GOIZEKO IZARRA IKASTOLA

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water
Tool: Water cycle in a bag
Age: The whole school has been involved

Objectives:

- To make a small scale replica of the water cycle.
- To demonstrate that there are four main stages in the water cycle: condensation, evaporation, precipitation and collection.
- To increase children's discourse about the water cycle.
- To recognise that water is continually circulating

Basic transversal competences:

- **B.C. 03/06 Competence for science and technology:**
  - Using scientific and technological thinking in order to recreate the water cycle.
  - Use and application of knowledge and methodologies that explain the natural process. Note the different stages of cycle. These involve an understanding of the natural changes caused by the weather conditions.
- **B.C. 08 Competence for thinking, learning and communicating:** Asking questions, making hypothesis, experimenting, observing, sharing ideas making use of verbal and non-verbal codes.
- **B.C. 09 Competence for initiative, entrepreneurship and communication:** Taking initiative and managing initiative processes decisively and effectively, planning and carriying out small scale research projects.
- **B.C. 10 Competence for learning and living and communicating together:** taking part in interpersonal and group situations in a collaborative manner, recognising one´s own and other´s rights and duties, for the individual´s and everybody´s good.
- **B.C. 11 Competence to be yourself and communicate:** Self regulation of the learning process and of individual decisions, opinions and motivation to carry out duties and willpower.

FACTS

The earth has a limited amount of water. This water keeps going around and around in what we call the water cycle. When the sun heats the water in the lakes, streams, oceans, etc. some of it turns to a gas (water vapor). This is called **evaporation**. This invisible water vapor is light and rises into the air.

When the water vapor hits the cold air high up in the atmosphere it turns back to water droplets and collects in clouds. This is called **condensation.**

When too many water droplets form in a cloud, the cloud gets heavy and the water falls back to the earth in the form of rain, hail, sleet, or snow. This is called **precipitation.**

When the water falls back to the Earth, it may fall back in the streams, lakes, ocean, etc. or it may fall on the land. This is called **collection**. When it falls on the land, it either soaks into the earth for plants to drink or runs over the soil and back into the streams, lakes, oceans, etc. and the cycle begins all over again.

QUESTION: what are clouds made of?

We explain our children that clouds are made of a large collection of very tiny droplets of water or ice crystals. The droplets are so small and light that they can float in the air.

- **How can we make clouds in a bag?**

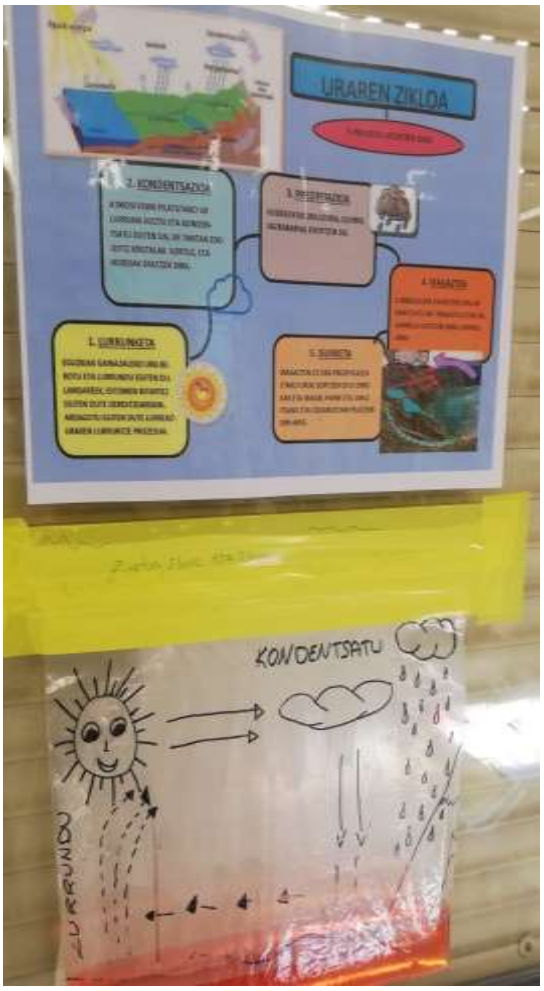
Materials:

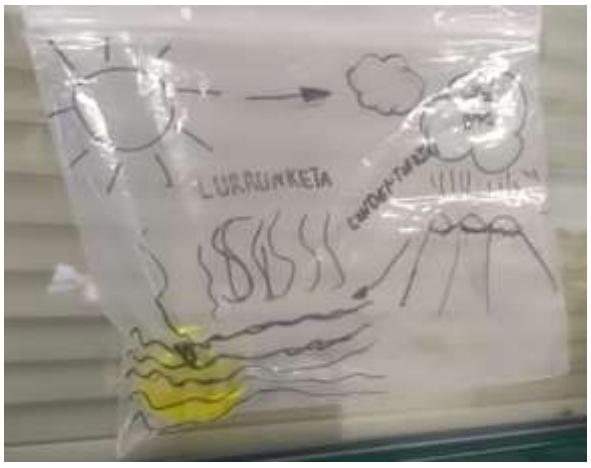
- A zip lock plastic bag.
- A cup of water.
- Food coloring (optional)
- Tape

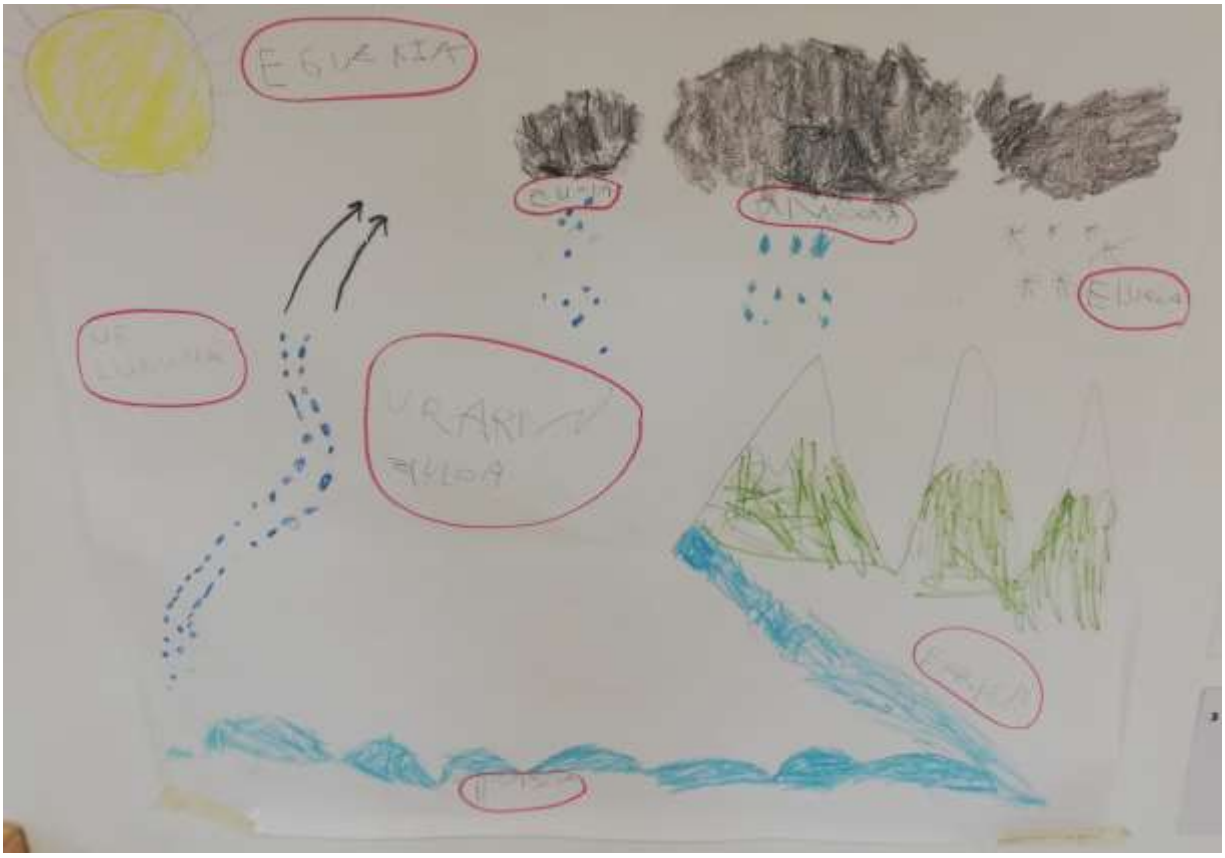
Procedure:

- Pour water into the plastic bag, add some drops of food coloring and seal it completely.
- Tape the bag to a window that receives some sunlight.
- Ask participants to predict what will happen and write their predictions: What do you think will happen?
- Keep the bag on the window for several hours /days and ask pupils if they can see any of the water cycle processes: Can you see any of the water cycle processes? (clouds are formed. When the clouds are full of water or saturated they release some of the water as rain)

- What processes do you know are occurring but we don't actually see happen? (The sun heats the wáter and wáter vapor rises)
- Make observations over the course of several days, record your observations and comment with your classmates.
- Where does the water go after it condenses on the plastic bag
- Why do you think this activity is called "Water cycle in a bag?"
- Draw the process using pictures and arrows: clouds, rain, sun.
- Label the process. Write the key words in the correct place: Evaporation, condensation, precipitation, collection.



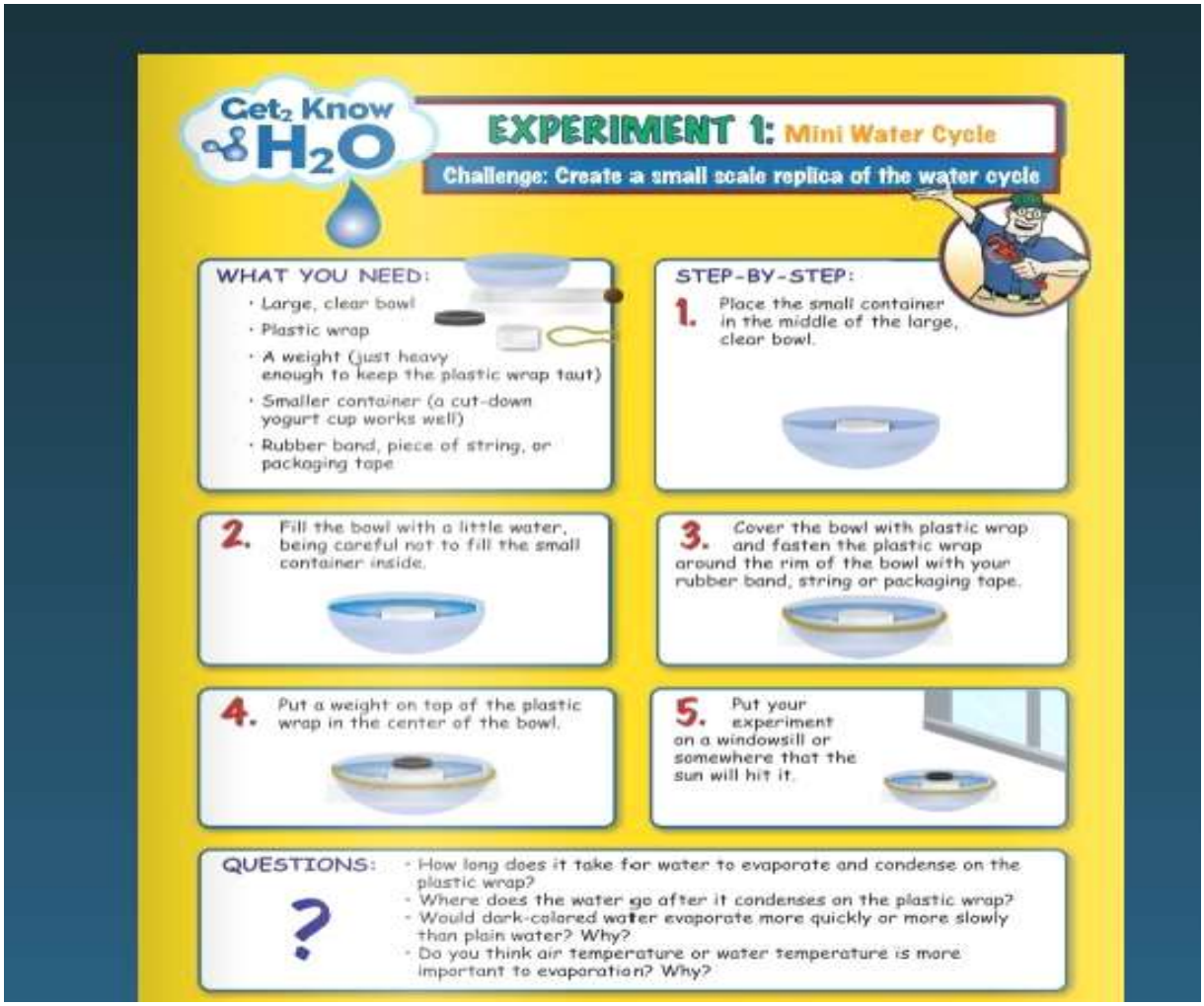


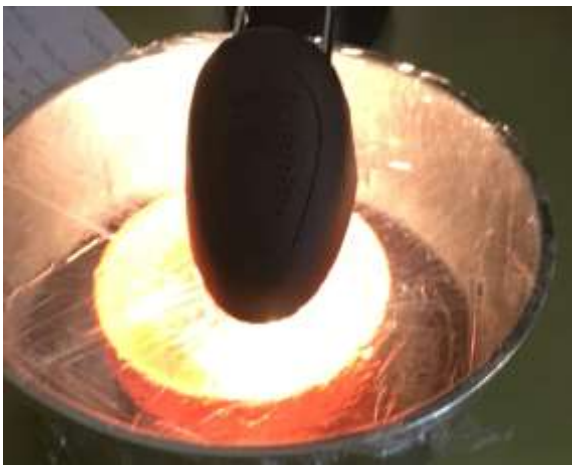


<u>OLDER PUPILS CARRIED OUT OTHER EXPERIMENTS ABOUT THE SAME TOPIC</u>

5th graders prepared and explained these experiments to 2nd grade pupils.

MINI WATER CYCLE EXPERIMENT





RAIN MAKING EXPERIMENT

Supplies:

- A plate, ice, pan, water stove.

Boil a pan of water *(this is an ocean)*. Fill a plate with ice cubes *(this is a cloud)*.

Place the pie plate above the steam *(evaporation)*. When the steam comes in contact with the cold plate, droplets of water form *(condensation)* and fall back into the pan – kind of like rain *(precipitation)*!

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water
Tool: Forms of Water and Water Cycle

Age: 4-year-olds

Objectives:

- To guide pupils to perceive the effects of heating and cooling on solids, liquids and gases.
- To offer pupils opportunities to identify water's three forms: solid, liquid and gas.
- To help pupils understand that there is water in the air, known as water vapor, even if they cannot see it.
- To help pupils realize water is changig all the time.
- To get to know different vocabulary about the water cycle: sea, river, lake, rain, hail, snow, ice, cloud, ocean, water, droplet, mountains, ice, vapour, underground, steam, to evaporate, to condense, to freeze, hot, cool, freezing.

Basic transversal competences:

B.C 08: Competence for thinking, learning and communicating: Asking questions, making hypothesis, experimenting, observing, recording data and sharing ideas making use of verbal and non-verbal codes.

B.C. 10 Competence for learning and living and communicating together: taking part in interpersonal and group situations in a collaborative manner to learn about the three forms of wáter and the wáter cycle.

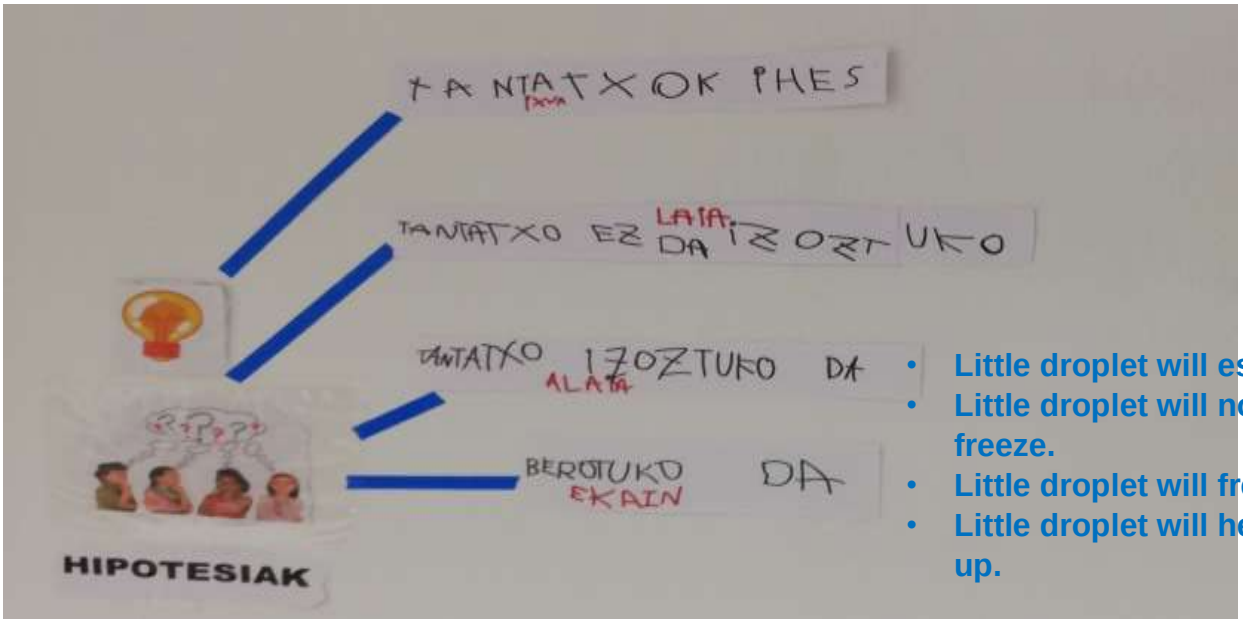
Experience:

4 year-olds experienced with the 3 states of water: liquid, solid and gas.

