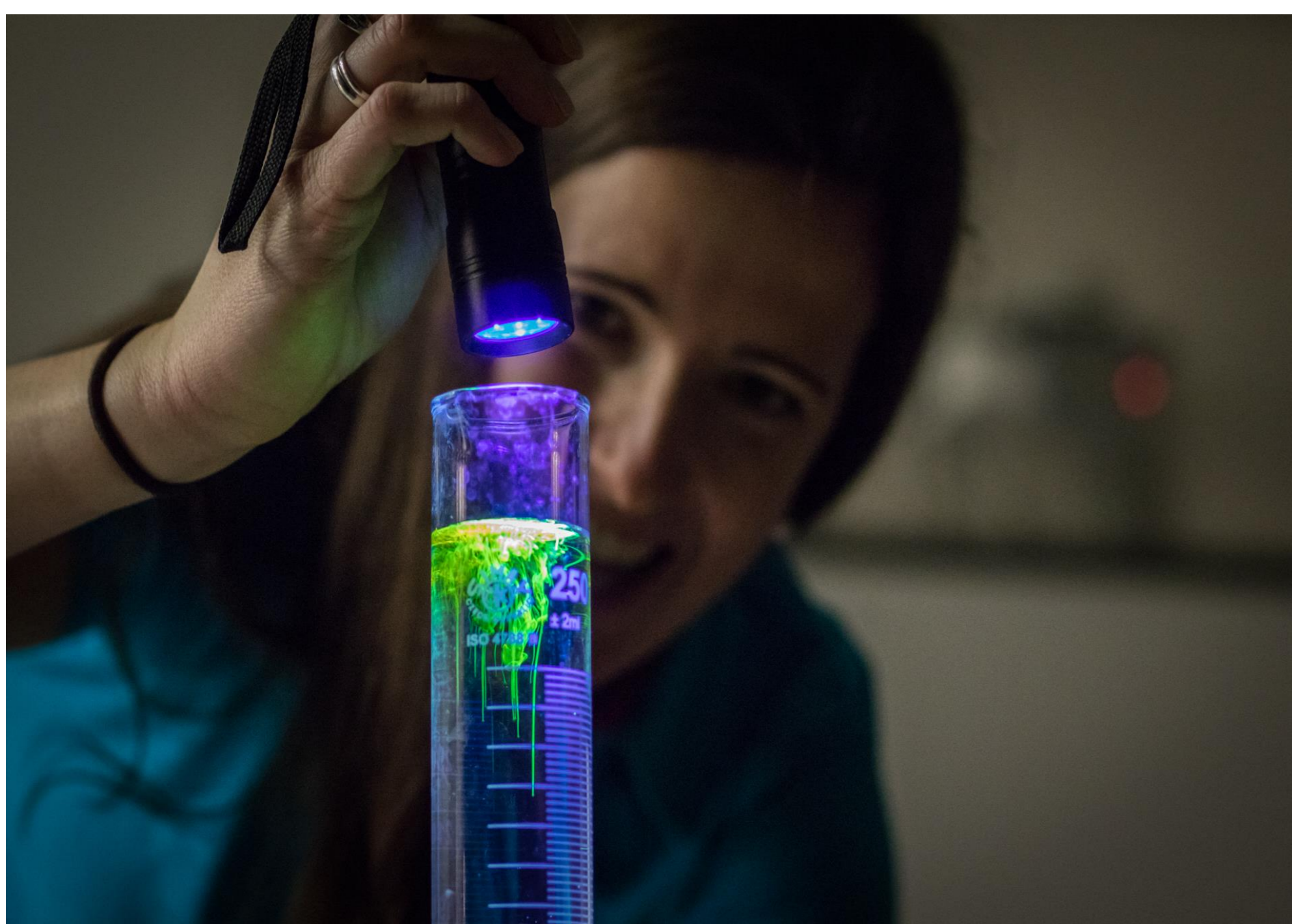


Monika Hojdanová and Šárka Látalová | VIDA! Science centre | Brno | Czech Republic

Life of Plants

**How do plants work? Why are they green?
Do you know how to light up the wood?**
Let's take a chance to think about plants in another way !

