Co-funded by the
Erasmus+ Programme
of the European Union

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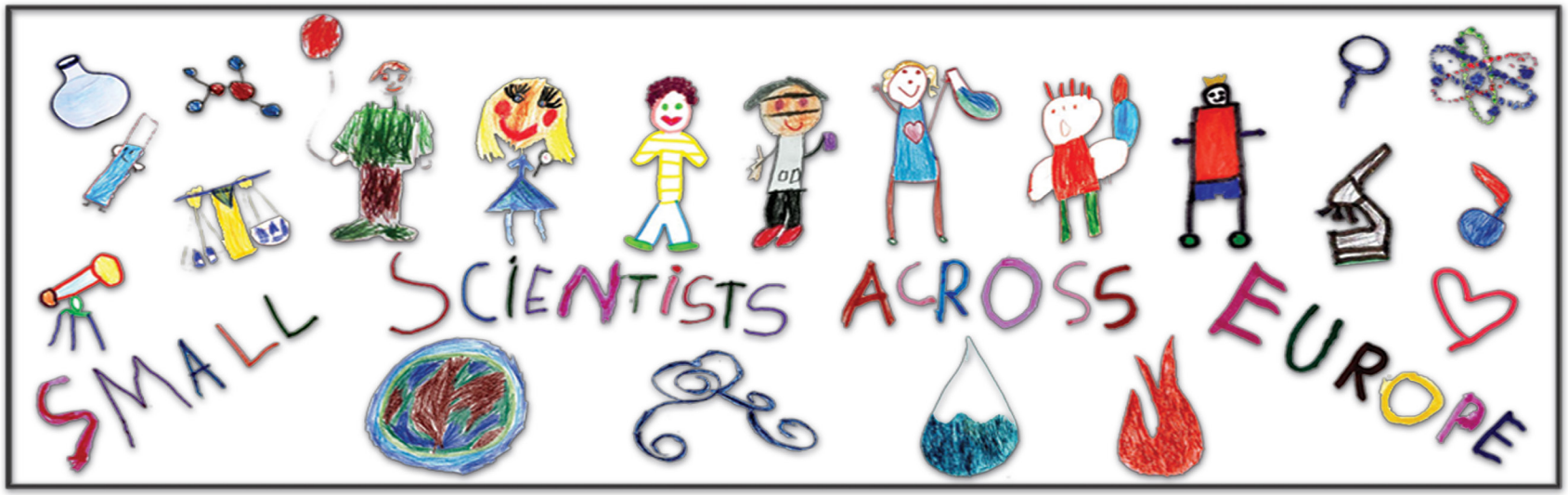


"AIR"

experiment book

www.ssae-eu.com

ABOUT THE PROJECT

Today's little students have a well-developed imagination that should be used in order to become future scientists. The dynamic of our time current requires innovative learning. We plan to adapt science, which is a highly abstract subject to the preschool curriculum, through play and experiments, not only using definitions and theory, and to apply this knowledge in finding ways to keep the environment clean and healthy. This project is designed only for preschool level and is particularly exciting for children this age because they are put in a position to explore, learn on their own, using new methods and concrete work; what makes them happy and eager to work.

In this project we plan to search information about themes like: earth, air, water, fire and create auxiliary materials such as books or puzzles.

By the end of the project, participants will become acquainted with the heritage and culture of other European nations.

'EARTH THEME' EXPERIMENTS

1- Smell Air
2- Egg In Jar
3 - Discovering Air
4 - The trip of the "ping-pong" ball
5 - The Air Car
6 - How to Realise a Wind Reels
7 - Storm
8 - Blowing Balloons
9 - Growing Marshmallows
10 - Will the Water Fall
11 - Balloon Inside the Bottle
12- The Bottle That Rains
13- The Flying Cup
14 - The Stubborn Ball
15 - Blowing Up a Balloon With Vinegar and Baking Soda
16 - Balloon Resistance
17 - Glass Thinning
18 - The Weight Of Air
19 - Octopus Wind Dancer
20 - Candle and Water Experiment
21 - Non Soaking Napkin

Kindergarten Põngerjas, Narva / ESTONIA

SMELL AIR **

Objectives:

Demonstrate an understanding of the properties of air – smelly and scentless.