•They described the process.

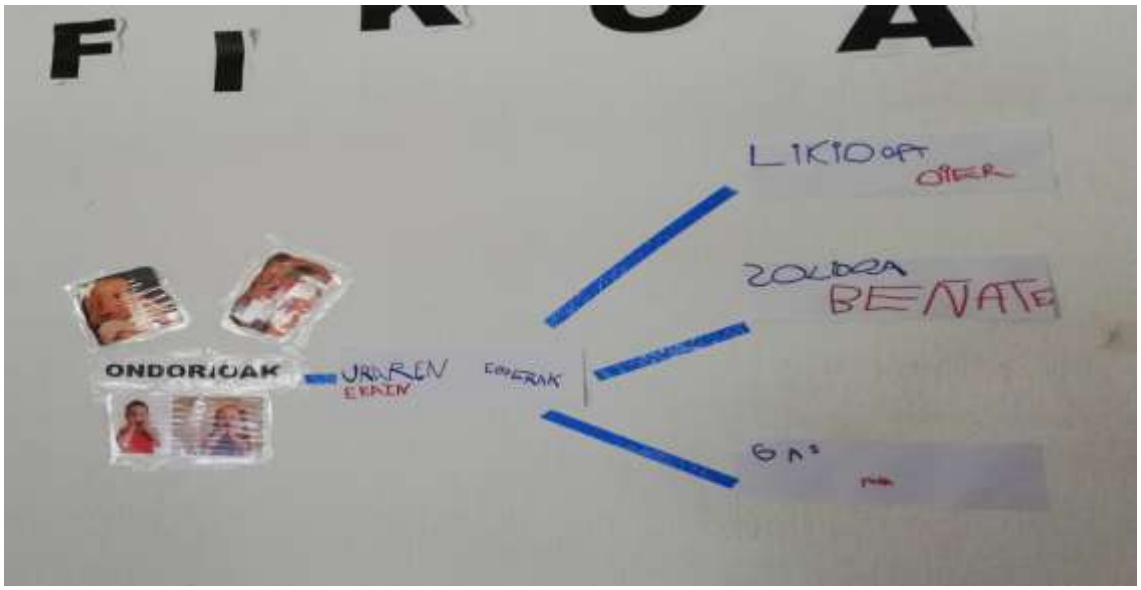
- Little droplets run between my fingers.
- Little droplet in the fridge.
- Little droplet heating up in the sauce pan.

•They made hypothesis.

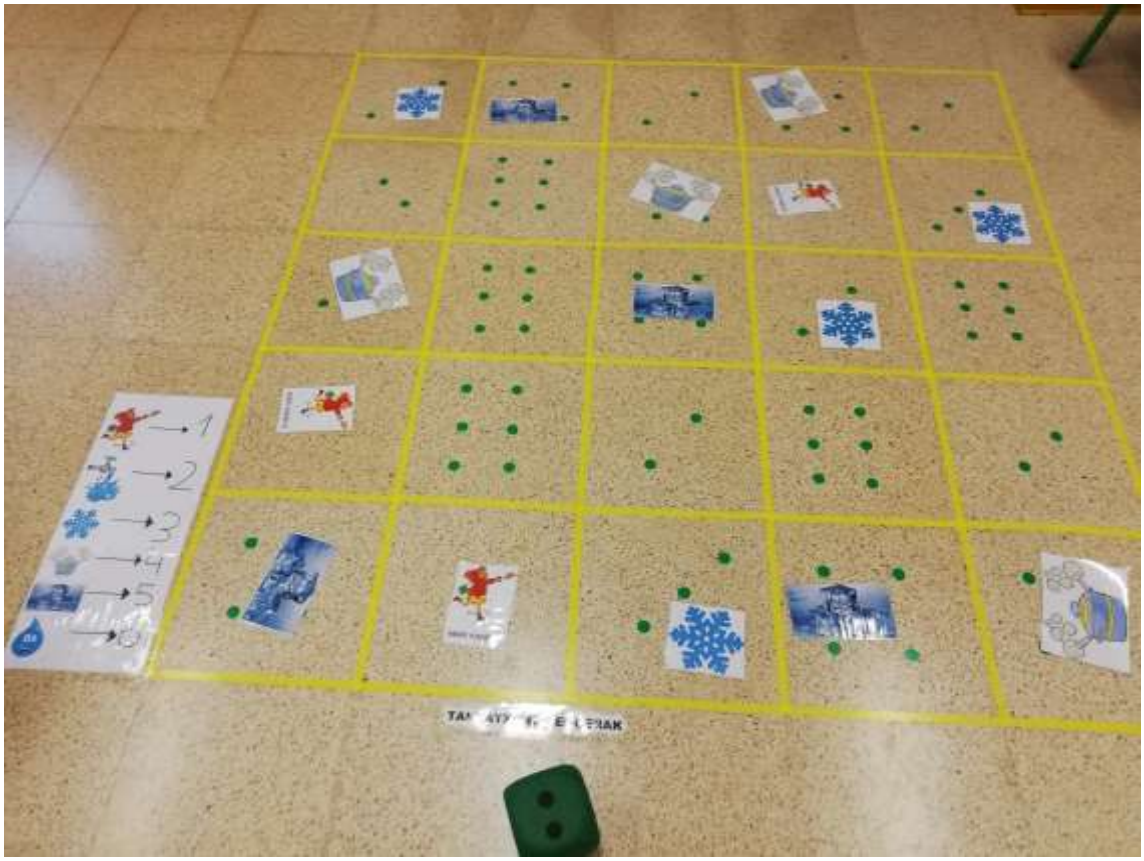


- Little droplet will escape.
- Little droplet will not freeze.
- Little droplet will freeze.
- Little droplet will heat up.

- And drew conclusions.



•They played a board game about the water cycle on the floor.



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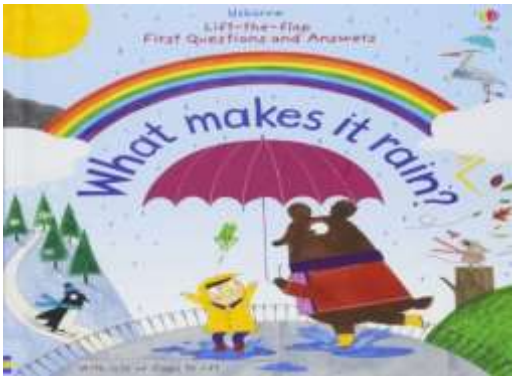
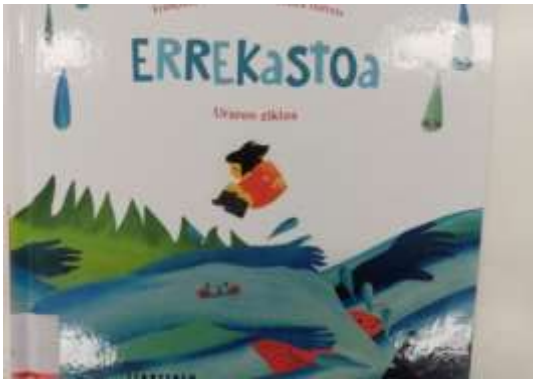
- **To learn about the water cycle** they used two books: ‘What makes it rain?’ (a lift the flap book) and ‘errekastoa’ (in Basque). Pupils asked tutor teachers to read the books once and again and again. They loved them.





- They built a diorama and prompt suggestions on water conservation.

- The toilet is not a rubbish bin.
- We have to take care of Nature.
- Don´t waste paper.
- Don´t throw paper to the rivers.
- Don´t waste water.

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- They recreated the water cycle.

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Growing new plants without soil.

Age: 5 year- oldS.

Objectives:

- To grow new plants from seeds and from different parts of a parent plant without water and learn about vegetative propagation of plants.
- To help pupils realize how important it is to take care of the Earth. And develop an attittude of serious respect for living things
- To help pupils to be a more patient boys and girls.
- Develope science inquiry skills including wondering, questioning, exploring and investigating, dicussing, reflecting and formulating ideas and theories.
- To guide our pupils throughthe study of living things specially by direct observation of plants.
- To gather data through observation.
- To share their observations and ideas through large group discussions.

Basic transversal competences:

B.C 08: Competence for thinking, learning and communicating: Asking questions, making hypothesis, experimenting, observing and sharing ideas making use of verbal and non-verbal codes.

B.C. 10 Competence for learning and living and communicating together: taking part in interpersonal and group situations in a collaborative manner to learn about vegetative propagation of plants.

Working with plants with preschoolers is a great way **to learn about the natural world** through hands-on activities and experiences.

Introduction

We can grow plants in water.
Have you ever grown plants? What did you do? How did you do?
I´ve bought pine cones and lentils. How can we grow plants using these things?
What can we do to help them grow? What might we do to make it grow?
Why do you think plants have roots?
Can you see plant's roots in the plants, trees…outdoors?

- Where do you think they are?
- What do you think they look like?
- What do you think the roots are for?
- What types of nutrients do plants need in order to survive?
- Why do plants need water?
- What happens to a plant that does not get enough water?

Experience: Germinate seeds in a pine cone.

- Monitor the process and answer the question: What changes are taking place?

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- **Experince: Growing new plants from cuttings**.

Taking a cutting involves removing a piece of a leaf, stem or root and placing it in a growing medium where it then develops the other parts that were left behind (i.e., a stem will then grow roots, a root will then grow a stem).

Once roots are established, students will pot up their cuttings.

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GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water
Tool: Animals book
Age: 5-years-olds

Objectives:

- To identify and classify sea animals by listening and answering about a text , sorting sea animals into categories and discussing sea animals with partners.

Basic transversal competences:

- **08 Competence for thinking, learning and communicating:** Gathering and managing information and sorting objects into categories to gain a sense of the concepts the categories represent.

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Erasmus+

ANIMAL BOOK

5 years old pupils made an animal book and one of the chapters was dedicated to animals that live in water.

First teacher asked pupils to think of any questions they could have about animals that live in water and these were the questions they came up with:

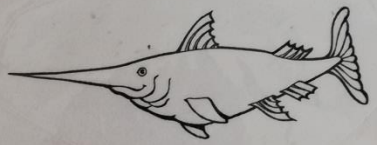
- What animals live in water?
- How do they reproduce?
- How do they look like?
- What do they eat?
- Where and how do they live?
- Did you know?

Then pupils started their own research with their teacher's help. Everyday teacher and students read different animal books and they wrote down the information they needed.

Now they've got the book in class and they can read it whenever they want!

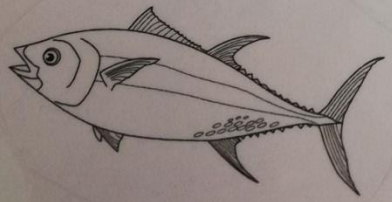
ARRAINAK

MARRAZOA



EZATA-ARRAINA

EZPATA



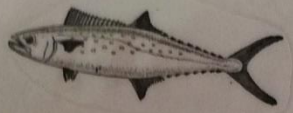
ATUNA

ASUNA

LASUNA

ANTXOA

ANTXOA



BERDELA

NOLA UGALTZEN DIRA?

ARRAUTZATIK

DIRA

JAIOTZEN

NOLAKO ITXURA DUTE?

ESKAMAK

DITUZTE

ALETAK

DITUZTE

ZAKATZAK

DITU

ZER JATEN DUTE?

ARRAINKIA

TXIKIAK

ALGAK

NON ETA NOLA BIZI DIRA?

IZADAN

ITSASOAN

ERREKAN

LAKUAN

ZEIN OHITURA DITUZTE?

TALDEAN

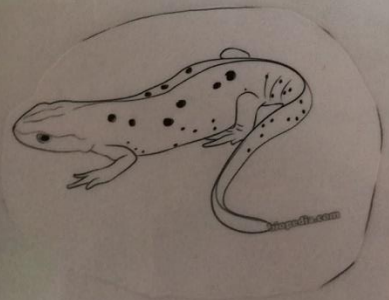
BIZI

OIRA

ANFIBIOAK

IGELA

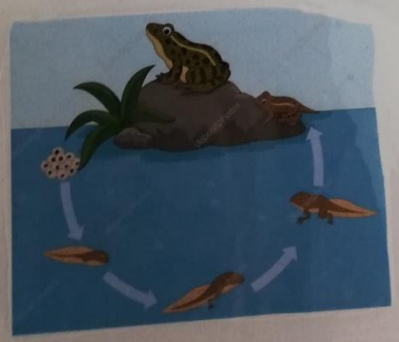
APOA



ARRABIOA

NOLA UGALTZEN DIRA?

ARRAUSEIK
JAIOSEAN
DIABAINA
UEJAN



NOLAKO ITXURA DUTE?

AO ANIAUT
AHO HANDIA DUTE
BOTANIAK
TUZE
BEGI HANDIAK DITUZTE
ANKAINDA
RUAK
HANKA INDARTSUAK

ZER JATEN DUTE?

INSETUAK

SISAEAK

ARRAPAK

ARMIARMAK

NON ETA NOLA BIZI DIRA?

LAUZEAN

URETAN

A NIZEANLORCA

HANDITZEAN LEHORREAN

ZEIN OHITURA DITUZTE?

UABARU EITZEO

URA BEHAR DUTE BIZITZEKO

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Marine Fossils in the Rocks of the Black Flysh

Age: 1st grade

Objectives

- To offer pupils opportunities to create relationship with their nearest environment and to give value to biodiversity.
- To help pupils understand that fossils provide evidence about the living things that lived millions of years ago and also about environmental conditions at that time.
- To help pupils gain a general understanding of what fossils are and how fossils are formed.
- To help pupils understand that changes in environmental conditions may result in the extinction of species.(Species become extinct because they can no longer survive and reproduce in their altered environment. if members cannot adjust to change that is too fast or drastic, the opportunity for the species' evolution is lost)

Basic Transversal Competences:

B.C. 08 Competence for thinking, learning and comunicating:

- Through these type of activities we keep on developing habits and attitudes like: interest, joy of learning and creativity.
- Using these type of activities pupils get to know and give value to their nearest environment and are made aware of the consequences of the changes in the environment.

Background:

Our 1st graders built their **"Time Machine"**.


Thanks to this machine they will be able to travel through time. This time they travelled to the past, to the **dinosaur period**, because they wanted to know more about these extinct animals.


But, how do we know that dinosaurs really existed? How do we know what we know about dinosaurs? Because we have found remains of these animals called **fossils**. Fossils tell a story about the animal/plant..They say how tall, how wide, what kind of teeth…. but fossils cannot tell us about what they may have eaten or the colour of the animal/plant… We have to guess about this.

Paleontologists are the scientists who study these remains.

Media: Pupils watched a short documentary on how scientists look for fossils, recover them and preserve them. (Material that comes with our textbook: Txanela)

*We have found a couple of videos in english. Maybe they could be useful:

- How do dinosaur fossils form?: https://www.youtube.com/watch?v=87E8bQrX4Wg
- Paleontologists at work: https://www.pbslearningmedia.org/resource/nat16.sci.lisci.dino-fldwrk/paleontologists-at-work/

We haven't found many dinosaur remains around us because the Basque Country was under water in that period of time but we have found a large amount of **marine fossils**, which lived in the same period, along our coast line, in the rocks of the Black Flysch around Mutriku.


Our pupils have participated in the first Geoschool Project founded by the Basque Coast Unesco Global Geopark and carried out by the "Algorri Centre" (https://www.algorri.eus/?lang=es%2F), in Zumaia.

Inside this Project 1st graders visited the Nautilus Museum (The Geological Interpretation Centre of Mutriku). The Nautilus Museum exhibits an important collection of fossils found in the Black Flysch.

Handcrafts: pupils created "fossils" which can help students to understand what fossils are.

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GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Stalactites and stalagmites

Age: 1st grade

Objectives:

- To offer pupils opportunities to create relationship with their nearest environment
- To introduce to stalactite and stalagmite formation.
- To help students realize that stalactites and stalagmites form because of water.
- To model stalactite and stalagmite formation.
- To become familiar with the solvent properties of water.