Kingdom of plants seems to be full of “magic”. Through the different kind of playful experiments we can explore principles at least some of them. Learn how does the capillary action and the photosynthesis work, try to extract chlorophyll and see the power of the chestnut fluorescence.



How important are plants for our life? How often do you use something that is made from plants? Can we live without them? The answers are right here...

We tend to forget the importance of plants and take them for granted. But for our long-term survival we need to understand them as much as possible.

Jitka Soukupová, Kateřina Osmiková | Grammar school | Stříbro | Czech Republic

Visit famous scientists and discoverers with us

a leisure time activity for 6 – 18 years old kids

- interesting facts from the life and work of selected scientists
- information about the countries where they lived
- simple models and experiments related to discoveries, inventions, experiments, and observations by individual scientists
- instructions for experiments and models preparation
- a 12-month calendar with 12 scientists and discoverers and 24 experiments



An important part of the project is inter-subject interconnection of information - history - information about life and work of selected physicists / scientists / discoverers, geography - information about the period and the country in which they lived / worked, math and science - realization of models and experiments related to discoveries, experiments and observations of individual scientists, preparation of instructions for individual models and experiments.

This is a two-level project - pupils and students aged 15-18 work in groups across age, all groups are jointly preparing presentations and models and experiments for their chosen scientist and presenting their outputs to each other, then presenting project results to pupils aged 6-10 and 11-14 years in the form of workshops – experiments, science toys and models.



These are 12 cartoon figures of famous scientists and explorers, information cards and maps of countries where scientists lived and worked. To each of the scientists we have prepared examples of two physical experiments or models.

Jitka Soukupová, Kateřina Osmiková | Grammar school | Stříbro | Czech Republic

Visit famous scientists and discoverers with us

Rene Descartes

- lived between 1596 and 1690, his birthplace was France – Brittany
- was a French philosopher, mathematician and naturalist
- formulated the law of reflection and refraction
- introduced a Cartesian coordinate system in geometry
- determined the refractive index of glass and water



Cartesian diver - PET bottle, water, straw, paper clips, balloon, rubber bands

If you press the bottle, the water is pushed inside the straw that forms the octopus's body. This increases the average density of the octopus and the octopus descends to the bottom. If we release the bottle, the pressure will decrease, the water will flow out of the straw and the octopus will have air inside, so it will have a lower density and it will ascend.

Hidden picture - 2 cups, 2 pictures, water pearls, glass of water

Water pearls are made up of more than 99 % of water. When water pearls are submerged in water, they have the same refractive index as water. The light passes through them without changing direction and the image below the cup is visible. In a situation where there is air around the water pearls, the water pearls have a different refractive index (1.33) than air (1), so the light on the water-air interface breaks, and we don't see the picture.



Did you know that ...

**the physical toy "Cartesian Diver" is named after Descartes
he was an active fencer and wrote a scientific treatise on fencing
designed and constructed his own microscope**

Kaisu Pöyskö & Anniina Vimpari | Kindergarten Piilometsä | Oulu | Finland

Play a role and learn



Prehistory

Four outdoor projects

Creativity is an asset of the future. The children are allowed to play roles while exploring, experimenting and solving problems.



Water protection

Children are involved in project:

- Design, work and reflection.