Materials:

- 5 small empty containers or baby food jars with lid,
- 5 pictures of orange, garlic, chocolate, pine, burnt bread (tost),
- 5 scents or fragrances such as orange peel, chocolate, garlic, pine needles, burnt food.

Instructions:

- Put 5 smelly items in a separate empty covered container or baby food jar.
- Ask kids to smell each container.
- After smelling, kids guess items and choose similar picture for each scent.

Conclusions:

Different items create scents, but air is scentless. The sense of smell tells us about our environment.

Scientifique explication:.

Small particles of perfume are moving in the air and getting into our noses. Then they tickle our nerves in our nose and the nerves send a messa-ge to our brilliant brains. Then we memorise new scents.

Source: http://www.saps.org.uk/attachments/article/194/SAPS%20-%20Using%20Your%20Nose%20-%20smell%20activities.pdf

Kindergarten Põngerjas, Narva / ESTONIA

EGG IN JAR ***

Objectives:

To demonstrate air pressure.

Materials:

- Anarrow-necked glass bottle,
- A peeled hard-boiled egg,
- 2-3 matches

Instructions:

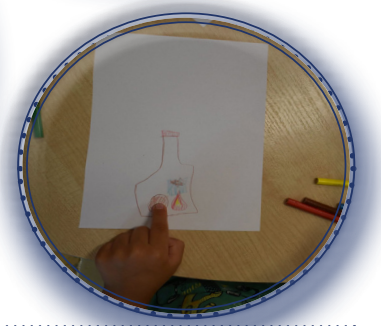
- Put 2-3 matches or other flammable material into a glass bottle with a neck slightly narrower than an egg. Burning material will warm up and expand the air in the bottle and molecules of air will leak out of the bottle.
- Put an egg - boiled and peeled on the neck of the bottle. When the fire goes out, the air in the bottle cools down. Atmospheric pressure in the bottle decreases. Because of different atmospheric pressures, higher outer pressure pushes the egg into the bottle.

Conclusions:

Air pressure changes with changing the temperature of air.

Scientifique explication:.

Matches use up the air inside the bottle. Once that happens the pressure outside the bottle is greater and pushes the egg down into the bottle.



Source:
http://www.science-sparks.com/investigating-air-pressure-more-ggs/

Kindergarten Põngerjas, Narva / ESTONIA

DISCOVER AIR *

Objectives:

To test for invisible air to realize that it is everywhere

Materials:

- Bowl with water 500ml
- Empty, clear plastic bottle

Instructions:

- Push an empty plastic bottle into a bowl of water so it begins to fill up. And watch what happens to the water.
- Kids will see bubbles in the bowl with water. Water pushes out air from inside the bottle.

Conclusions:

Air is invisible, but kids can "see" air with this tricky experience

Scientifique explication:.

Since air is invisible and we can't see air by itself, it is everywhere around us and even things, that look empty, are full of air.

Source: https://happybrownhouse.com/simple-science-experiment-for-kids-testing-for-air/

Ecole Maternelle, Tourrette-Levens / FRANCE

'AIR' experiment book

THE TRIP OF THE PING-PONG *

Objectives:

Explore the world of things;

Students will have to look for solutions to solve a problem.

Materials:

- Objects allowing to realize a circuit (example: Lego, Kaplas)
- Ping pong ball
- Cardboard, straw
- Other: students propositions

Instructions:

- A circuit was made on a table by the teacher using Lego, wooden sticks ....
- Students observing the circuit realized by the teacher. Presentation of the ping-pong ball.
- Formulation of the problem to solve: move the ping-pong ball in this circuit without touching it and without moving the table. "
- Students make assumptions and get the material they need.
- Students experiment with their hypotheses

Conclusions:

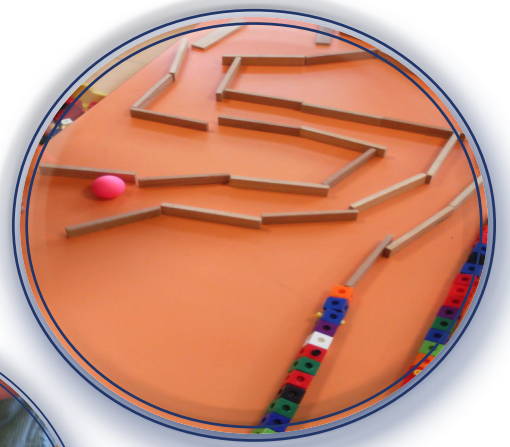
Students are grouped into 4 teams. Each team builds their own circuit and makes them discover and experiment with the other teams. We can time the fastest trip for each of the 4 circuits and determine the winners.