Basic Transversal competences:

- **Competence for thinking, learning and communicating:** Using different materials pupils work together to investigate how salt dissolves in water and how evaporation helps to the formation of icicles.
- **Competence learning and living and communicating together:** Pupils take part in interpersonal, group situations in a collaborative manner.
- **Competence to be yourself and communicate:** Pupils reflect on their social behaviour for own's and everybody's good.

- **Background:**

Our 1st graders built their **"Time Machine"**.

Thanks to this machine they will be able to travel through time. This time they travelled to the past, to **Prehistory**, because they wanted to learn about the **Early humans**.

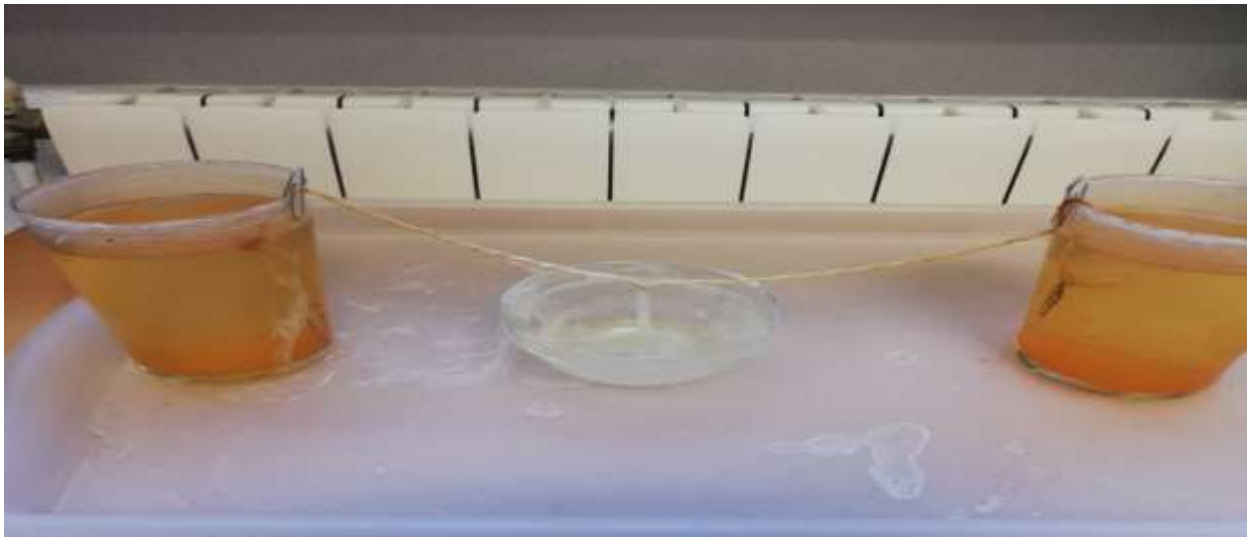
They have learnt about the tools they used, their diet, the "clothes" they wore, that fire was one of their most important invention, that they were great artists, and that they lived in **caves.**

Our pupils did a field trip to visit one of those caves, called **"Ekainberri"** in Zestoa. "Ekainberri" is the replica of the **"Ekain Cave".** Ekain was declared **World Heritage of Humanity in 2008 by UNESCO.**

(Petteri went with them and he had a wonderful time! Can you find him?)

1st graders built a cave in their classroom recreating the cave paintings Early humans created.

And **recreated** the **stalactites** we can find in caves. **Stalactites** are formations that look like icicles and grow down from the ceiling of a cave. They form over time when **water** slowly drips from cracks in the ceiling. There are minerals (calcite) dissolved in the water that build up over time as the water drips, forming stalactites and stalagmites. This process is called precipitation.



RECREATING STALACTITES AND STALAGMITES

Tell the students that they will be participating in an experiment to show how water deposits minerals to create stalactites and stalagmites.
The process of stalactite and stalagmite formation may take hundreds, thousands, or even millions of years in a cave.
We are going to speed up the process in the classroom by using a concentrated solution and sunlight to aid in evaporation.

Materials: Epsom salt (Magnesium sulfate), clear glass containers, a dish, 2 clips or 2 screws, water, a sauce pan, a stove (induction plaque), cotton string.

Procedure:

1. Prepare a supersaturated epsom salt solution: Heat the water, without boiling. Fill the glass containers about half full with epsom salt and then fill to the top with warm water. Stir well.
2. Tie the clips (or screws), as weight, to the ends of the string and soak the string in solution, making sure it is wet.
3. Hang the string so it is suspended between the two jars. Place a dish under the lowest part of the string to catch the drips. The center of the string should hang below the level of the solutions forming a drip point.
4. Let the experiment sit for several days and watch your crystal form.
5. Capillary action will draw the epsom salt through the string. The water evaporates forcing the epsom salt to form again as a solid. The epsom salt will deposit from the string and form stalactites on the string and stalagmites on the dish.
6. Caution the students that once " stalactites" start to form they are extremely fragile and any movement of the string could cause them to break.

7. If the students are careful they can use a ruler to record the length of any stalactite growth.

Ask the students what they noticed about the level of the water in the cups. (At the beginning:when adding the salt and at the end.) What happened to the water? (Much of the water was pulled into the string and dripped onto the tray) ….

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Water is life!: Ancient Egypt, the Gift of the Nile River.

Age: 3th graders

Objectives

- To help pupils understand the importance rivers (water) have had for humans and how water is important for us.
- To help pupils understand why early civilizations arose on the banks of rivers.
- To learn about the important natural resources provided by the River Nile.
- To make a model to represent the relationship between the needs of humans and the places they live.

Basic transversal competences:

- **B.C. 08: Competence for thinking, learning and communicating:** Using different resources pupils investigate how The Nile River was important for ancient egyptians and what did they use it for.
- **B.C. 09: Competence for initiative, entrepreneurship and communication:** Pupils find and select the information they need and plan how to carry out the diorama.
- **B.C. 10: Competence for learning and living and communicating together:** Pupils cooperate to make the diorama and then cooperate to present it to 6th graders.

Final task: At the end of the project pupils will use their new knowledge to create a diorama about the Nile.

Facts

Civilizations developed **around rivers because** their waters provided places to fish and hunt the animals that came to drink water. They also provided a supply of drinking water and as the **rivers** flooded, the lands **around** them became fertile for growing crops. This is especially true of the Nile **River**, which flooded the same time each year.

Moreover, goods and people could be transported easily.

Access to water is still crucial to modern civilizations; water scarcity affects more than 2.8 billion people globally.

Facts about Ancient Egypt

Ancient Egypt was one of the greatest and most powerful civilizations in the history of the world. It lasted for over 3000 years from 3150 BC to 30 BC.

Egyptian men and women wore makeup. It was thought to have healing powers, plus it helped protect their skin from the sun.

They were one of the first civilizations to invent writing. They also used ink to write and paper called papyrus.

The Ancient Egyptians were scientists and mathematicians. They had numerous inventions including ways to build buildings, medicine, cosmetics, the calendar, the plow for farming, musical instruments, and even toothpaste.

Cats were considered sacred in Ancient Egypt.

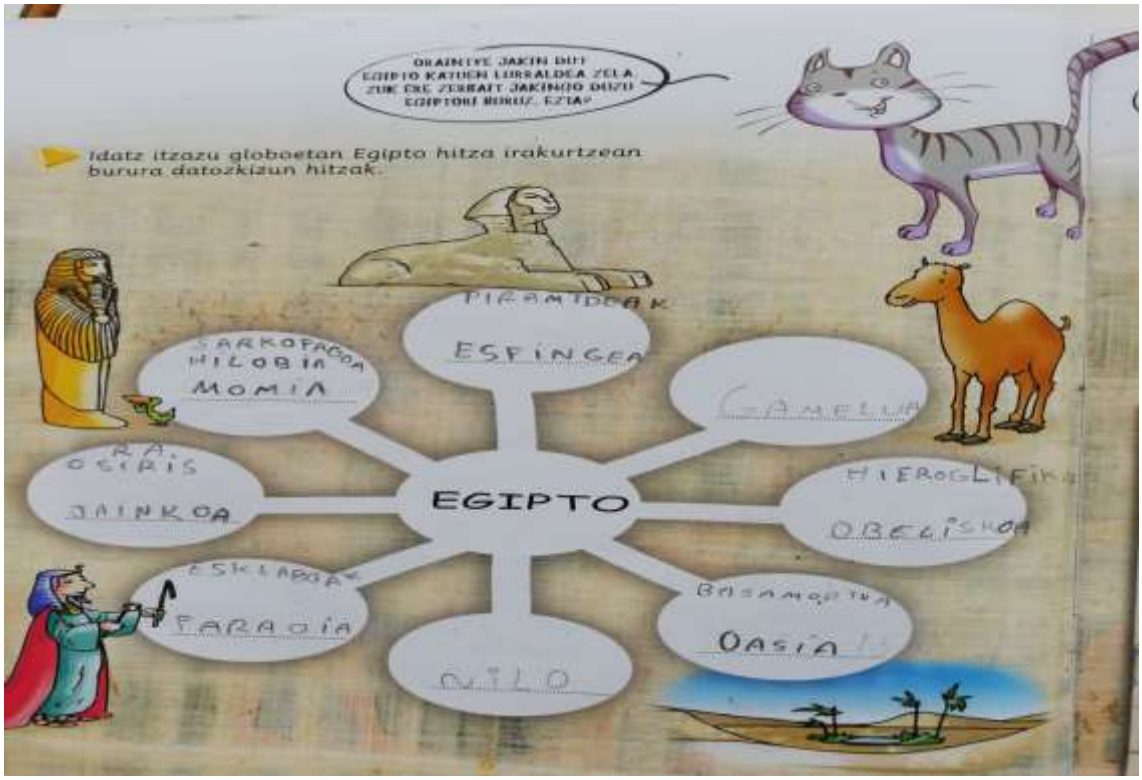
The "White corner"

When we start a new project, we always ask students to bring any materials related with the topic they have at home. These materials will be in class until we finish the project.

Most of times we realize that they already have a lot of information about the topic.

So we start activating previous knowledge.

- What do you think of when you hear the word “Egypt”?



Pupils situated Egypt and the Nile River on the **map**….

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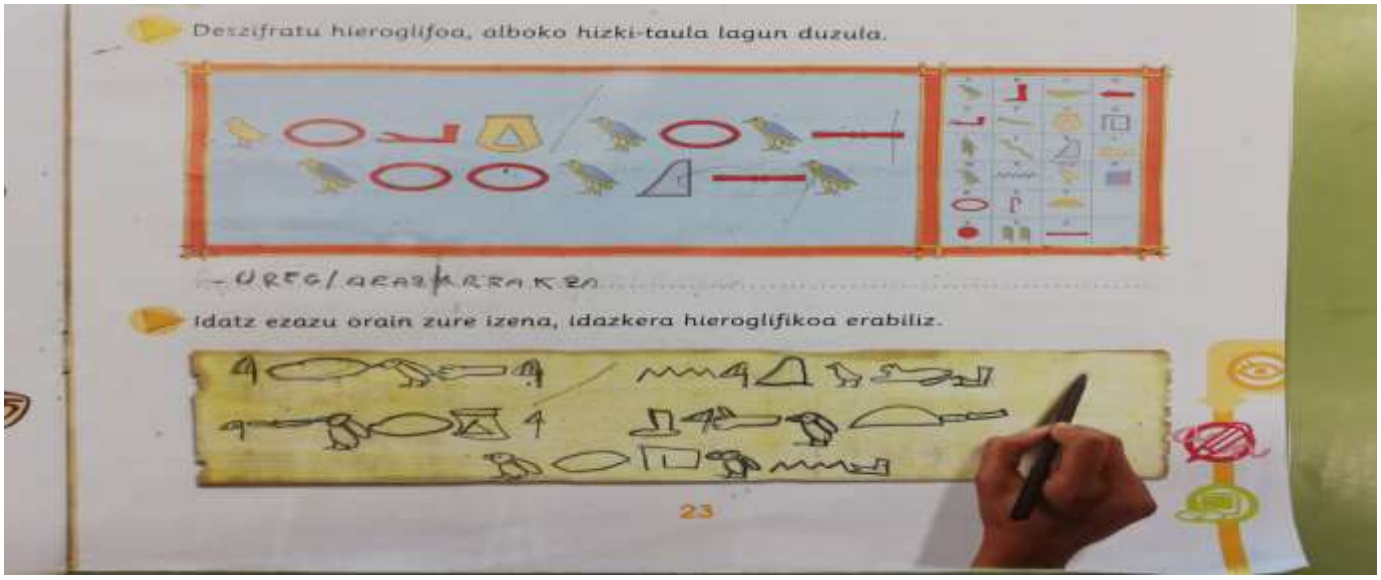
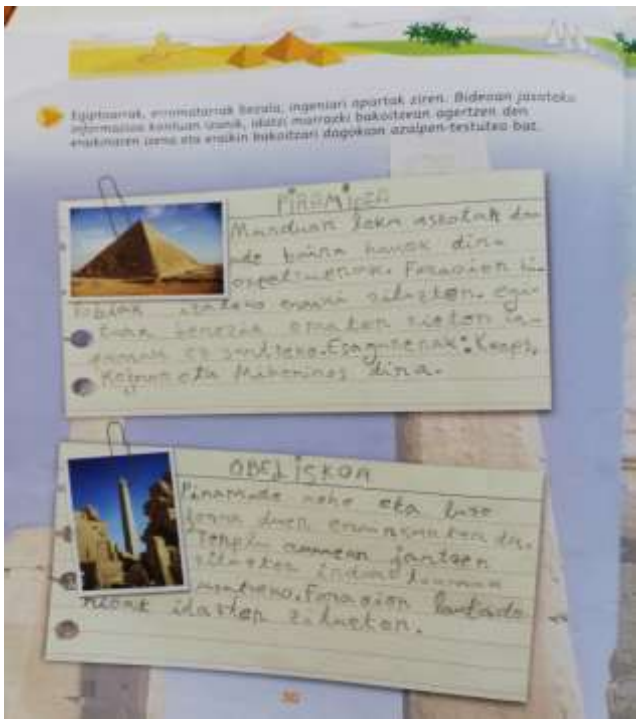
… and in a **timeline**. Timelines help students understand the chronology of historic events.

Pupils found out that Egyptian Hieroglyphs were the formal **writing** system used in **Ancient Egypt**. Hieroglyphics used pictures to represent different objects, actions, sound or ideas. There were more than 700 hieroglyphs.



BELGIUM, FINLAND,GREECE,ITALY,SPAIN AND TURKEY

Egyptians were excellent architects and engineers and they built their pyramids, temples and tombs out of stone. Egyptian buildings were decorated with paintings, carved stone images, hieroglyphs and three-dimensional statues. The art tells the story of the pharaohs, the gods, the common people and the natural world of plants, birds and animals.