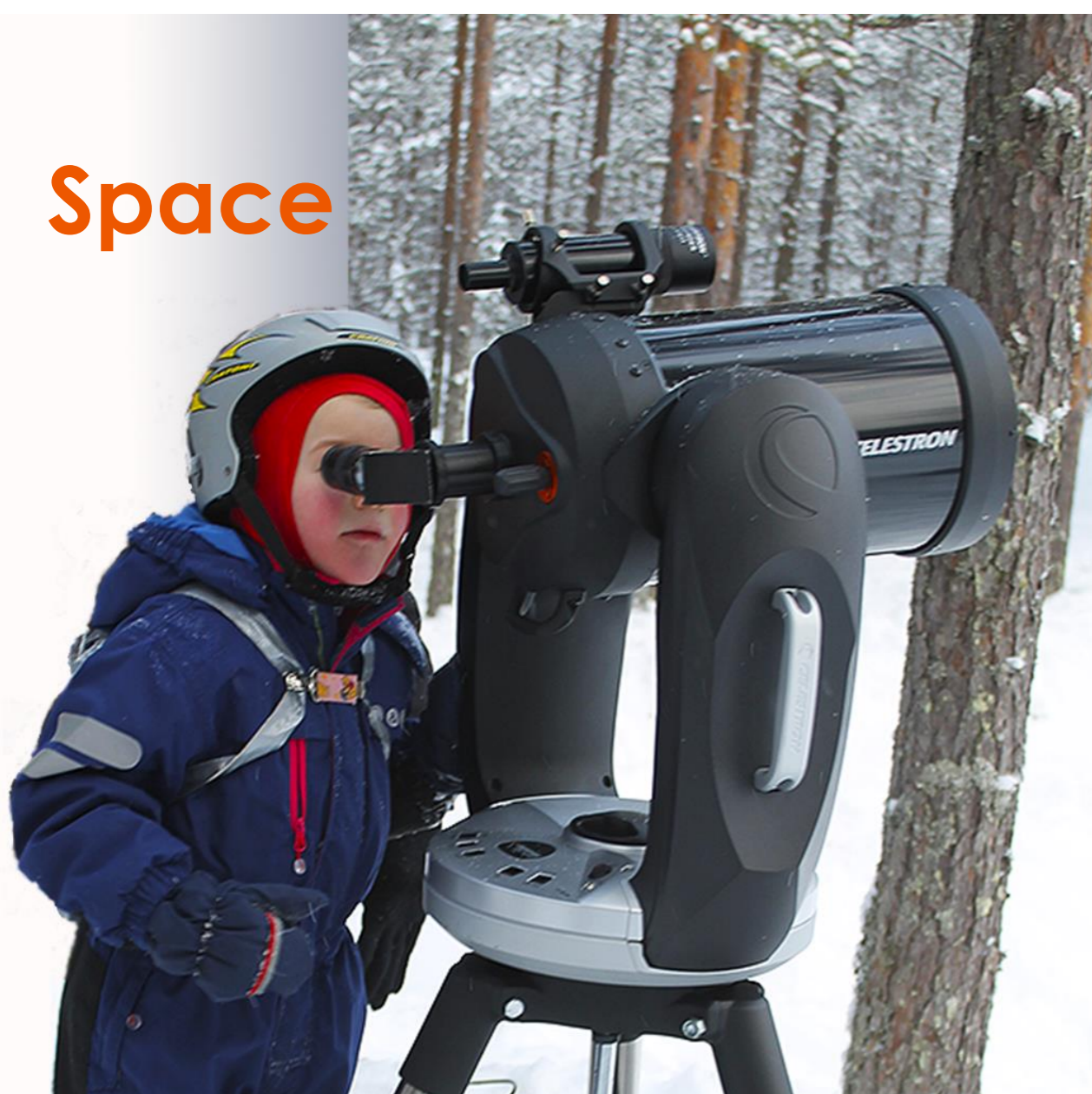
Recycled and natural materials are used.

Teaching takes into account the interests of children.

- Children are allowed to use imagination.
- Children are active and come up with their own ideas.
- Instead of studying inside children work outdoor or in nature.
- Many subjects can be combined: example art and exercise.
- No whole group: individual and small group work.