The students are in pairs. Each pair builds their own circuit. The students are face to face and exchange the ball through the circuit.

Scientifique explication:.

Use your breath wisely (intensity, duration, direction);

Use objects that can generate breath



Source: the book "Sciences à vivre - maternelle – Accès"

Ecole Maternelle, Tourrette-Levens / FRANCE

THE AIR CAR ***

Objectives:

Build a small car that advances thanks to the reaction principle with a balloon.

Capabilities:

- Manipulate
- Build
- Observe

Materials:

- 1 small and long brick of fruit juice
- 4 caps of water bottle or soda
- 1 skewer
- 1 rigid straw
- 1 balloon
- Scotch tape
- Glue (preferably strong glue)
- The body of a ballpoint pen about 8cm long
- The pen cap

Instructions:

- Cut a straw in half and glue the two parts under the juice brick.
- Drills a hole in the center of the plugs.
- Cut a skewer in half and insert each part into the straws located under brick.
- Push the four plugs into each end of the skewers.
- Insert the body of the ballpoint pen in the hole of the balloon, about 2 to 3cm,
- Secure the two objects with adhesive tape and check that the junction is airtight
- Fix the pen-balloon assembly on the top of the brick. The ball must rest on the brick and the body of the pen must protrude on the other side of the support (about 4 cm)
- Inflates the balloon by blowing into the end of the pen then mouth with the cap so that the balloon does not deflate.
- Place the car on a stand and remove the cap.

Conclusions:

The air escapes from the balloon attached to the car which propels it quickly allowing it to roll for a few seconds. The vehicle rolls forward "alone" when removing the cap of the pen, if the balloon was "armed", if the elements properly assembled.

Scientifique explication:.

These are two sessions of technology, devoted to the realization of a car propelled by the air and which can be organized in the following way:

Either we leave a free construction to the children then we list all the technical problems encountered by asking the children to bring solutions (the difficulty comes mainly from the fixing of the wheels and the setting up of the axes. surprises at the level of meaning!)

Either the construction is directed using a written protocol to avoid too many technical problems.

Source: http://www.lamap22.net/

Ecole Maternelle, Tourrette-Levens / FRANCE

HOW TO REALISE A WIND REELS **

Objectives:

Explore the world of objects

Produce a technical sheet of manufacture

Materials:

- Sharp wooden sticks (sticks for skewers, barbecue)
- Corks, beads,
- Round-headed pins or nails,
- Square sheets of various paper,
- Scissors
- Felts to decorate

Instructions:

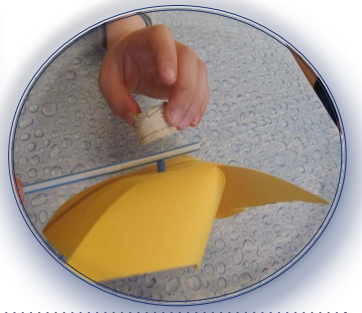
- Follow the steps on the drawing opposite.
- To fix the wings of the windmill (steps 5 and 6):
- Thread each angle of the reel wings into the nail (or pin)
- Put the nail (or hairpin) in the hole in the middle of the wings
- Put the pearl in the nail or the hairpin
- Plant the nail in the cap prick the cork with the pointed wooden stick
- Enjoy a day when there is wind to spin your reels in the playground.

Conclusions:

We know that there is wind because it makes move or tip objects. When there is wind, the objects move (the flag, the scarf, the leaves of the trees, the hair) or incline in the direction of the wind (the branches of the trees, the clothes that dry ...).
The wind is blowing more or less strongly. Depending on the fixation of objects, they fly more or less. Depending on the objects (matter, shape, size, weight), they bow more or less.

Scientifique explication:.

The wind is a movement of air relative to a landmark, we can see the effects.