Pupils recreated an Egyptian temple:

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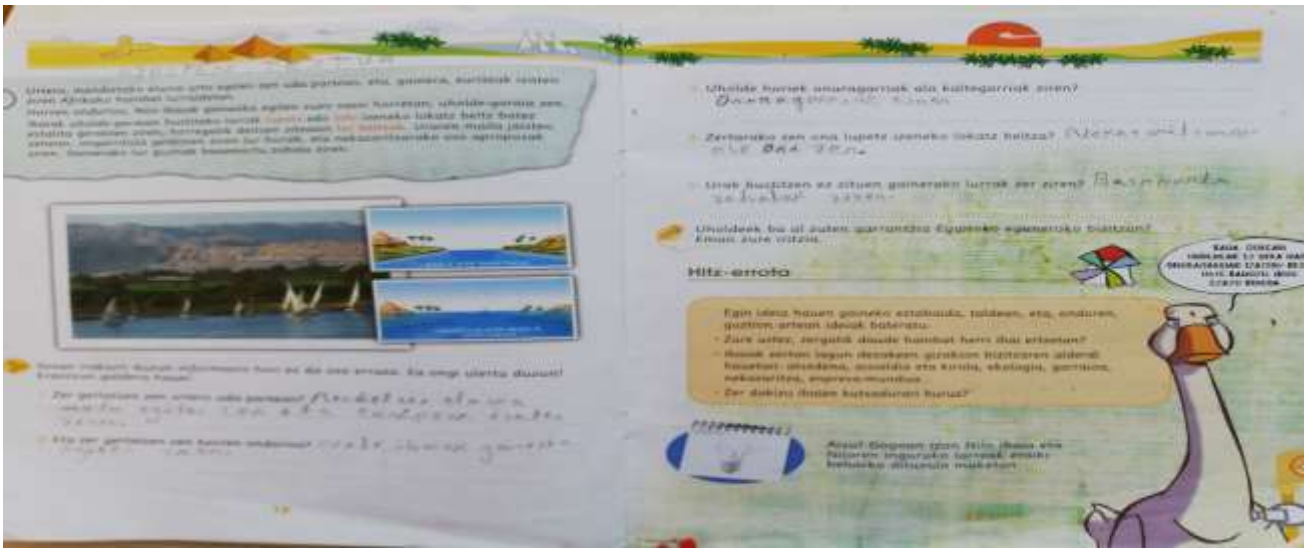
Boats and Transportation

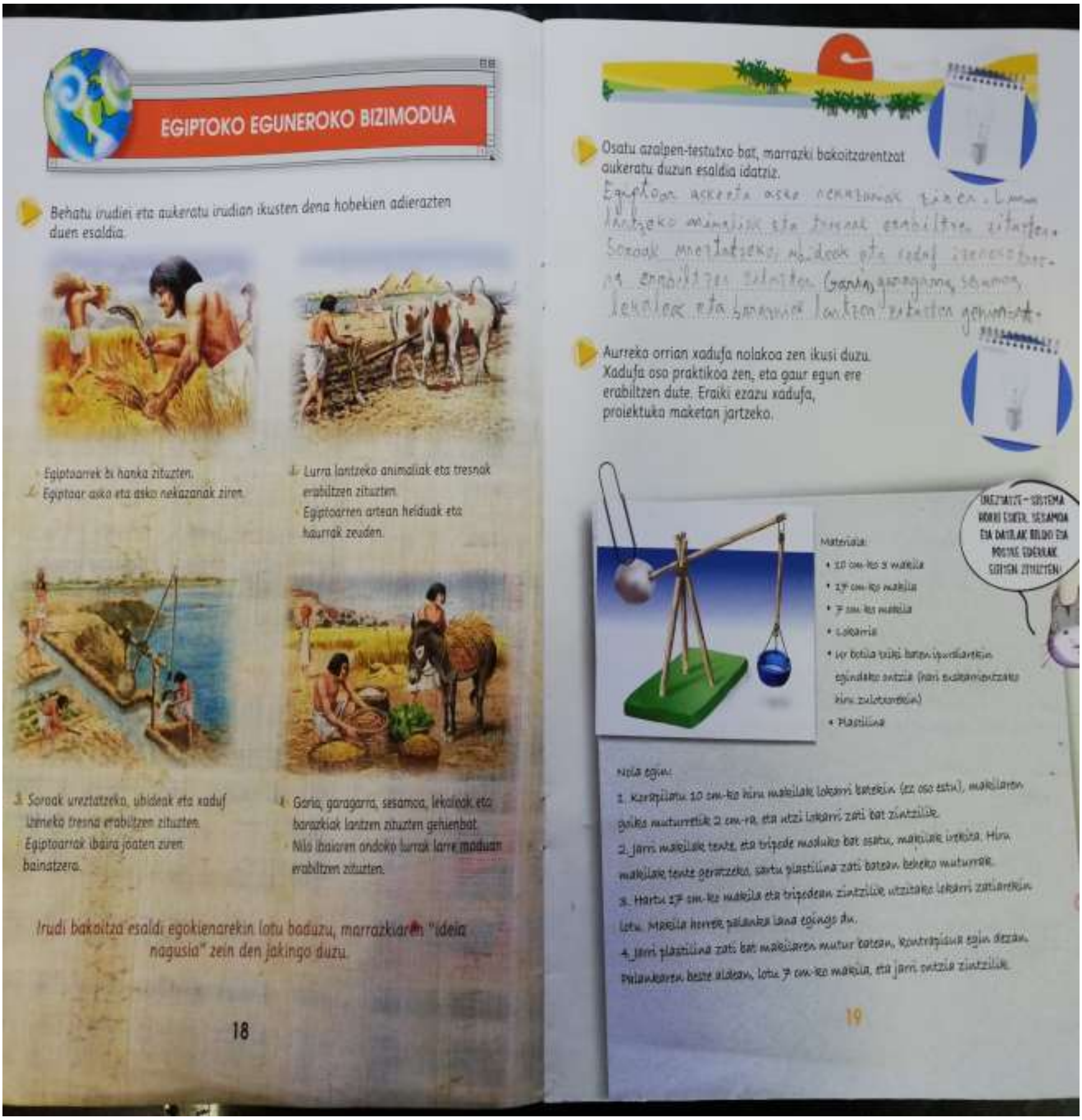
The Egyptians didn't build roads to travel around their empire. Most of the major cities in Ancient Egypt were located along the banks of the Nile River. As a result, the Egyptians used the Nile for transportating people and goods.

Nile River Flooding

The River Nile was vital to life in Ancient Egypt. Agriculture depended on its summer floods (ice from the mountains melt and it was the rainy season in Ethiopia) , which fertilized land along the river banks by depositing a layer of black soil rich in nutrients.

Through the use of irrigation canals, agriculture was born. Still used today, the *shaduf* is a mechanical irrigation device used to conduct water from the canals to the fields. One person can operate it by swinging the bucket of water from the canal to the field.





EGIPTOKO EGUNEROKO BIZIMODUA

Behatu irudiei eta aukeratu irudian ikusten dena hobekien adierazten duen esaldia.

- Egiptoarrek bi hanka zituzten.
- Egiptoar asko eta asko nekazariak ziren.

- Lurra lantzeko animaliak eta tresnak erabiltzen zituzten.
- Egiptoarren artean helduak eta haurrak zeuden.

- Soroak ureztatzeko, ubideak eta xaduf izeneko tresna erabiltzen zituzten.
- Egiptoarrak ibaira joaten ziren bainatzera.

- Garia, garagarra, sesamoa, lekaleak eta barazkiak lantzen zituzten gehienbat.
- Nilo ibaiaren ondoko lurrak larre moduan erabiltzen zituzten.

Irudi bakoitza esaldi egokienarekin lotu baduzu, marrazkiaren "ideia nagusia" zein den jakingo duzu.

18

Osatu azalpen-testutxo bat, marrazki bakoitzarentzat aukeratu duzun esaldia idatziz.

Aurreko orrian xadufa nolakoa zen ikusi duzu. Xadufa oso praktikoa zen, eta gaur egun ere erabiltzen dute. Eraiki ezazu xadufa, proiektuko maketan jartzeko.

Materiala:
- 10 cm-ko 3 makila
- 17 cm-ko makila
- 7 cm-ko makila
- Lokarria
- Ur botila txiki baten ipurdiarekin egindako ontzia (hari eskegitzeko hiru zuloekin)
- Plastilina

Nola egin:
1. Korapilatu 10 cm-ko hiru makilak lokarri batekin (ez oso estu), makilaren goiko muturretik 2 cm-ra, eta utzi lokarri zati bat zintzilik.
2. Jarri makilak tente, eta tripode moduko bat osatu, makilak irekita. Hiru makilak tente geratzeko, sartu plastilina zati batean beheko muturrak.
3. Hartu 17 cm-ko makila eta tripodean zintzilik utzitako lokarri zatiarekin lotu. Makila horrek palanka lana egingo du.
4. Jarri plastilina zati bat makilaren mutur batean, kontrapisua egin dezan. Palankaren beste aldean, lotu 7 cm-ko makila, eta jarri ontzia zintzilik.

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Final task

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GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

TOOL: VISIT TO THE AQUACULTURE INSTITUTE.

Our Grade 1 children visited the Aquaculture Institute in our town. It's located on the port and here is their web page:
http://www.mutrikuakuakultura.hezkuntza.net/es/

CONTEXT:

Aquaculture is a sector with opportunities and challenges: production of high-quality food in a more sustainable way, and new breeding techniques, alternative raw materials for feed, and other innovations contribute to this. The Sustainable Development Goals (SDG) of the United Nations are the blueprint to achieve a better and more sustainable future. They address the global challenges we face related to the green sector, for example food, energy, and water.

REAL PROJECT (enterprise in charge: https://www.azti.es/en/about-azti/)
AZTI TECNALIA is in charge of a real proyect on the coast of Mutriku. Look at this picture:
https://www.azti.es/eu/proyectos/malotes/
They are breeding mussels on that place of the sea.

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Water is life!

Age: 4th graders

Objectives:

- To give pupils opportunities to gain an understanding of the importance of water for all living things.
- To develop an awareness that water is a precious and limited community resource on Earth. Students will learn about water scarcity and how much of the earth's water is actually available for daily human use
- To help pupils develop an awareness for the importance of water in our daily life.
- To think of ways in which water can be saved at home and at school and not over-used.
- To develop an awareness of where water in Mutriku comes from.
- To get to know what happens with waste water.
- To increase awareness on how clean and safe water improves health, poverty, education and hunger problems.
- To Learn about the states of water.
- To investigate designs for water purification.
- To learn about dissolving, mixtures, solutions and **solubility**: Students will compare how different substances dissolve in **water**
- To use water to make music.

Basic Transversal competences:

- **B.C. 08: Competence for thinking, learning and communicating:**
  - Collect data using information texts and surveys, and organize the data into tables and graphs.
  - Recall information from experiences or gather information from provided sources to gain an understanding about water scarcity and how it is affecting humans worldwide.
  - Students will investigate designs for water purification.

- **B.C. 09: Competence for initiative, entrepreneurship and communiction**:
    - Students work in teams to plan and develop different experiments.

- **B.C. 10: Competence for learning and living and communicating together**:
    - Ask and answer questions to peers in order to seek help, get information, or clarify something that is not understood.
    - The students in teams will learn about the importance of water, the many ways it is used, how it can be wasted, and ways to save water through observations and discussions.

ACTIVATING PREVIOUS KNOWLEDGE

The teacher introduced the didactic unit through questions in order to activate previous knowledge:

- Have you ever realized how important water is for us? When?
- What do we need water for?
- Do you know how water gets to your houses? And where does it come from?
- Do you think we have always had water in our houses?
- Is all the water around us safe for drinking? Why?
- What can we do to make contaminated water, safe to drink?
- Where does all the dirty water, from our houses and factories go? What do we do with it?
- What would happen if water would disappeared from Earth?

Teacher presented these pictures and then they commented on them.

(2017 World Vision / photograph, John Warren)

- What are they doing?
- Do you think the water in the picture is safe to drink?
- Would you drink that water? Why?
- What could happen if you drink dirty water?
- What do you think they will use water for?
- Do you think they will have enough water to wash their clothes, to have a shower, to cook, to drink, to water the crops…..?

FACTS: Worlwide 844 million people live without access to safe Water. Dirty water and lack of acess to sanitation kills over 5000 children every day.

Carrying water takes time! Women and children can walk kilometres every day to retrieve water. The average distance that women and children walk for water in Africa and Asia is **six kilometers a day**. Women carry heavy loads of water (about 20 litres) on their heads and children may carry 3 to 5 litres. This hard work takes time that they might otherwise spend at school or earning additional income.
Water saving solutions are necessary to keep kids in school, and women from having to spend all of their time walking to get water just for **hand washing**. One of the simplest solutions is the **tippy tap**. The **tippy tap is a hand washing station** that allows people to use small amounts of flowing water (40 ml instead of 500ml+) and soap instead of contaminating a whole bowl of water. **Hand washing can cut down on diarrhea** (**and some other diseases**) rates by more than 40%. Further, the simple design of the tippy tap is vital to its success for three reasons.
1. Children can be taught how to build and operate it. This also means that they can teach their parents.
2. The hands free design means that no germs are transferred between users.
3. The water is not wasted but used by plants directly around the tap.

http://www.tippytap.org/

How to make one: https://www.youtube.com/watch?v=t6bP7JYPOzM

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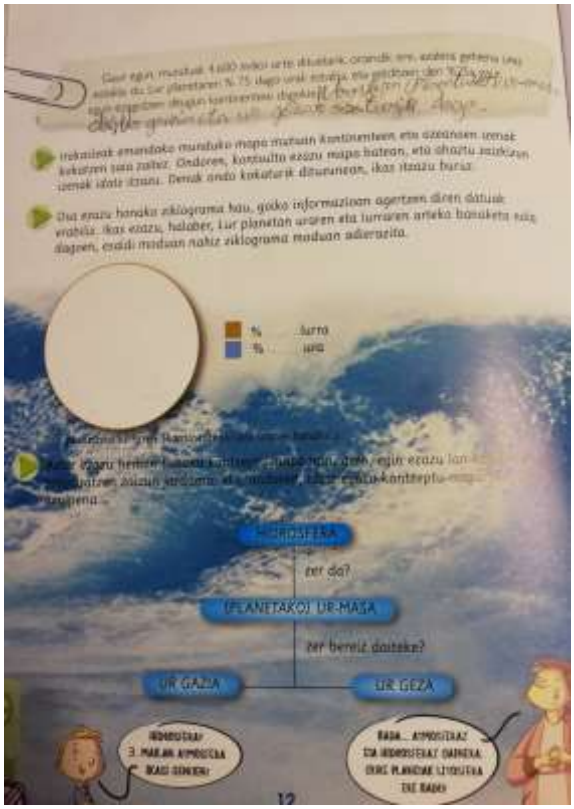
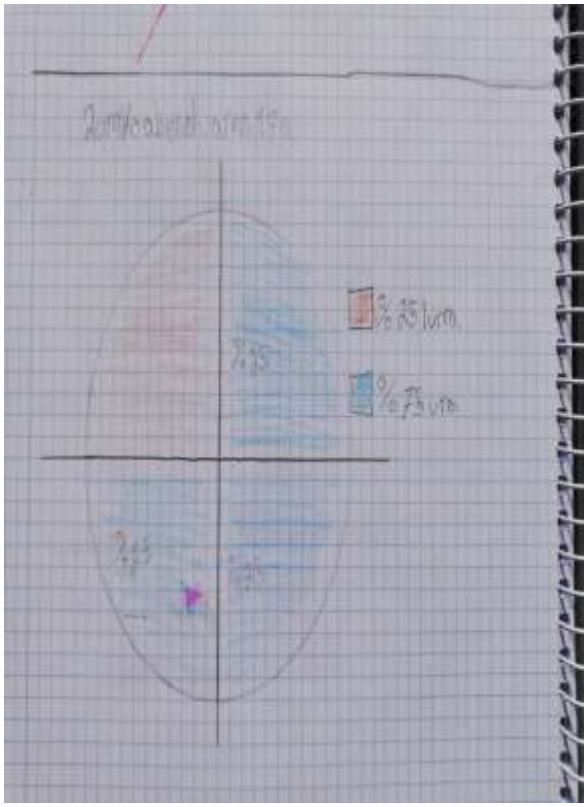
Drinkable water on Earth.

It is said that Earth is a water planet because water covers around 75% of the Earth's surface. While about 25% is land.

Pupils completed a pie chart with the percentages.



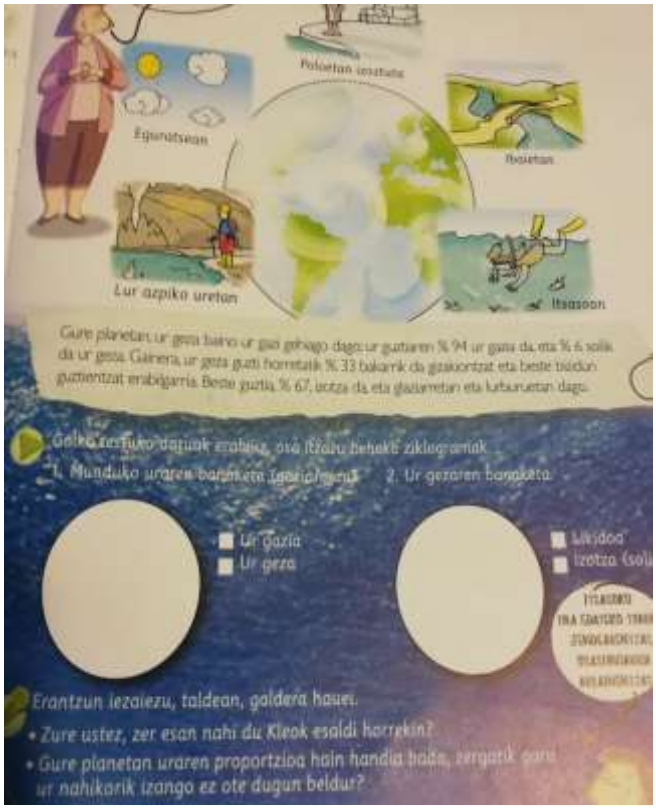


- **Where can we find water on Earth?**

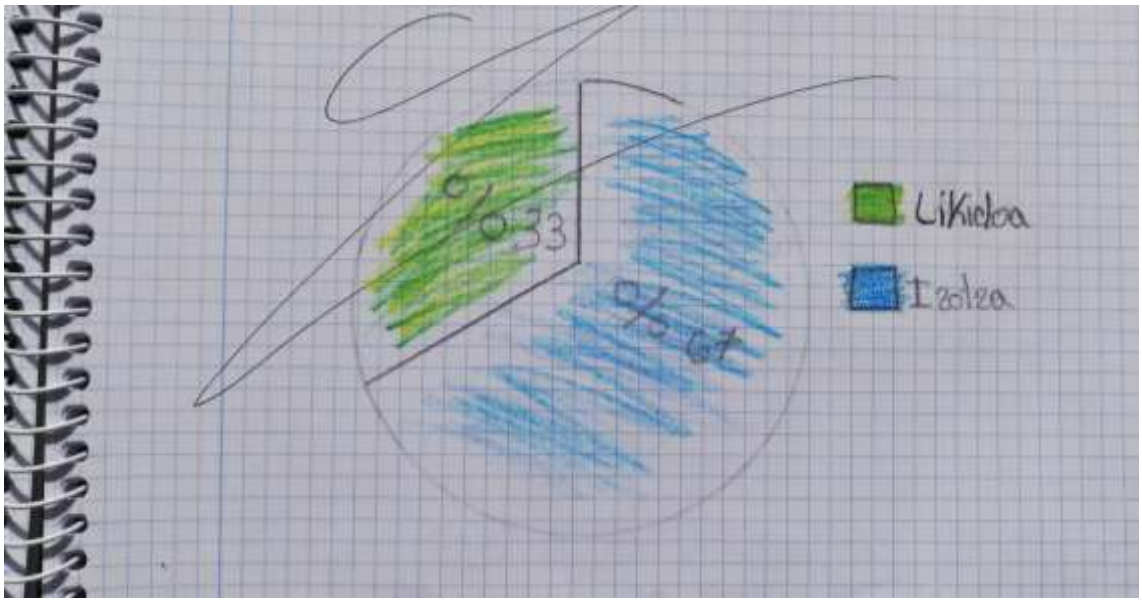
  Interesting video: https://ed.ted.com/lessons/where-we-get-our-fresh-water-christiana-z-peppard

  We can find water in the air and clouds, rivers, oceans, underground, glaciers and ice caps, lakes and living things.