Space



SOLAR SYSTEM



SUN

PLANETS

ASTEROID ZONE



Bat life



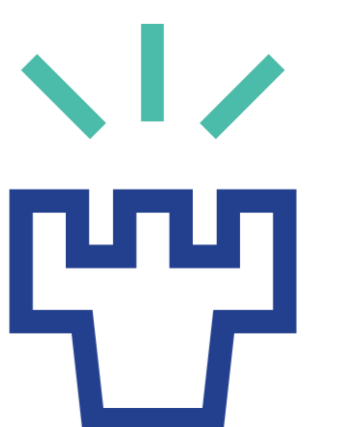
The learning process motivates if it matters in the child's life.

Project:

<http://www.piilometsa.fi/2019/08/play-role-and-learn-four-outdoor.html>



PIILOMETSÄ
www.piilometsa.fi



UNIVERSITY OF OULU

Kaisu Pöyskö & Anniina Vimpari | Kindergarten Piilometsä | Oulu | Finland

Play a role and learn



Prehistory

Four outdoor projects

Creativity is an asset of the future. The children are allowed to play roles while exploring, experimenting and solving problems.



Water protection

Children are involved in project:

- Design, work and reflection.



Recycled and natural materials are used.

Teaching takes into account the interests of children.

- Children are allowed to use imagination.
- Children are active and come up with their own ideas.
- Instead of studying inside children work outdoor or in nature.
- Many subjects can be combined: example art and exercise.
- No whole group: individual and small group work.



Space



SOLAR SYSTEM



SUN

PLANETS

ASTEROID ZONE



Bat life



The learning process motivates if it matters in the child's life.

Project: <http://www.piilometsa.fi/2019/08/play-role-and-learn-four-outdoor.html>

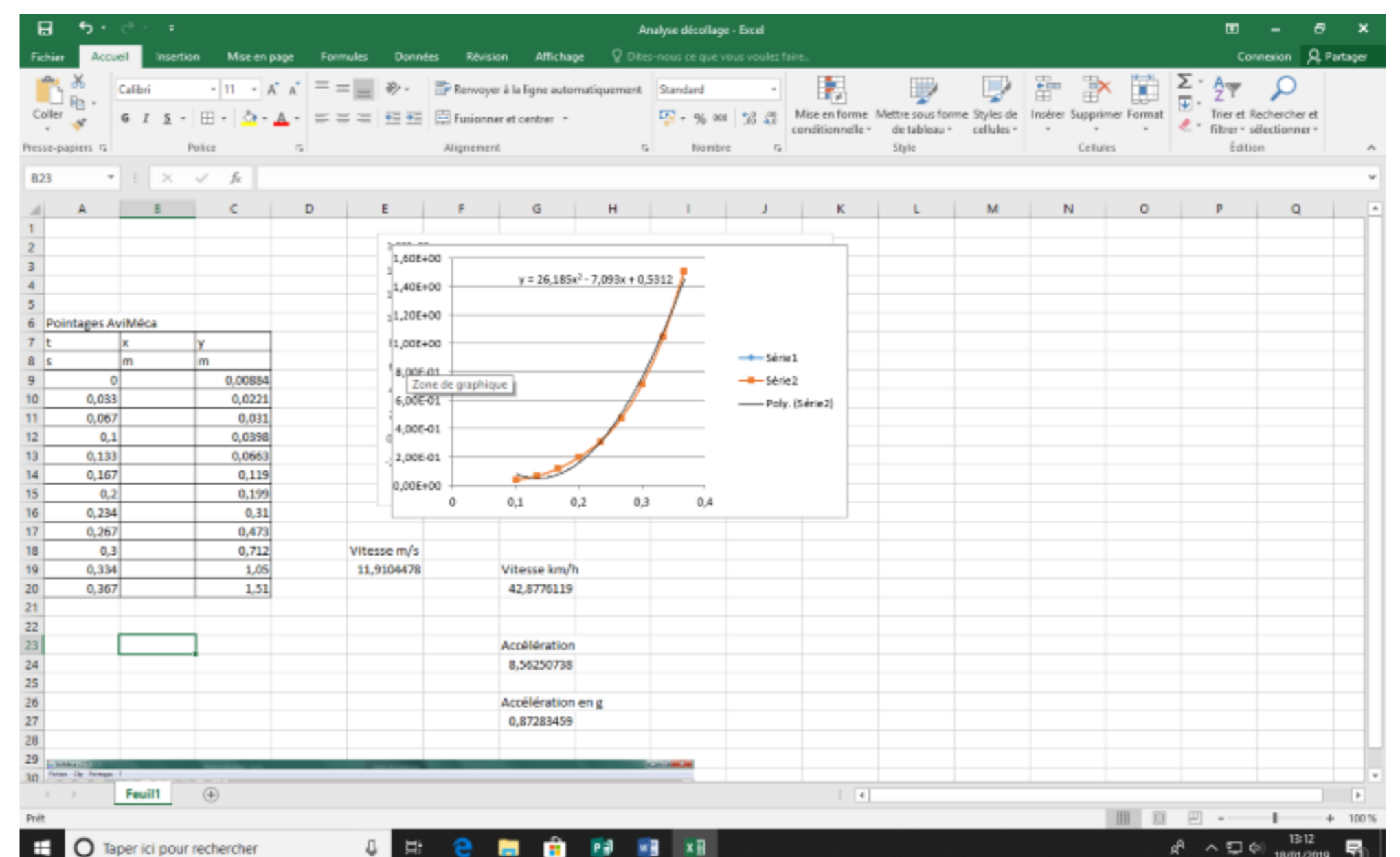
Astronomy and Space Exploration in Science Education