Source: the book: "Sciences à vivre - maternelle – Accès"

Kauno Lopšelis-Darželis ,,Giliukas", Kaunas / LITHUANIA

STORM **

Objectives:

Find out why there are waves in the seas and sandstorms in the desserts.

Materials:

- Containers for water and sand,
- Water, - Sand,
- Straws, - Stones,
- Boats from paper,
- Cut plastic bottles

Instructions:

- Fill the containers with water.
- Put some shells and rocks to the container.
- Put paper ships on the water.
- Using a straw make bubbles in the water an examine the waves.
- Using cut bottles blow through to the water to examine waves which can drown the ships.
- Repeat everything with dry and wet sand. Inspect that wet sand is hard to lift by blowing.

Conclusions:

The larger differences in temperature the stronger the wind is going to be, which can cause storms. Weaker winds cause small waves in the sea while stronger ones cause large waves which can sometimes drown the ships.

Scientifique explication:.

Wind is the movement of air caused by the differences of Earth's surface temperature. Main parameters of the wind is speed and direction.

Source:

Kauno Lopšelis-Darželis ,,Giliukas", Kaunas / LITHUANIA

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BLOWING BALLOONS **

Objectives:
Find out why everyone fills the balloon to the different level

Materials:
- Balloons

Instructions:
- Take a balloon and with one deep breath fill it with air.
- Hold it by the end, son no air comes out.
- Compare the size of the balloons to others.
- Think why some children were not able to blow a balloon.

Conclusions:
The younger the child the smaller volume he is able to fill. To fill the balloon with more air one has to excersise, spend more time outside.

Scientifique explication:.
The volume of the balloon filled with air depends on age, the volume of lungs, the force of blowing.

Source:

Kauno Lopšelis-Darželis ,,Giliukas", Kaunas / LITHUANIA

'AIR'
experiment book

GROWING MARSHMALLOWS ***

Objectives:
Find out how volume of gases depends on pressure

Materials:
- Vacuum container,
- Syringe for taking air out of the vacuum container,
- Marshmallows

Instructions:
- Put marshmallows in vacuum container,
- Pull the air out of the vacuum container,
- Watch as the marshmallows increase in size and decrease when we open the box.

Conclusions:
Marshmallows have small holes filled with air inside them. In normal conditions those holes don't occupy a lot of space, but when we lower the pressure in the container the air inside the marshmallows expand thus expanding marshmallows.

Scientifique explication:.
Everything is affected by the atmospeheric pressure. People, buildings, animal, everything.

Source:

'AIR' experiment book

WILL THE WATER FALL? **

Objectives:

To demonstrate how the atmospheric pressure acts on a glass with water, preventing it from emptying when turned down

Materials:

- 1 recipient, in case we pour water out.
- 1 container with water;
- 1 transparent cup;
- squares of paper; these squares should be a few centimeters larger than the diameter (mouth) of the glass;
- 1 recipient, in case we pour water out

Instructions:

- Fill in the glass with water;
- Wet the edge of the glass with your finger;
- Place the paper square on the glass and ensure that no air bubbles are inside the glass;
- Hold firmly the paper square against the mouth of the glass, exerting a slight pressure, turning it upside down carefully.
- Then, remove your hand from under the paper.
- After all this process, the paper does not pass water from the glass to the outside, even after you release your hand.

Conclusions:

The atmospheric pressure exerts this same force on the surface of the Earth (force of gravity) and that is why we do not fall into the immensity of space.

Scientifique explication:.

The water inside the glass pushes the paper but it also pushes the atmospheric air out of the glass, too. This makes the pressure exerted, from the inside out and from the outside into the glass, to be equal, and therefore the paper stays in balance and so does not fall.

The air around the cup exerts a force in all directions, including from the bottom up. This force is called Atmospheric Pressure, it does not allow the paper to move from the mouth of the glass.

Source: https://educador.brasilescola.uol.com.br/estrategias-ensino/pressao-atmosferica-no-copo.htm

'AIR' experiment book

BALLOON INSIDE THE BOTTLE **

Objectives:

Note that it is possible to fill a balloon without blowing;

Prove that gases expand upon heating and contract upon cooling down;

Materials:

- A balloon;
- One glass bottle;
- Hot water;
- Cold water (room temperature);
- A bowl;
- A funnel;
- Handles.