  The majority of water on the Earth's surface, over 94 percent, is saline water in the oceans. Only 6 percent of the water is fresh water.



But not all of it is accesible for humans and other living things. Less than 1 percent is available, the rest, percent is frozen in glaciers in places like the Antarctic and Greenland ice sheets.



Pupils completed the pie charts with the data available and tried to answer the question:

- **If there is so much water on Earth why do we worry about water? Do you think we could run out of water?**

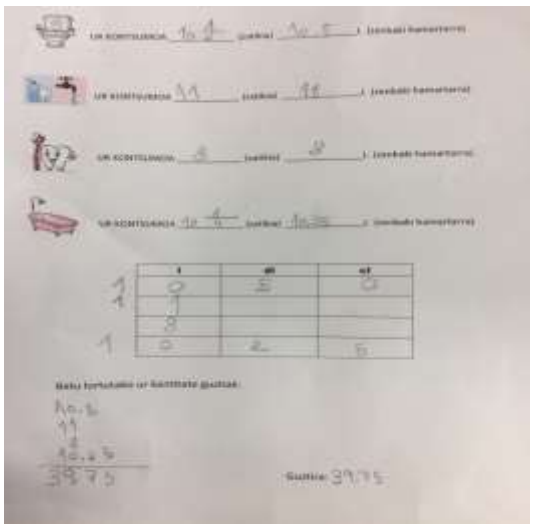
Facts: The amount of freshwater which is available to us stays relatively constant over time but there is no new water. The water we drink is the same the dinosaurs drank which is recycled once and again.
Although the amount of freshwater is staying constant, the population of planet Earth is growing rapidly. We need it to survive. The NHS recommends that we should drink between 6 and 8 glasses of water a day to stay healthy (that's just under 2 litres). But we don't just need water to drink, we also need access to water for growing and processing food, for manufacturing clothing and equipment, for our waste management and sanitation systems and leisure activities such as swimming and watering the garden!

<u>Water conservation. How can we prevent water scarcity / water shortages?</u>

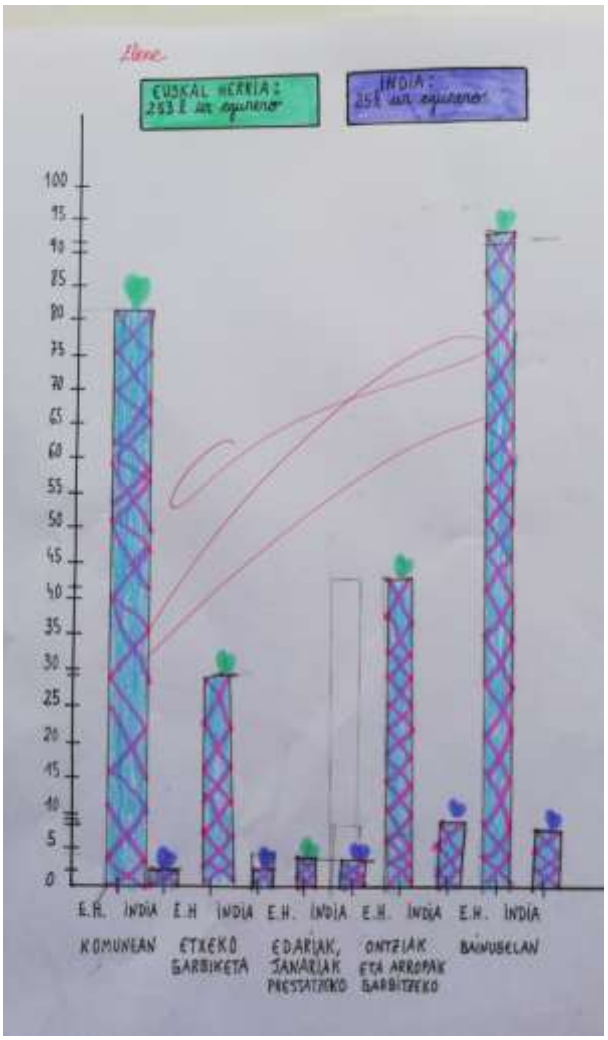
- What is water conservation? It means using less water or recycling used water so that it can be used again.

- Why do you think water conservation will be important?

- **Pupils measured** how much water they use at home: flushing the toilet, cleaning the house, to drink, cooking, washing the dishes, washing the clothes, in the bathroom (having a shower, hand washing, bushing teeth) **and compared it with the water an average Indian family uses**.



- **The average Indian family uses 25 l a day. If you had access to only 25 l a day, what would you use it for? And what would you do to use less water in your everyday life?** (we can have a shower instead of a bath, close the tap while you are cleaning your teeth, check for water leaks, run the dishwasher and the washing machine only when they are full….)



- Movie: the animals save the planet. https://www.youtube.com/watch?v=lTuu7A4NgT4

How is water contaminated?

Teacher and pupils looked at the pictures and talked about them: ways water gets contaminated and ways we can act to prevent water pollution.

- Where does all the dirty water, from our houses and factories go? What do we do with it? Water leaving our homes generally is sent to a **wastewater-treatment plant** through a sewer system.

VISIT TO "ZABALERA", WASTEWATER-TREATMENT PLANT

The monitor explained all the process. (Our material is in Basque there is an interesting video in English explaining it: https://www.youtube.com/watch?v=wAcZrC1wnss)

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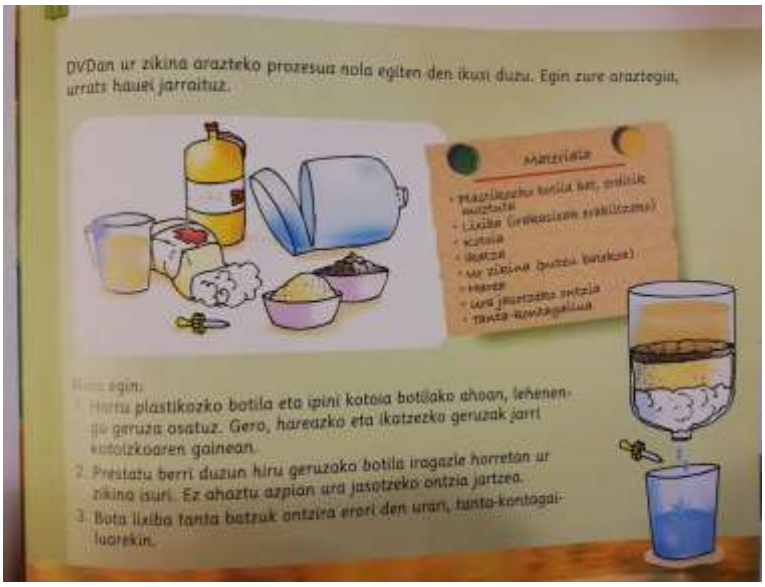
How does water get to our taps?

VISIT TO “KILIMON”: DRINKING WATER TREATMENT PLANT.

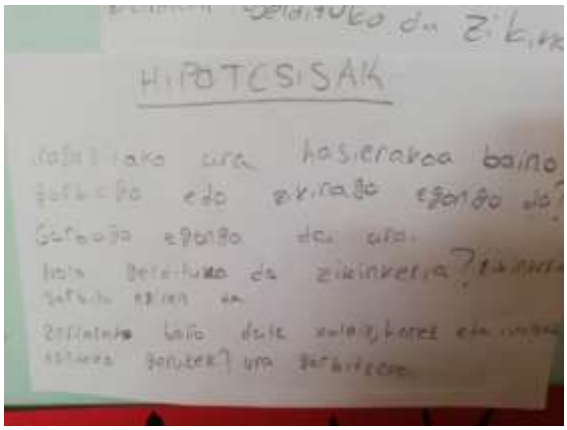
BELGIUM, FINLAND,GREECE,ITALY,SPAIN AND TURKEY

Create a water filter.

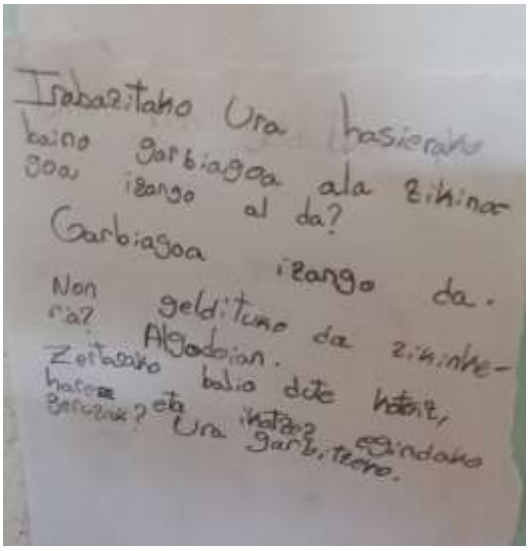


(This is the water filter in our text book but you can find different ones on the internet. For example: https://science.lovetoknow.com/science-fair-projects/homemade-water-filter-science-project

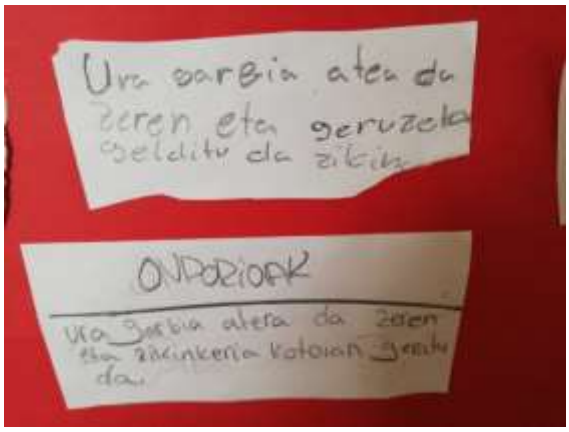
- First students made their own **hypothesis:**



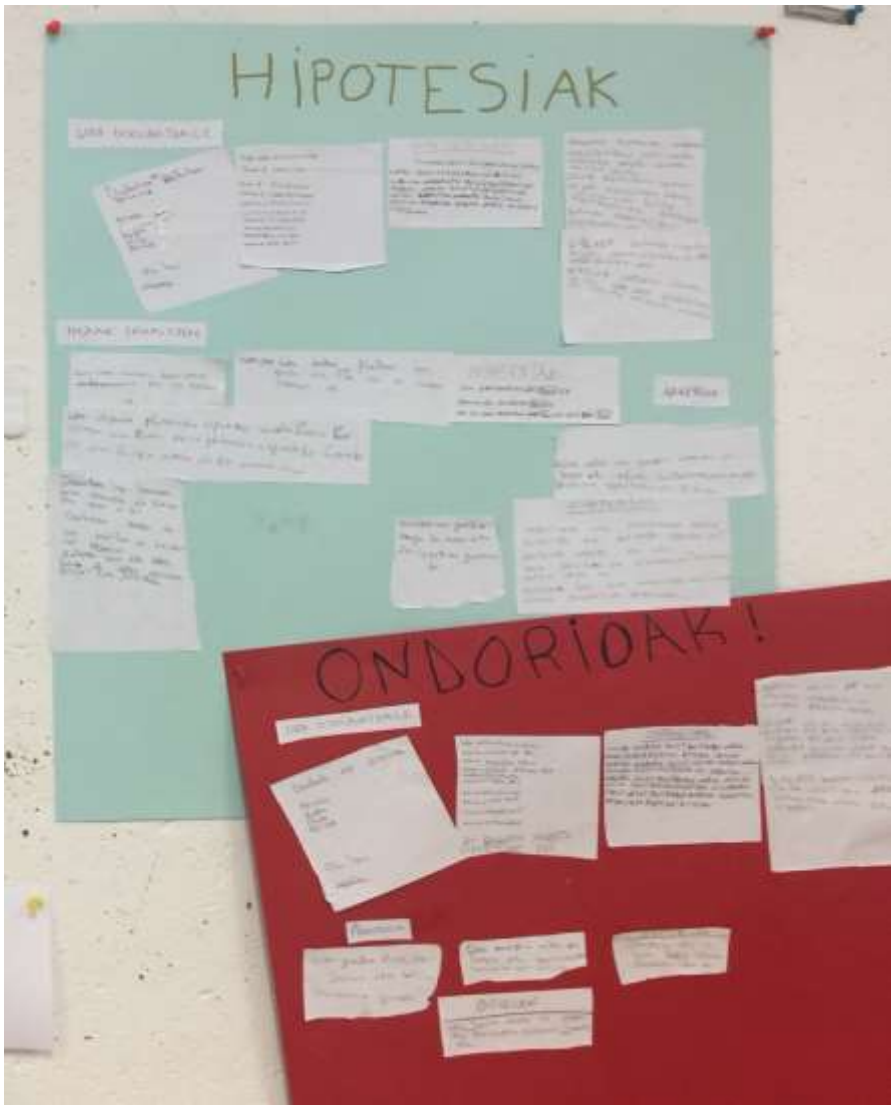
- Filtered water will be cleaner or dirtier? Water will be cleaner because cotton will remove dirt.
- What are the layers of different materials for? To clean the water.



- **Conclusion**



The filtered water is cleaner now because the different layers removed the dirt.



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States of water

Water can occur in three states: solid (ice), liquid, or gas (vapor). the **state** water is in is determined by its **temperature**. At low temperatures (below **0°C**), it is a solid. When at "normal" temperatures (between **0°C** and **100°C**), it is a liquid. While at temperatures above **100°C**, water is a gas (vapor).

Pupils carried on the next experiences to work on the states of water and answered the questions:

- **Materials needed**: a bottle, a saucepan and water.
  - 1st expereience: Fill the bottle with water and leave it in the freezer all night.

    What happened to water?

    How do we call that state?

    When and where does water appear in that state in Nature?

  - 2nd experience: Take the bottle out of the freezer and leave it outside.

    What happened?

    How do we call that state?

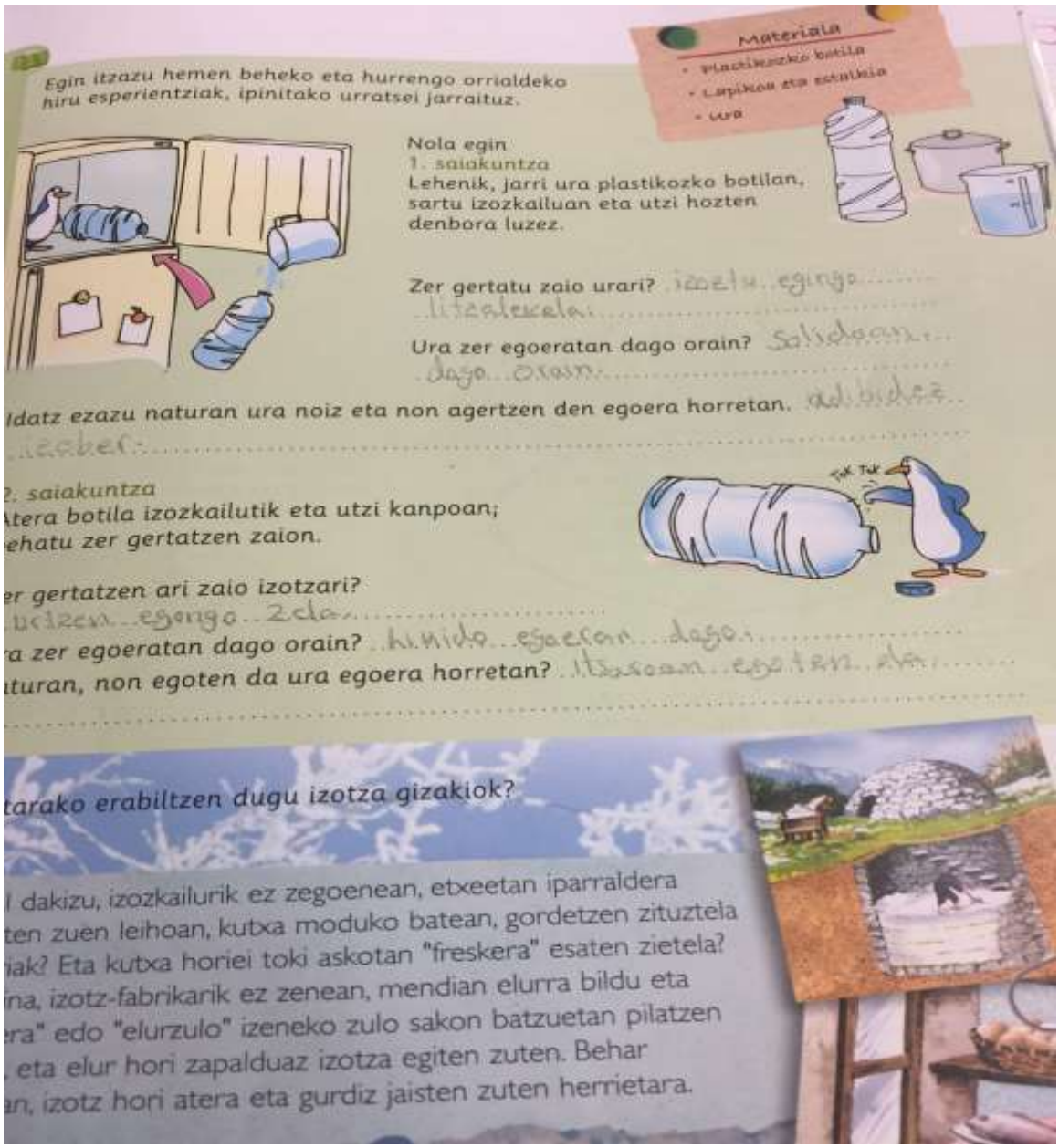
    Where can we find water in that state in Nature?