Seconde professionnelle | Lycée Saint Joseph | Vannes | France

Dreaming stars to live better on Earth

Micro-rocket project by students of professional second

The students designed micro-rockets, they made them using computer tools and a 3D printer, they made them take off from the Meucon aerodrome by respecting the security measures, and later in class they analyzed the flight data and they modeled the trajectories.



Students apply trigonometry, use software (Excel, AVIMECA, 3D printer) and connected equipment. They perform speed calculations from measurements in the field.

For a rocket to take off properly and climb to an interesting height, you have to design it, the students were motivated to have the best rocket ... they did maths and physics while having fun.

Nino Abesadze

American International High School-College Progress, Tbilisi, Georgia

Lali Mgeladze

N51 Public School, Tbilisi, Georgia

Game Laboratory



The game laboratory is intended for the kids ages 5-6 at the kindergartens. We tried to create the models according to the interests of children at this age. How can we observe and be invisible at the same time? How can we manage to keep the bird on the branch? How does the rainbow appear? How does the rain come? – to find solutions to all these questions our models will help them.



The important fact is that, children not only observe the physical phenomenon, but take part in creating of models.

By means of our toys, children learn while playing, these toys help them to develop the skills of observation and result making process. Children tend to develop the interest to learn more about the natural phenomenon.

Heroin Fountain



This wonderful game causes great surprise not only in children, but in adults, too.

Make a Drawing



This model teaches children the concept of symmetry.

Puppet Theatre



In this puppet theatre the children's most favorite heroes take part in. Children paint puppets and fix magnets on them.

Water Xylophone



Spiral



Equilibrium



It's very important, that kids not only conduct inquiry and discover, but they will play in our “Merry Laboratory”.

Don't you agree that children learn better while playing!

Astrid Pösl | Birkendorf Grundschule | Biberach an der Riss
Sonja Vochezer | Berger-Höhe Grundschule | Wangen im Allgäu
Schülerforschungszentrum Südwürttemberg e.V. | ww.sfz-bw.de | Germany

When...