Instructions:

- Firstly, we filled the balloon to ensure it wasn't punched. Then we put the water to boil (until it bubbled). Then we filled the bottle with warm water with the help of the funnel.
- After it was full, we waited thirty seconds until the bottle warmed up and then we poured hot water from the bottle.
- To finish up, we then fitted the empty balloon into the mouth of the bottle and put it in the bowl. We then filled the bowl with the cold water.
- And we observed it!
- The balloon began to get into the bottle and increased in volume. It fitted it into the bottle (whilst cooling down, the bottle pulls the balloon into the bottle, and the volume of the balloon will depend on the volume of the bottle used in the experiment).

Conclusions:

The balloon entered the bottle due to atmospheric pressure and temperature difference.

Scientifique explication:.

When the bottle is warm, it is in equilibrium with atmospheric pressure, and as the bottle cools down, the air inside the bottle will compress and the atmospheric pressure will exert a force on the balloon, which pulls it towards the inside of the bottle.

Source: https://www.emsintese.com.br/2010/balao-dentro-de-uma-garrafa/

Agrupamento de Escolas Rainha Santa Isabel, Coimbra / PORTUGAL

'AIR' experiment book

THE BOTTLE THAT RAINS *

Objectives:

To demonstrate the action of atmospheric pressure in a covered and uncovered bottle, with holes in its base.

Materials:

- 1 plastic bottle with lid
- 1 peak
- 1 bowl with water

Instructions:

- With the peak, make several holes in the base of the bottle.
- Unscrew the bottle cap.
- Immerse the bottle in the basin and fill it with water.
- Cover the bottle.
- Take the bottle out of the container / bowl and watch what happens.
- Unscrew the lid of the bottle and observe what happens: the water starts to come out through the holes, it looks like a shower.
- Cap the bottle again and watch what happens: the water stops coming out of the holes.

Conclusions:

The atmospheric pressure exerts this same force on the surface of the Earth (force of gravity) and that is why we do not fall into the immensity of space.

Scientifique explication:.

When the bottle is capped, the pressure inside the bottle is less than the pressure outside the bottle and, for this reason, the water does not flow out through the holes in the base.

When the bottle is uncovered, the outside atmospheric pressure pushes the water, causing it to exit through the holes.

Source: http://objetoseducacionais2.mec.gov.br/bitstream/handle/mec/11306/garrafa%20furada.pdf?sequence=1

Grădiniță Cu Program Prelungit Nr. 3 Bistrița, Bistrița / ROMANIA

THE FLYING CUP *

Objectives:

To follow the instructions in order to conduct the experiment correctly;

To observe how high pressure air can move objects;

To test the optimal conditions required for the cups to move.

Materials:

- empty cups (paper, plastic, styrofoam)

Instructions:

- Place one cup inside of another.
- Sit the cups on a flat surface of hold in your hand.
- Using your breath, gently blow between the rims of the cups you hold and observe how and the cup rises slowly.
- Repeat as many times as necessary. By using your breath, blow the cup, with more force this time and see the top cup launch up, up and away.
- Compare the effects of different strengths of pushes on the motion of the cup.

Conclusions:

The cup isn't really being pulled by anything. It is pushed up by air that is at higher pressure inside the cup

Scientifique explication:.

The air you blow hugs the area between the rims and causes less pressure between the rims. Inside the bottom cup, the relatively still air is at the same pressure as before which is higher than the reduced pressure near the rim. This higher pressure air forces the top cup up and out of the bottom cup.

Source: http://www.abc.net.au/science/surfingscientist/flyingcups.htm

THE STUBBORN BALL **

Objectives:

To follow the instructions in order to conduct the experiment correctly;

To observe how high pressure air can move objects;

To test the optimal conditions required for the ball to move.

Materials:

- Small ball (ping pong, styrofoam),
- Funnel or paper cone (paper and tape)

Instructions:

- Place the ball in the funnel.
- Hold the funnel above your head and blow through the narrow end of the funnel.
- The goal is to blow the ball out of the funnel. Blow hardly and constant.

Conclusions:

It is impossible to push the ball out unless the funnel is too small.

Scientifique explication:.