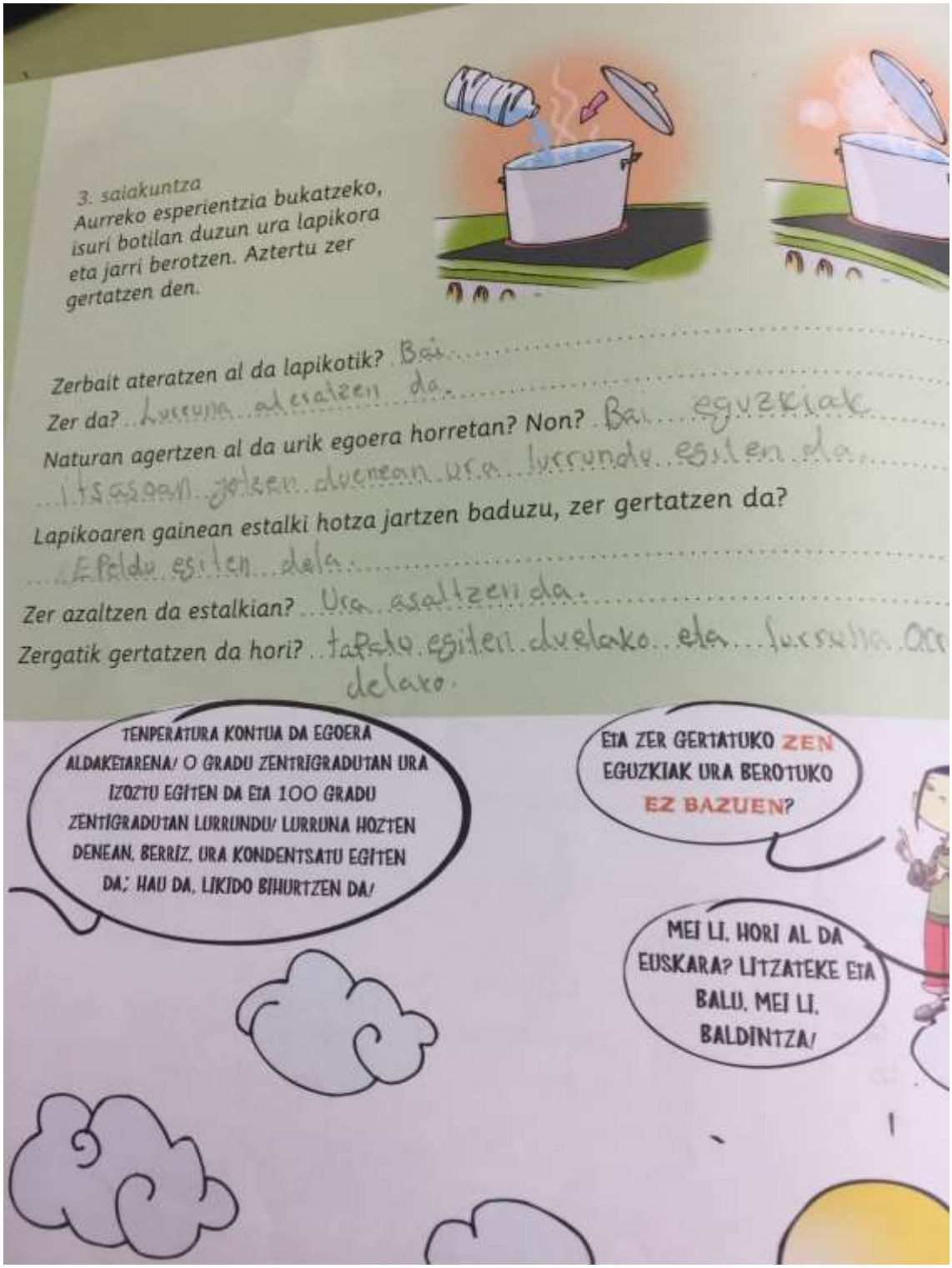
  - 3rd experience: pour the water you have got inside the bottle into the saucepan and warm it up.

What's going on? Can you see anything leaving the saucepan? What is it?

Can we see water in that state in Nature? Where?

Cover the saucepan with the lid for a while. Then remove the lid and observe it. What happened? Can you see anything below the lid?
Why did it happened?




3. saiakuntza
Aurreko esperientzia bukatzeko, isuri botilan duzun ura lapikora eta jarri berotzen. Aztertu zer gertatzen den.
Zerbait ateratzen al da lapikotik? Bai
Zer da? Lurruna ateratzen da.
Naturan agertzen al da urik egoera horretan? Non? Bai... eguzkiak ...itsasoan jolsten duenean ura lurrundu egiten da.
Lapikoaren gainean estalki hotza jartzen baduzu, zer gertatzen da?
...Epeldu egiten dela.
Zer azaltzen da estalkian? Ura asaltzen da.
Zergatik gertatzen da hori? ...tapelu egiten duelako eta ...lurruna ...delako.
TENPERATURA KONTUA DA EGOERA ALDAKETARENA/ O GRADU ZENTIGRADUTAN URA IZOZTU EGITEN DA ETA 100 GRADU ZENTIGRADUTAN LURRUNDU/ LURRUNA HOZTEN DENEAN, BERRIZ, URA KONDENTSATU EGITEN DA; HAU DA, LIKIDO BIHURTZEN DA/
ETA ZER GERTATUKO ZEN EGUZKIAK URA BEROTUKO EZ BAZUEN?
MEI LI, HORI AL DA EUSKARA? LITZATEKE ETA BALU, MEI LI, BALDINTZA/

5 U

Aurrerago uraren zikloa deskribatzen duen azal... har duzunez, bertan adierazi beharko dituzun hitz jakin batzuen esana... hia aldez aurretik argi izatea komeniko litzaizuke. Horretarako, hitz ho... rien definizioak idatziko dituzu.

Hemen beheko ereduari behatuz idatz ezazu hitz bakoitzaren definizioa eta hitz hori erabiliz asmatutako esaldi bat.

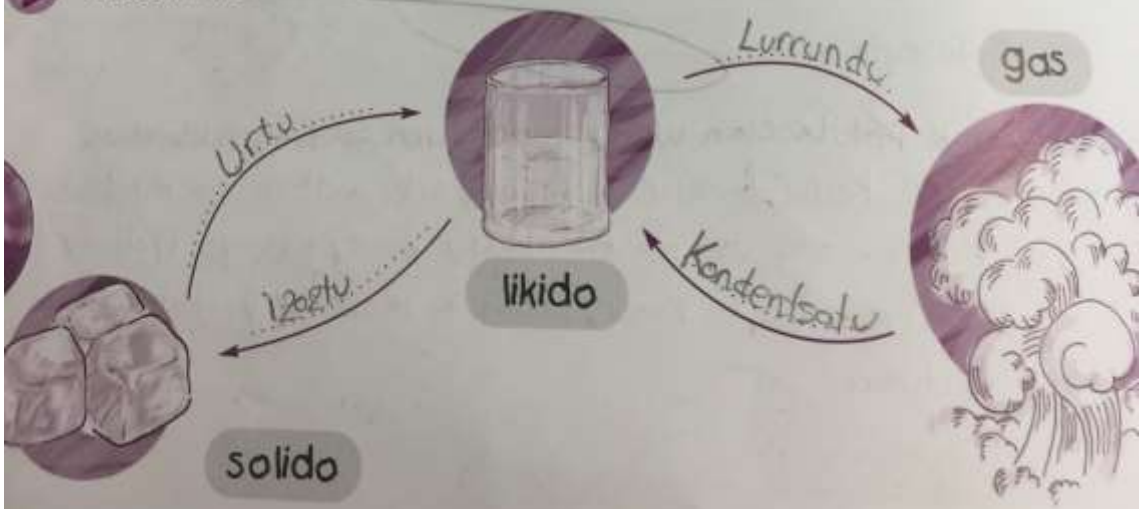
• **Urtu:** *Beroaren eraginez gorputz solido bat likido bihurtu.*
Adibidea: Atzo egin genuen elur-panpina urtu egin da.

• **Lurrundu:** Ura beroa dagoenean lurrundu egiten da.....
Adibidea: Lapikoan ura berotzen baduzu lurruna atera... da

• **Solidotu:** Ura hotza dagoenean solidotu egiten da.....
Adibidea: Ura izozgailuan sartzen baduzu solidotu egiten da

• **Kondentsatu:** Lurrun orrek hotza sumatzen duenean
kondentsatu egiten da.....
Adibidea: Dutxan gaudenean ur beroarekin espioa
kondentsatu egiten da.....

Osa ezazu hemen beheko eskema, uraren egoera-aldaketen izenak bertan idatziz.



...RAREN ZIKLOA: ikaslearen liburuko...

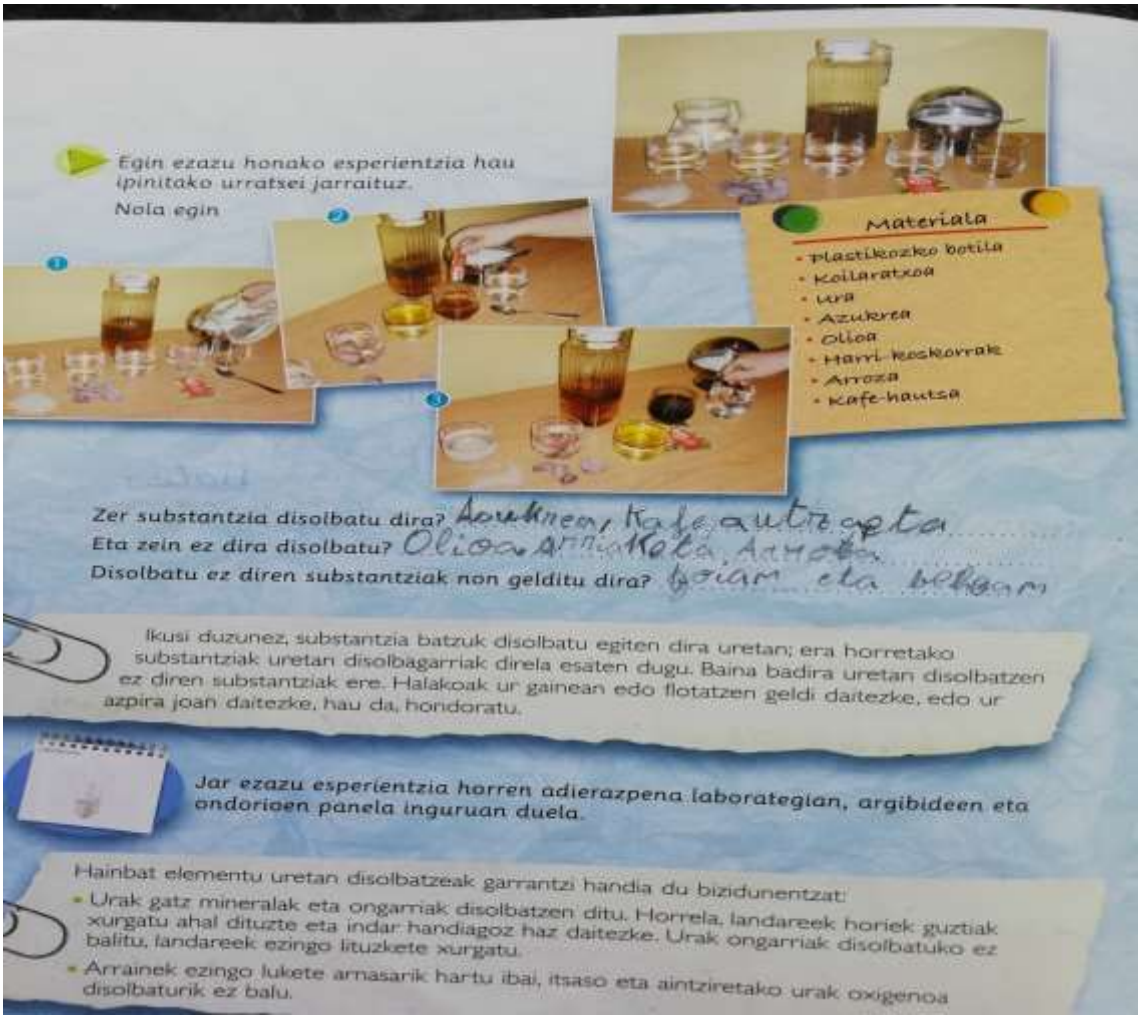
What can dissolve in water?

Water is capable of **dissolving** a variety of different substances, which is why it is such a good solvent. And, **water** is called the **"universal solvent"** because it **dissolves** more substances than any other liquid.

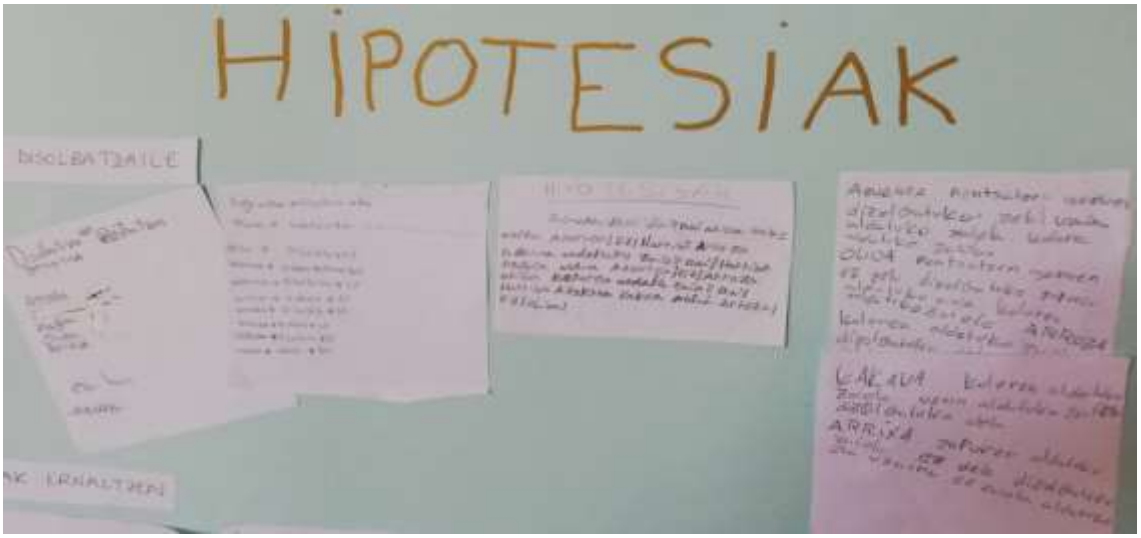
A **solution** is made when one **substance** called the **solute** "**dissolves**" into another **substance** called the **solvent.**

Pupils carried out the next experience:

- **Materials used:** coffee, sugar, cocoa, stones, oil, rice, water

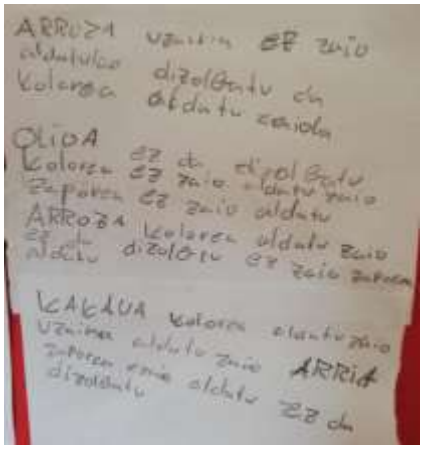


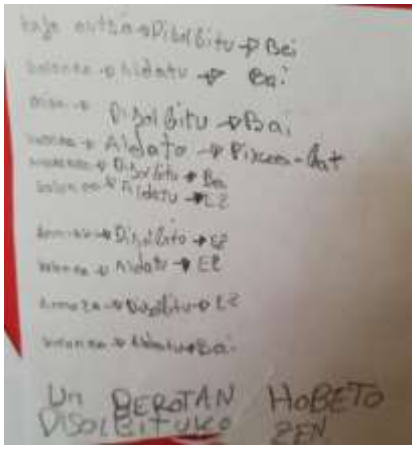
- Students made their **hypothesis:**

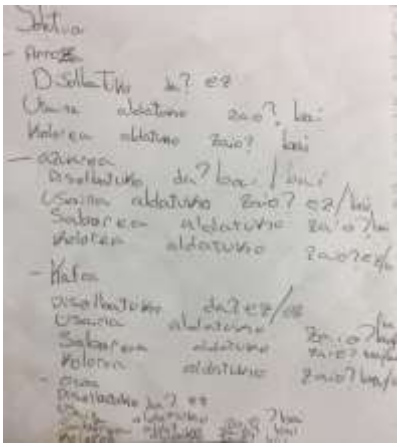


- **Questions:**
  - Will it dissolve? We think …….. wil dissolve in water. …… will not dissolve.
  - Will water smell different?
  - Will water colour change?
  - Will water flavour change?