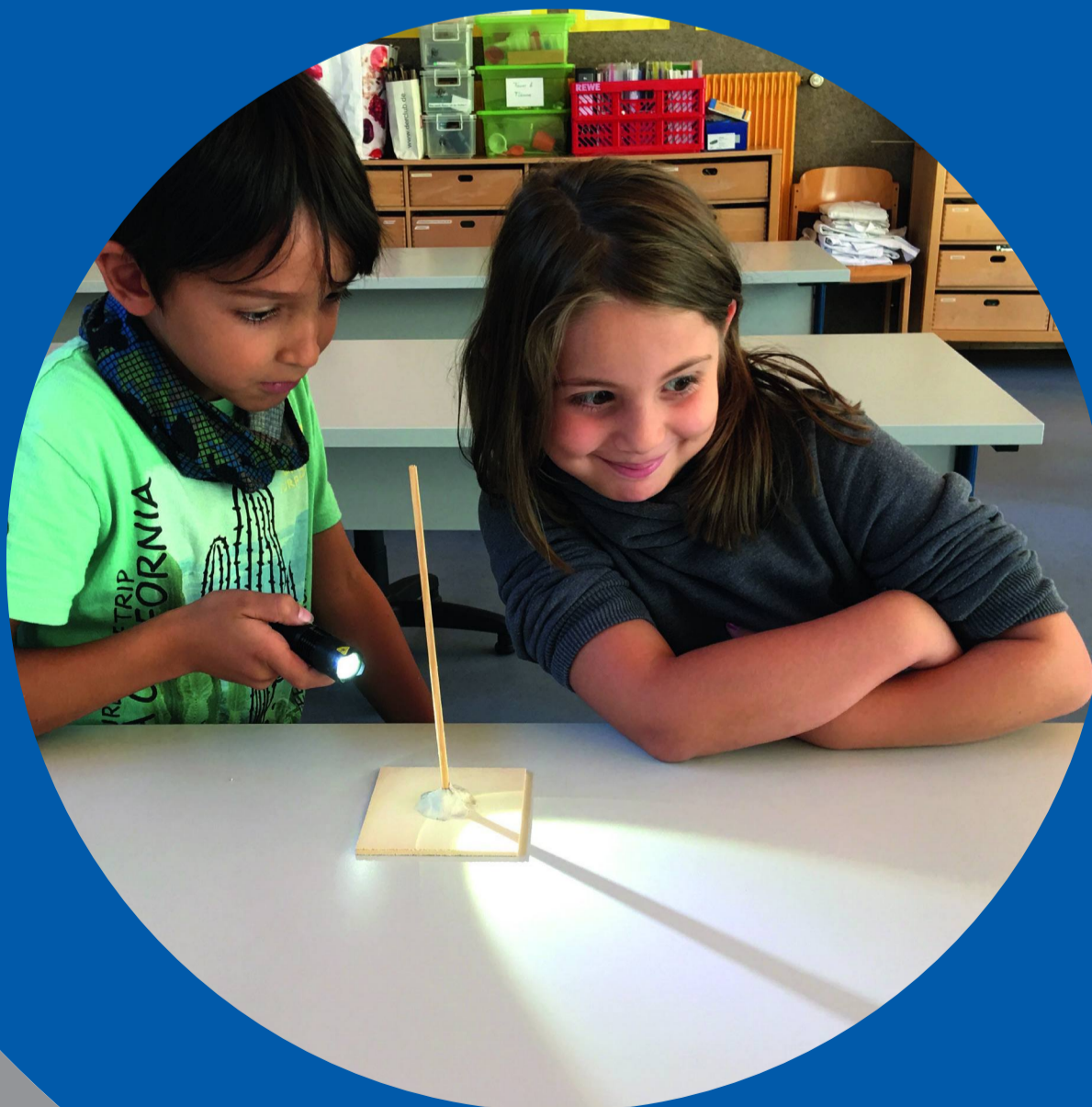
can you see light?

...when it hits something!

I. Properties of light



III. Light and shadow



II. Light and colour



Seeing and understanding
the characteristics of light

S. Puda, R. Rustige | Grundschule Birth | Velbert

„We become experts in insulation!“

Thermal insulation? A topic for primary school?

A **complex and highly scientific topic**, exciting and interesting for our youngest.

The terms **sustainability** and **energy efficiency** are omnipresent in everyday life.

But what does that mean?

The project shows how the complex topics of thermal insulation and resource protection can be presented in a simple and action-oriented way.