The air around the ball makes the ball jump, but the ball will not go out of the funnel. The air moves fast around the ball causing it to "dance", but it will not push it up. The ball will jump upwards, sometimes even higher than the edge of the funnel, but will never jump on a side.

Source: 365 Super Science Experiments with Everyday Materials, by E Richard Churchill, Louis V Loesching, Muriel Mandell, Turtleback Books

BLOWING UP A BALLOON WITH VINEGAR AND BAKING SODA ***

Objectives:

To follow the instructions in order to conduct the experiment correctly;

To learn about gas and chemical reactions;

To demonstrate that the power of gas produced when of baking soda and vinegar are mixed is strong enough to blow up a balloon.

Materials:

balloons, baking soda, white vinegar, empty bottle, small funnel, spoons

Instructions:

- Using the funnel, add baking soda into a balloon. Also, with a clean funnel, pour the vinegar into a plastic bottle.
- Carefully fit the balloon over the bottle opening on the top of the bottle.
- Once the balloon is fitted snugly on the nozzle, straighten up the balloon so the baking soda falls down into the vinegar.
- Observe the chemical reaction and effect on the balloon (the balloon is blowing up).

Conclusions:

Just about everything around you is made up of molecules, or different types of substances. Often, two kinds of molecules react with each other, breaking up and forming different molecules out of the pieces.

Scientifique explication:.

Baking soda is a type of substance called a base. Vinegar, or acetic acid, is a type of substance called an acid. Bases and acids react with each other, partially breaking apart and forming different substances. In this case, the new substances are water, a kind of salt, and carbon dioxide. Carbon dioxide, a gas, leaves the liquid mixture and expands throughout the bottle and the balloon, inflating it.

Source: Science Project: How to Inflate a Balloon Using Baking Soda and Vinegar, Brooke Greco, Copyright © 2018 Education.com

BALLOON RESISTANCE **

Objectives:

To handle the materials provided by the educators;
To follow the experiment's instructions;
To draw conclusions from the experiment

Materials:

- 2 ball,
- 2 candles,
- matches.

Instructions:

- The first balloon swells with air and binds, while the second balloon is filled with water, and then binds.
- The two candles are lit and placed on the table 30 cm apart from each other.
- The two balloons stay above the candles at the same distance. We will find that the air balloon breaks first.

Conclusions:

Water is a very good heat obsorber. It takes much heat to change the water temperature.

Scientifique explication:.

The wall of the balloon will become very hot as it sits under the flame. It will soften and will not withstand the air pressure inside. In the case of the water balloon, it will absorb most of the heat and the balloon wall will no longer be melted. If we keep the flame burning long enough for the water to heat up, then the wall of the balloon will behave like the first balloon.

Source: http://www.scientia.ro/stiinta-la-minut/experimente-acasa

GLASS THINNING *

Objectives:

To know the materials provided by the educators;

To follow the steps towards completion of the experiment;

To draw conclusions from the experiment.

Materials:

- A plastic bottle,
- Hot water.

Instructions:

- Fill the glass halfway with hot water
- Shake the water in the glass for 1 minute,
- Empty the bottle and cover.

The warm air will thin the bottle!

Conclusions:

Cold air occupies less space than hot air.

Scientifique explication:.

Hot water heats the air inside the glass. Without the lid, the bottle will fill up with hot air until full. When the water is poured out and the lid of the bottle is placed back on, the air inside thebottle starts to quickly cool.

This cold air occupies less space than the warm air, and there is now a free space in the glass. In order to fill that space, the glass walls are pushed in by the force of outside air pressure, which acts as a constant in all directions.

Source: http://www.qbebe.ro/psihologie/jocuri_si_activitati/10_experimente_distractive_pe_care_sa_le_faci_alaturi_de_copilul_tau

Grădiniță cu Program Prelungit, Scornicești / ROMANIA

THE WEIGHT OF AIR ***

Objectives:

To handle the materials provided by the educators;

To follow the steps towards completion of the experiment;

To draw conclusions from the experiment.

Materials:

- Tray,
- Glass of water,
- Empty glass,
- Candle,
- Napkin,
- 2 weights

Instructions:

- Place the napkin in the middle of the tray and moisten with water.
- Put the candle on the moistened napkin, then light up. The empty glass is placed over the candle, and this will soon go out.
- Once the candle goes out, place two weights on the left and right of the glass.
- Then grab the glass and pick up the tray.
- We will notice that we can pick up the tray with the two weights.