- **Conclusion:**

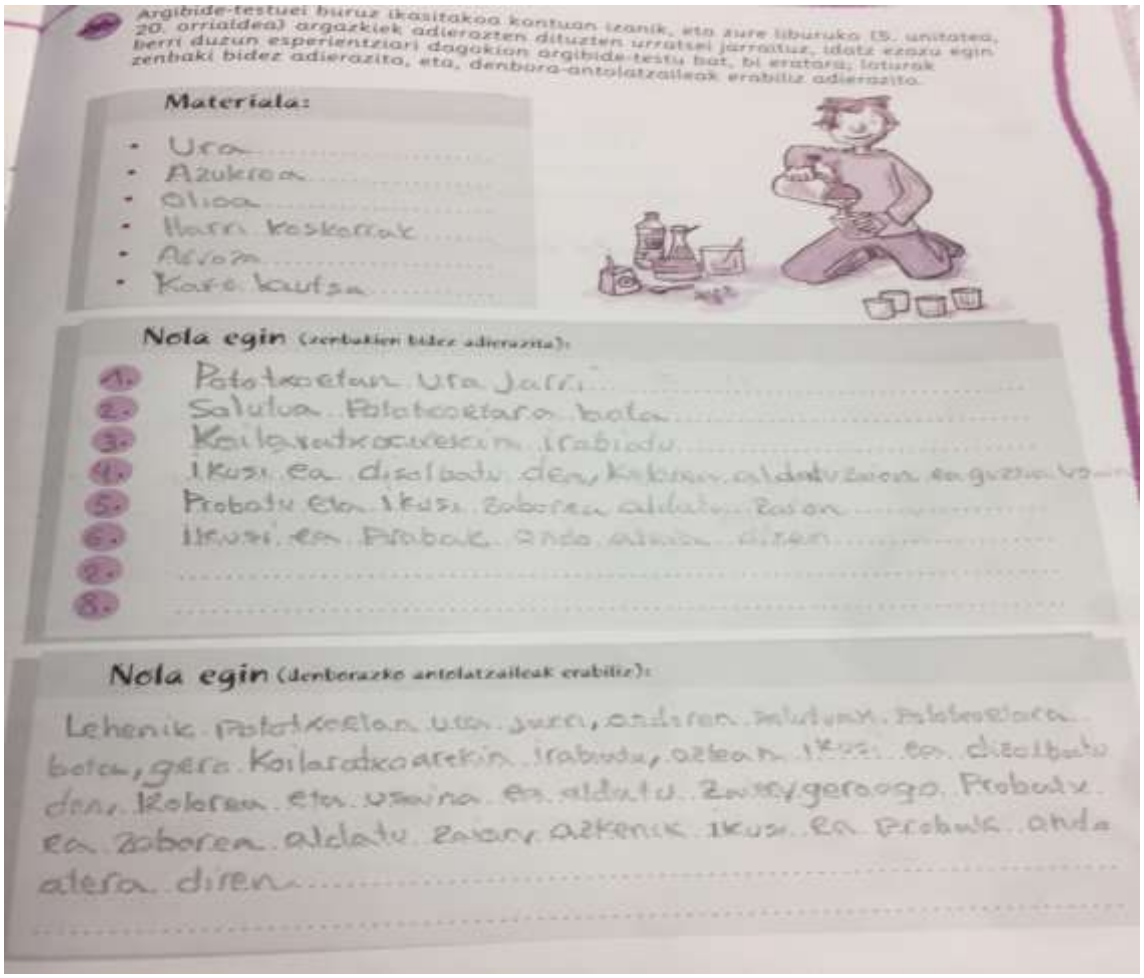






- **Question:** Do you think temperature could affect dissolving?

- Pupils wrote an **instructive text** explaining how they carried out the experiment. First using numbers to describe the process and then using time connectors.



Argibide-testuei buruz ikasitakoa kontuan izanik, eta zure liburuko (5. unitatea, 20. orrialdea) argazkiek adieraziten dituzten urratsei jarraituz, idatz ezazu egin berri duzun esperientziari dagokion argibide-testu bat, bi eratara; lehenik zenbaki bidez adierazita, eta, denbora-antolatzaileak erabiliz adierazita.

Materiala:

- Ura
- Azukrea
- Olioa
- Harri koskorrak
- Arroza
- Kafe kautsa

Nola egin (zenbakien bidez adierazita):

1. Patatxoetan ura jarri.
2. Salutua Patatxoetara bota.
3. Koilaratxoarekin irabiatu.
4. Ikusi ea disolbatu den, kolorea aldatzen ea gutxiago...
5. Probatu eta ikusi zaporea aldatu...zaion
6. Ikusi ea Probak anda atera diren
7. .....
8. .....

Nola egin (denborazko antolatzaileak erabiliz):

Lehenik Patatxoetan ura jarri, ondoren Salutuak Patatxoetara bota, gero Koilaratxoarekin irabiatu, ozean ikusi ea disolbatu den. Kolorea eta usaina ea aldatu. Zertxogeroago Probatu ea zaborea aldatu zaion, azkenik ikusi ea Probak anda atera diren.....

BELGIUM, FINLAND,GREECE,ITALY,SPAIN AND TURKEY

BELGIUM, FINLAND,GREECE,ITALY,SPAIN AND TURKEY

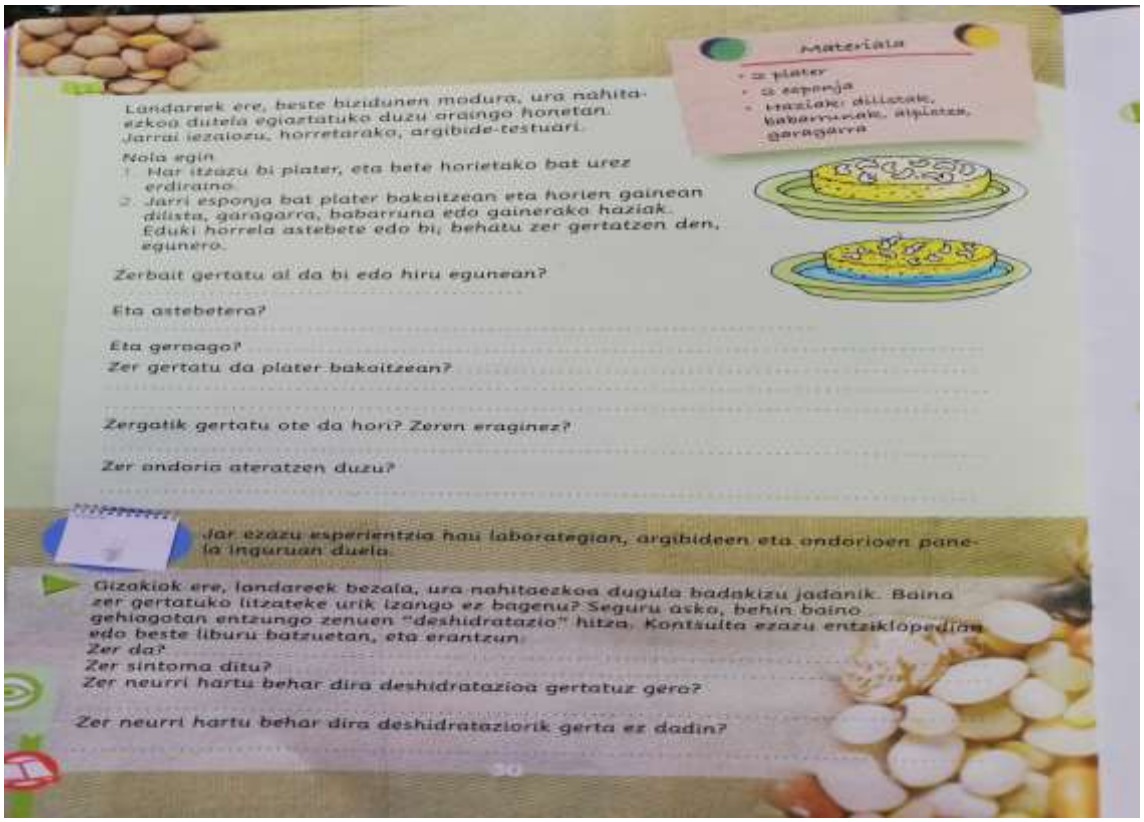
Make your Rain Stick.

Water can be used to make sculptures, paint pictures and even make music. The “rain stick” is a musical instrument that makes a sound like the rain.

Pupils made their own “rain stick”.

All living things need water to survive.

- **Experience:** Germinate seeds on a sponge.
  - **Materials:** plates, sponges, seeds.



  - **Procedure:**
    1- Fill half of a plate with water.
    2- Place a sponge in each of the plates and place some seeds on top of each sponge. (Remember to keep the sponge in the plate with water wet the next days. It's important not to let the seeds dry out)
    3- Observe what's happening and answer the questions:
    4-
      - What has happened after three days?
      - And after a week?
      - And the next days?
      - What has happened in each of the plates? Is there any difference?
      - Why do you think happened that?
      - What conclusion do you get?
      - You already know that human beings also need water. Why is water important to human beings?

- Sure you have already heard about **“dehydration”.**
  - What is dehydration?
  - What are the symptoms?
  - What should you do if you are dehydrated?
  - What should you do to avoid dehydration?

- **Experience:** How do plants drink water?
  We did this experiment to show pupils how plants absorb water and nutrients up through their stems.
  - **Materials**: glassess, jars, or cups, paper towels, food colouring, collard leaves (the lighter ones), white flowers (carnation flowers, margarita flowers…)
  - What do you think it will happen?
    Observe what happens.
  - Why do you think the colours are changing?
  - Why might the water be able to move up against gravity like that?

Facts: The water moves up the paper towels through a process called **capillary action.** The paper towel is made from fibers and the water is able to travel through the gaps in the fibers. The gaps in the paper towel act like capillary tubes and pull the water upward. This is what helps water climb from a plant’s roots to the leaves at the top of the plant or tree.

The water is able to move upward against gravity because of the attractive forces between the water and the fibers in the paper towel.

Facts: Plants have tiny tubes, called **xylem tubes**, throughout their body that help carry water up through the stem (plants have “veins” like we have), and to the leaves. The water molecules are attracted to the molecules in the tubes, helping to pull the water upward. This is called capillary action.We can see these pathways with our experiment!

TOOL: Homemade Plasticine

Age: 2nd grade

2nd grade pupils taught 5th grade pupils how to make plasticine.
Younger students realized that they can teach something new to older students and older students realized that they can learn from the younger ones.

Objectives:

- To learn to follow a recipe to create plasticine.
- To give the younger pupils opportunities to teach the older ones.

Materials:
Water, flour, salt, oil, food colouring

Process:

It's very easy and you can find the directions here:

https://www.youtube.com/watch?v=89dG2Ag_oVg

https://www.youtube.com/watch?v=IZVQwabqup0

BELGIUM, FINLAND,GREECE,ITALY,SPAIN AND TURKEY

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: **MARITIME HERITAGE: SHIPBUILDING AND WHALING.**

A visit to Albaola: The Sea Factory of the Basques. (http://www.albaola.com/en/site/special-place)

Age: 5th graders.

Objectives:

- To offer pupils opportunities to know about our history and our ancestors' way of life; traditions, jobs, maritime heritage, important explorers and navigators.
- To offer pupils opportunities to create relationship with their nearest environment.

FACTS

The Basque people have always had a close relationship with the sea.

The Basques were pioneers in whaling and cod fishing in Newfoundland (Canada) and the Gulf of St. Lawrence since the early part of the sixteenth century.

The sixteenth century marked the golden era of Basque fishing. At that time 2,000 "arrantzales" (sailors) are estimated to have set sail every year from Basque ports to the St. Lawrence River – at that time known as Nueva Vizcaya – in search of the giant mammals that reproduced and fed in the waters of the estuary on their migration from the Arctic. Their blubber rendered down into oil was a great source of wealth for the Basque Country.

The Basques left many traces of their presence in Canada, including place-names such as Mingan (Québec) and Ingornachoix, Port au Choix and Port au Port (Newfoundland). Five Basque shipwrecks have been located in the area; the earliest, the *San Juan*, dates from 1565 and it shows how good shipbuilders they were. (http://www.albaola.com/en/site/investigation-process)

Our pupils visited Albaola: The Sea Factory of the Basques, where a replica of the San Juan Whaleship is being built using the same materials, procedures and tools that our ancestors did.

Albaola is located in Pasaia. We got to Pasaia by bus and then we took a boat to the factory.

There, we visited the museum with Ander and Eider, our monitors. Our monitors gave us some information about the relationship our ancestors had with the whale and our students showed that they already know quite a lot about that because they worked on this theme in the 2nd grade.

Our pupils, also, made a compass.

And worked with maps, locating the points of the compass and drawing some routes using the given latitude and longitude coordinates.

We saw the San Juan Whaleship they are building. A replica of the original which sank off the coast of Canada, in Red Bay, Canada. (**Petteri** was there too!)

There is an International Boat Building School in Albaola. The school takes place in an atmosphere centred on the recovery of our maritime heritage.

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Azterkosta (Coastwatch)

Age: 6th graders

- **<u>Objectives</u>**
  - To help students develop awareness about how human impacts on the natural environment.
  - To invite students to think about ecological issues, to talk about the causes and come up with potential solutions.
  - To help children realise how harmful is waste for the environment and help them improve their ecological behaviour.
  - To make caring for nature part of our students lives and use it to overcome today's environmental challenges with a proactive attitude.

- **<u>Basic transversal competences:</u>**

  B.C. 08: Competence for thinking, learning and communicating:
  - Analyzing the situation of our coast and sea and proposing solutions.

  B.C. 11: Competence to be yourself and communicate: self-regulation:
  - Reflecting on our habits, values and behaviour towards the environment in order to promote more sustainable habits.

- **BACKGROUND INFORMATION**

"Azterkosta" is the name for the Basque Country of the European program "Coastwatch Europe" (http://coastwatch.org/europe/about/). Coastwatch Europe (CWE) is an international network of environmental groups, universities and other educational institutions, who in turn work with local groups and individuals around the coast of Europe. CWE primarily protects wetlands by raising public awareness of their value and demonstrating practical ways to save them.
The goal of CWE is the protection and sustainable use of coastal resources.

- **ANALYSING WATER SAMPLES**

Our pupils **brought water samples** the beach **and they proceeded to analyse** them.
Results showed that water has too many phosphates causing excessive growth of algae.
Excessive growth of algae harms water quality, food resources and habitats, and decreases the oxygen that fish and other aquatic life need to survive.
The video has been uploaded to PEDA: https://peda.net/kuopio/p/rajala/erasmus/wind3/spain/ab/ab2
Our students made the most of their time collecting garbage on the beach and by the seashore trying to keep our coast a bit cleaner. **Petteri** helped them too!
A video has been uploaded to PEDA: https://peda.net/kuopio/p/rajala/erasmus/wind3/spain/ab/azterkosta

Eighty percent of pollution to the marine environment comes from the land.

Activities such as bathing and washing clothes near lakes, ponds or rivers and fertilizers from farms add nutrients like nitrogen and phosphorous into the water bodies.

