUSSION: SUGGESTED INTEGRATION ACTIVITIES (CONSOLIDATION)

Each team presents the results of their experiments on a poster using a bar graph. The teacher can take this opportunity to encourage the teams to discuss their data among themselves and to go over the important concepts and difficulties encountered.

## SUGGESTED ACTIVITIES FOR APPLYING KNOWLEDGE (APPLICATION)

The teacher invites a representative from each team to take part in one final experiment. All the students in the class try to predict which materials, among a wide range of samples, will be the most absorbent. Finally, the teacher leads the students in a discussion on the importance of using reusable absorbent materials such as dish cloths in order to protect the environment and conserve natural resources.

## SCIENTIFIC CONCEPTUAL CONTENT

**Absorption**
Action of a body becoming soaked by a liquid. For a material to have a good absorptive capacity, its fibers must have empty spaces in the weave. It is these small spaces where liquid will penetrate. Coarse materials such as raw cotton are more absorbent than smooth materials such as silk because they have more tiny spaces between their fibers.

**Waterproofing**
It is possible to render a fabric waterproof by coating it with a waterproofing agent that plugs the fabric's holes, preventing it from absorbing liquids.

**Paper towels**
Paper towels are usually made of plant fiber from trees.

**Saturation**
This is the maximum amount of a substance that can be dissolved by another. For example, when making chocolate milk, the milk's saturation level is reached when a sediment of chocolate powder remains at the bottom of the glass.

## CULTURAL REFERENCES

**Nature**
Sea sponges were for a long time considered plants. However, in 1765, naturalists realized that they were a primitive kind of animal.

**Environment**
To make environmentally responsible choices when buying absorbent paper products, consult the following website: http://tissue.greenpeace.ca/.

FOR MORE CULTURAL REFERENCES, VISIT THE ÉCLAIRS DE SCIENCES WEBSITE:
**www.eclairsdesciences.qc.ca**

## REFERENCES

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Heddle, Rebecca. "Les matières absorbantes." In *Science Active – La nourriture*. London: Usborne Publishing, 1993, p. 4.

Greenpeace. "*Greenpeace Tissue Product Shopper's Guide*." In *Greenpeace*. [Website, 1999] http://tissue.greenpeace.ca/. Consulted September 11, 2007.

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# PROCESS OF ACTIVE DISCOVERY

## GENERAL LEARNING PROCESS IN SCIENCE AND TECHNOLOGY (IN ELEMENTARY SCHOOL)

### Context related to everyday life

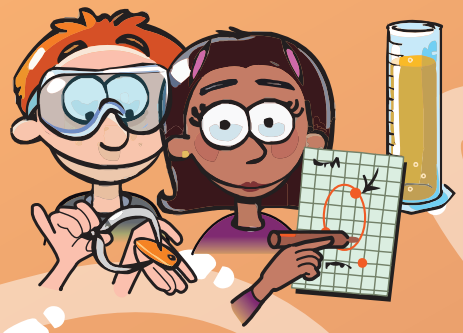
- **Situation problem** or
- **Discovery question** or
- **Need to be fulfilled**
- **Question related to the operation of an object** (how does it work?)

### Initial ideas and hypothesis

**My initial ideas:**
- I share my own ideas.

**My hypothesis:**
- I predict that... I think that because…
- I imagine my prototype.
- I think it works like this…

### Planning and carrying out



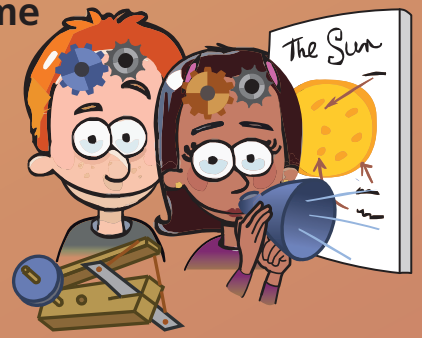
**My equipment:**
- I observe and handle the equipment.
- How could this equipment be useful to me?
- I choose my equipment and my materials.

**Carrying out my process:**
- What will the steps be?
- What precautions should I take?

**My actions:**
- I carry out the steps of my protocol.
- I note or draw what I observe, what I do and what I discover.

**My results:**
- What is my answer to the problem, question or need?

### Outcome




**My outcome:**
- Do my results confirm my hypothesis or not?
- Are my results similar to those of the other teams?
- Can the other teams' results help me to find answers to my problem, my question or my initial need?
- What could I communicate concerning my discoveries?

New question?

**What I learned:**
- What do I retain from this activity?
- What could I communicate concerning my results or my discoveries?

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