Conclusions:

The air pressure in the glass, due to the oxygen consumption by fire, is lower than that in the environment.

Scientifique explication:.

Fire consumes oxygen from the air in the glass; the air pressure around us will be higher than the pressure in the glass, so when we pick up the tray with the glass, it will not fall.

Source: https://www.youtube.com/watch?v=KAv5z518rPQ

'AIR' experiment book

OCTOPUS WIND DANCER *

Objectives:

Understand the existence of wind

Materials:

- Crepe paper
- 2 paper egg cups from an egg carton
- Glue - Hole punch or pencil
- Tempera paint
- Paper plate - Scissors
- String

Instructions:

- Paint Paper Plate; Make the octopus's body by painting the underside of a paper plate. Let it dry.Cut Out Paper Plate; Cut out the center of a paper plate, leaving a two-inch wide by one-inch tall tab at the base. (See patternfor detail.)
- Add Crepe Paper Arms; Cut 8 long strips of crepe paper for the arms.When the paper plate is dry, fold it in half. Glue the ends of each crepe paper strip inside the paper plate so they hang down like arms. Glue the paper plate shut.
- Add Eyes; Paint the egg cups white. Let them dry. Then paint or draw two small black circles on the top.
- Attach String; Ask an adult to make a hole at the top of the head with a pencil or hole punch. Thread the string through the hole and tie a tight knot. Hang your octopus wind dancer to a tree and watch the legs move as the wind blows.
- Remember to bring your octopus inside on rainy days because this octopus doesn't like to get wet!

Conclusions:

In windy weather our octopus's feet will sway and let us know if there is wind outside.

Scientifique explication:.

The wind is an invisible phenomenon. Defining winds for children is matured only by experiencing. Early childhood science education should be as simple and practical as possible. We can constantly observe the presence of the wind with this activity and we can keep the schedule.

Source: Anonymous

Hüma Hatun Special Needing Preschool, Bursa / TURKEY

CANDLE AND WATER EXPERIMENT*

Objectives:

The importance of air in our lives

Materials:

- One candle
- Plate
- Food colour
- Water
- Glass

Instructions:

- Pour some water into a plate, then add food colour.
- Put the candle in the middle of the plate with coloured water.
- Light up the candle.
- Put the glass above the candle and observe what happens.

Conclusions:

Without weather, plants, people and animals can not live. Even the fire needs air to burn.

Scientifique explication:.

When the wax in the candle burns, it uses oxygen in the air and the water comes out with carbon dioxide. Since the amount of carbon dioxide that is used is twice as high, when we close it on the candle lit by the glass, the amount of gas in the cup decreases and the water level rises. During this time, the air inside the cup warms. The warming and expanding air destroys the reduction of the volume of gas produced by the combustion of oxygen at one point and the rise of the water level ceases. When the oxygen disappears, the candle goes out. When the candle is turned off, the air cools rapidly and the volume decreases, the water level rises slightly.

Source: Anonymous

Hüma Hatun Special Needing Preschool, Bursa / TURKEY

NON SOAKING NAPKIN *

Objectives:

The presence of air

Materials:

- bowl,
- Water,
- Paper towels,
- Drawing pin,
- Transparent (clear) plastic cup

Conclusions:

Air in the glass prevents the napkin to getting wet.

Instructions:

- Is there a way to put the paper towel in the water without it getting wet? take a paper towel and crumple it up. Put paper towel to transparent plastic cup turn the cup upside down and plunge it into the water lift the cup back out of the water and feel the paper towel

What do you notice?

- The paper towel should be dry because pushing the cup into the water upside down traps the air inside it. As the cup is full of air, there is no way that the water can enter the cup so the towel stays dry.

After...

When we make a hole in the cup... air escape and the paper towel is wet...

Scientifique explication:.

Air is a mysterious condition that we can not touch. It is difficult for us to grasp something that children can not see. It will help them to perceive the air because they will not make sense without air.

Source: Anonymous

SMALL SCIENTISTS ACROSS EUROPE

experiment book

www.ssae-eu.com

This book is a result of Erasmus+ project as 'Small Scientists Across Europe'