Other pollutants come from septic tanks, sewerage system, cars, trucks, and boats, fertilizers from farms, chemical waste from factories, and discarded human rubbish **(eighty percent is plastic).**

- **MARINE POLLUTION DIORAMA**

- Pupils made a diorama using some of the rubbish collected on the beach and rocks:
    - Paper needs 3 months to 1 year to dissolve.
    - Glass bottles need 1.000.000 years to decompose.
    - Plastic bags need over 100 years to degrade.
    - Cans need over 200 years to decompose.
    - Batteries take between 500 and 1.000 years to decompose.
    - Plastic bottles can take 450 years to degrade.
    - Cigarette butts take from 18 months to 10 years to decompose.

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HOW DOES PLASTIC GET INTO THE OCEAN?

There are three main ways the **plastic** we use every day ends up in the **oceans**. **Plastic** you put in the bin ends up in landfill. When rubbish is being transported to landfill, **plastic** is often blown away because it's so lightweight. From there, it can eventually clutter around drains and **enter** rivers and the **sea** this way.

HOW CAN WE REDUCE MARINE POLLUTION?

https://passportocean.com/2018/10/14/ocean-pollution-solutions/

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GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Protected Biotope: the Zumaia cliffs and tidal plain.

Age: 6th grade

QUESTION: How do you think were the rock facies created?

Our 6th grade pupils went on a field trip to Zumaia, where some amazing cliffs are located and covers around 8 kilometres.

On one hand, there the students learnt about how our internal forces determine our coastal landspace. The rock facies between Zumaia and Mutriku are constituted by vertical sheets. But why? Million years ago, the Basque Country was under water and thanks to the internal forces of the earth, the sheets of Iberian Peninsula and Europa crashed with each other and so appeared the flysch (the rock facies). As a result of this crash the earth went up and took the actual appearance.

On the other hand, ocean waves can cause the coastline to erode. The force of the sea/waves causes pieces of rock to break off changing the coastline over time.

In Zumaia, the monitors of the **Algorri Interpretation Centre** helped our students to better know our coastline and understand these processes.

On their route through the cliffs our students saw the Hermitage of San Telmo, located on the Itzurun beach, over a cliff shaped by the flysch. Water and wind erode that piece of land 1 cm per year so this Hermitage will fall into the sea in some years!

- **Objectives**
  - To offer pupils opportunities to create relationship with their nearest environment and to give value to biodiversity.
  - To offer pupils opportunities to become aware of the natural phenomenons.
  - To help pupils understand that rock facies fossils provide evidence about the earth's internal forces.
  - To help pupils gain a general understanding of the information of the last million years that the layered materials of the flysch (rock facies) give us.

- To help pupils understand that changes in environmental conditions may result in the natural evolution of the earth.
- To analyze and show the earth's evolution in a presentation.
- To use scientific definitions of the natural phenomenons and define some theories related to the earth's evolution.

- **<u>Basic transversal competences:</u>**

  - **B.C. 03/06 Competence for science and technology:** Using scientific and technological thinking in order to understand the creation of rock facies.
    Use and application of knowledge and methodologies that explain the natural world. These involve an understanding of the changes caused by natural phenomenons.

  - **B.C. 08 Competence for thinking, learning and communicating:** Asking questions, making hypothesis, experimenting, observing, creating, selecting, and sharing ideas making use of verbal and non-verbal codes.

  - **B.C. 09 Competence for initiative, entrepreneurship and communication:** Taking initiative and managing initiative processes decisively and effectively: preparing a presentation about the handled natural issues.

  - **B.C. 10 Competence for learning and living and communicating together:** taking part in interpersonal and group situations in a collaborative manner, recognising one´s own and other´s rights and duties, for the individual´s and everybody´s good.

  - **B.C. 11 Competence to be yourself and communicate:** Self regulation of the learning process and of individual decisions, opinions and motivation to carry out duties and willpower.

- **<u>Facts:</u>** visit to the protected biotope and to the Interpretation Center. Analysis of the natural phenomenon in situ and consideration of the long natural process in classroom.

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

TOOL: MAGIC WITH WATER!

We organized a STEM afternoon in which students in mix-aged groups had to present the experiments they had prepared.

In order to do so each group used different sources of information to investigate easy to carry out and explain experiments. After that, they had to do the experiments, do their research and prepare the materials and documents for the public presentations.

Objectives:

- To present opportunities for the introduction or reinforcement of science concepts and for students to practice their science skills and to instil positive attitudes towards science studies.
- To observe, infer, discuss each groups observations, record them and report their conclussions.
- To work cooperatively in small groups and ensure everyone has sufficient opportunities to see and understand the activity

Basic transversal competences:

- **B.C. 08: Competence for thinking, learning and communicating:**
  - Identifying , evaluating and selecting reliable information sources.
  - Finding and recording information.
  - Understanding information and expressing what has been understood.

- **B.C. 09: Competence for initiative, entrepreneurship and communication:**
  - Planning and carrying out simple experiments, making observations and reporting their conclussions.

- **B.C. 10: Competence for learning and living and communicating together.**
  - Taking part in interpersonal, interactive situations encouraging pupils to express themselves following the rules of social behaviour.

EXPERIMENT 1: FIRE-RESISTANT WATER BALLOON

Objectives

- To provide students with the understanding that water (a liquid) has a higher specific heat capacity in comparison to air (a gas).
- To understand that liquids (wáter), can absorb a large amount of energy (heat) in comparison to gas.

Materials: Balloons, water, candle, matches.

Instructions:

- Inflate one balloon with air and tie off.
- Stretch the other balloon over a tap and fill with water until the balloon is approximately the size of a grapefruit.
- Light the candle and ask the class what they expect to happen when the flame touches the ‘air only’ balloon. When they have had sufficient time to consider the possible outcomes, hold the balloon in the flame – it will pop, as expected.

Let’s repeat the experiment, but this time the bottom of the balloon will have a layer of water inside.

- Show the water balloon to the class and ask whether or not they would like you to repeat the demonstration with it. They are likely become quite excited at the prospect of watching you make a terrible mess. Ask them what they expect to happen this time.
- Lower the balloon from above to ensure the flame does not touch the sides of the balloon – it will burst if this happens! Surprisingly, the balloon will not burst.

https://www.youtube.com/watch?v=JO6X6K7zRnQ

Why doesn't the balloon pop when there is water inside? Ask the class to think of reasons why the balloon did not burst.

When the class is sufficiently impressed by the demonstration, show them the bottom of the balloon. They will see a dark black spot which they may suspect to be a 'burnt' patch. Rub your finger across the spot to show that it is soot from the candle flame, and that the balloon is not burnt.

The secret lies in yet another amazing **property of water** – **its ability to absorve heat.**

Water is a great substance for soaking up heat. The thin latex balloon allows the heat to pass through very quickly and warm the water. As the water closest to the flame heats up, it begins to rise and cooler water replaces it at the bottom of the balloon. This cooler water then soaks up more heat and the process repeats itself. In fact, the exchange of water happens so often that it keeps the balloon from popping . . . until the heat of the flame is greater than the water's ability to conduct heat away from the thin latex and the balloon pops.

NOTE: The soot is wax vapour deposited onto the balloon before being entirely burnt – you can also form soot on a piece of white paper lowered onto the candle flame to explain this further

EXPERIMENT 2: THE MAGIC BOTTLE. ANTI GRAVITY WATER TRICK

Objectives:

- To understand that a substance has characteristic properties such as surface tension.
- To investigate surface tension in order to develope an understanding of properties and changes of properties in matter.

Materials: Piece of light flyscreen, scissors, bottle, rubber bands (2).

Procedure:

- Fill the bottle up with water.
- Carefully cut out a piece of flyscreen.
- Put the flyscreen over the bottle's mouth and bend the flyscreen down the neck of the bottle.
- Put a rubber band around the bottle's neck to hold the flyscreen in place.
- Turn the bottle upside down: When the bottle is completely upside down, the water stops pouring.
- Insert some toothpicks into the neck of the bottle which are clearly seen to float up through the water inside.

SCIENCE: Water tends to stick to itself, and this property is known as surface tension. The air can't stretch the surface of the water from a tiny flyscreen square to a huge bubble. The water molecules don't stick together particularly strongly, but it's enough to keep air out and water in.

https://youtu.be/OadVsncDRis

EXPERIMENT 3. OIL AND WATER

MATERIALS: Oil, water, a card, 2 glasses (containers), food coloring (optional)

PROCEDURE:

- Fill one glass to the brim with oil.
- Fill the other glass to the brim with water.
- Set the playing card over the mouth of the container filled with oil. Hold it firmly in place.
- Lift the oil container, turn it upside-down, and line it up directly over the water-filled container. Set the oil in place over the container holding the water. Keep the card between the containers to let the liquids settle. Slowly and gently remove the playing card. What happens? The oil and water remain in their respective upper and lower containers.
- Now, repeat the process (start over completely.) But, this time, turn the water container upside down and place it on top of the oil-filled container. Carefully remove the card and watch what happens. The water and oil switch places. If you wait long enough, it will look almost exactly opposite of how it started, too.

SCIENCE: Oil and water do **not** mix. The molecules of water can't mix with the molecules of oil. Even if you try to shake up a bottle of half-oil and half-water, the oil just breaks up into smaller droplets, but it doesn't truly mix with the water. Also, food coloring only mixes with water. It does not color the oil at all. If you see coloring in the oil, those are tiny droplets of water trapped in the oil.

When you set the water container above the oil container and remove the card, the water sinks and the oil floats. They switch places. Oil floats on the surface because water is heavier than oil. Scientists say that water is more dense than oil. This is why the oil always stays in the top container.

https://www.stevespanglerscience.com/lab/experiments/oil-and-water/

EXPERIMENT 4: RISING WATER.

Objectives:

- To demonstrate the effects of pressure and attractive forces.

MATERIALS: Water, a plate, a candle, a glass (a coontainer), a lighter, food coloring (optional)

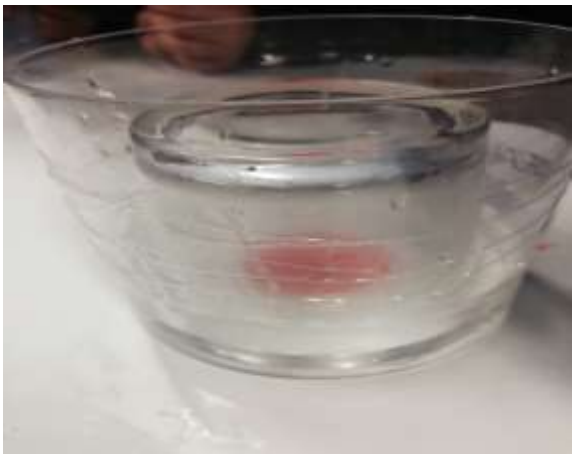
PROCEDURE:

- Pour the colored water in the plate.
- Place the candle in the middle of the plate, light the candle and cover it with the glass.
- Observe what happens.

SCIENCE:

- The candle flame will gradually diminish in size as it consumes the oxygen inside the bottle The candle goes out because it runs out of oxygen
- Heat produced by the candle's flame causes the air inside the bottle to expand – termal expansion- some of this expanding air is forced out of the bottle which can be observed as it bubbles through the water .
- When the candle flame expires, the remaining air in the bottle begins to cool – a cooling gas contracts creating a partial vacuum (a region of lower than atmospheric pressure) – the higher external pressure forces water into the bottle until the external and internal pressures are equalised (the pressure inside the bottle is lower than the pressure outside the bottle)
- The height to which the water rises depends on the shape of the bottle and the volume of the candle.

Thermal expansion – gases expand when heated and contract when cooled. Gases move from regions of high pressure to regions of low pressure until the pressure in both regions is equal . A vacuum is a region of lower than atmospheric pressure



https://www.youtube.com/watch?v=-g6tShHPxdA&feature=emb_logo

GEAR (Global and Environmental Awareness and Responsibility) – a Toolkit for Inclusive Environmental Education

Project Element: Water

Tool: Marbling paper. Painting with water and oil.

Age: 5th and 6th grades together.

Objectives:

- To experiment with science (chemistry) to create an artwork.
- To revise simple concepst about mixtures and matter.

Basic transversal competences:

B.C. 08: competence for thinking, learning and communicating:

- Exploring objects and materials in order to create an artwork that will have a practical use.
- Applying previous knowledge in order to carry out a task.

B.C. 09: Competence for learning and living and communicating together:

- Taking part in interpersonal, group situations in a collaborative manner.

MATERIALS

- Baking dish, cooking oil, liquid watercolor (or food coloring), heavy paper (sketch paper, watercolor paper,cardboard), eye droppers, pipettes or paint brushes.

PROCESS

- •Mix up some food coloring with cooking oil in a few cups.
- •Use a tray and add a thin layer of water to cover the bottom.
- Next use your eye dropper to drop the colorful oil in various patterns on top of the water.
- •Place the paper on top of the creation.
- •The oils will be absorbed into the paper along with the colors.
- •Remove the paper and let it settle on a surface to dry out.

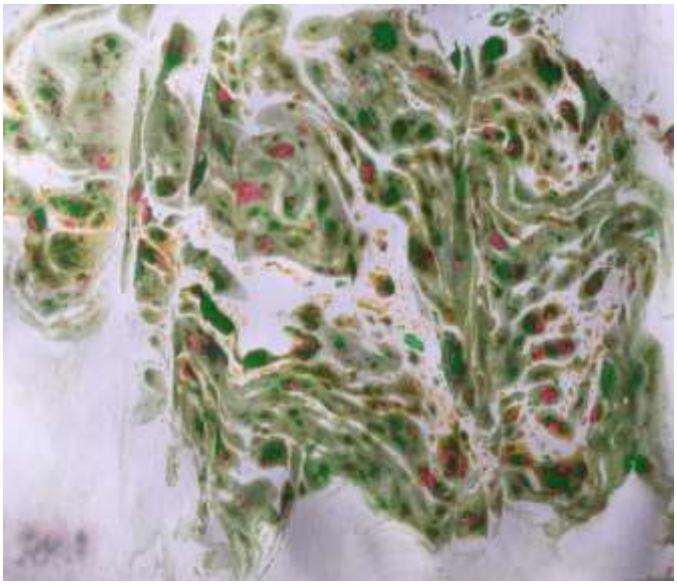
FINAL PRODUCT

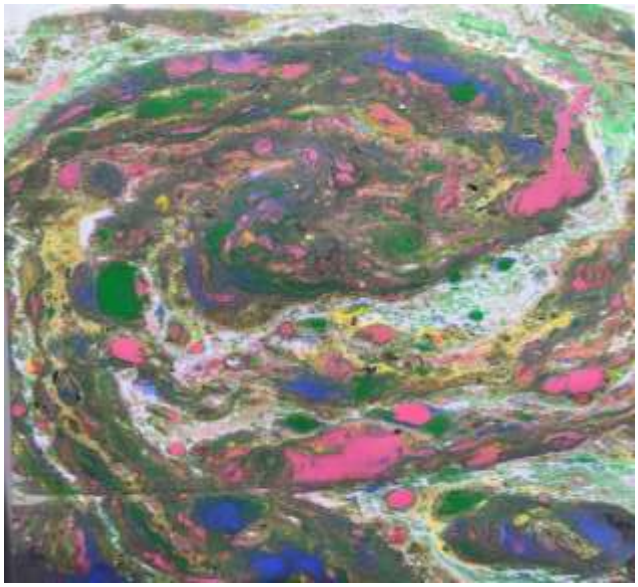
- Pupils made notebooks using the marbled paper.

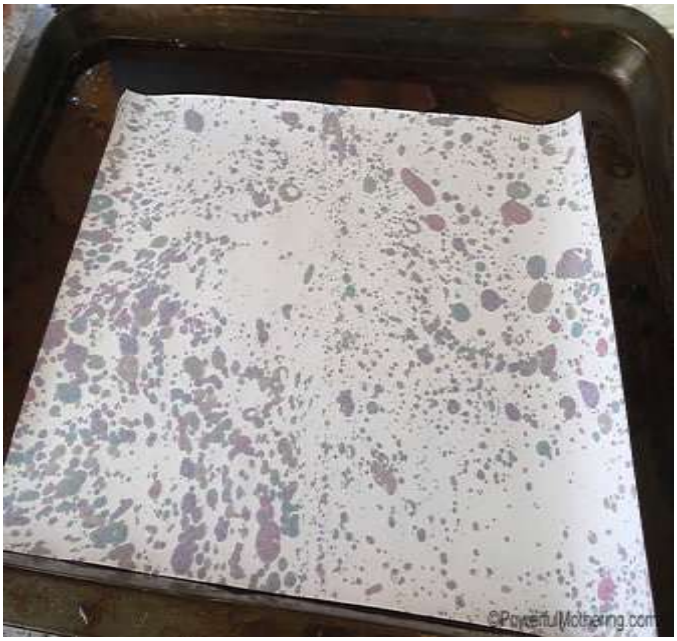
SCIENCE BEHIND

- Oil is less dense than water. That means that the molecules that make up water are packed more tightly than those in the same amount of oil, so water will always sink below the oil.

- Oil and water don't mix because water likes itself more than oil. Oil is non-polar, which means it's "afraid of water" so it doesn't like to mix and water molecules are more attracted to other water molecules than oil molecules because they are polar. So, oil only likes non-polar molecules and water only like polar molecules.







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