The aim is to promote **awareness of sustainability**, to implement own ideas, to include concrete conditions in our considerations and to understand the effects of physical forces.

Become
an
expert!!

Presuming, experimenting, understanding!

-> become an expert through action orientated learning!

“What we do today determines what the world will look like tomorrow.” (Boris Pasternak)

Science in Early Years



Evangelia Samanta -1st High School of Agios Athanasios
Angeliki Samanta -27th Primary School of Acharnes
Giannis Mindis - 1st Primary School of Aridaia Greece

Oh that gravity!

Celestial object	Gravity (g) m/sec ²
Mercury	3,7
Venus	8,87
Earth	9,81
Mars	3,71
Jupiter	24,79
Saturn	10,44
Neptune	11,15
Uranus	8,87
Moon	1,62
Sun	274
Io	1,796
Pluto	0,62
Ceres	0,27
Eris	0,79
Makemake	0,47
haumea	0,63
Titan	1,35
Ganymede	1,43

Scientific spark

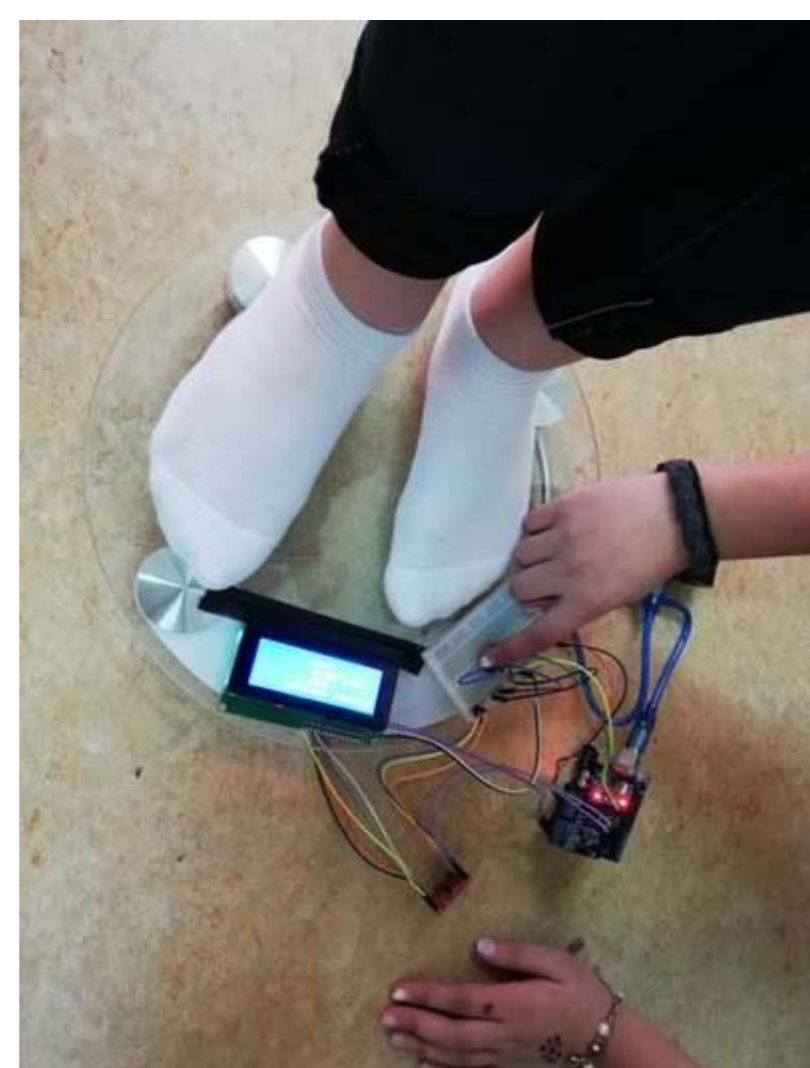
Scientists have shown a great interest in **gravity**. Before Newton, Aristotle had noted that objects tend to move towards the position they should be. Many Scientists tried to understand that force and its effects .

A question to be answered is whether a student can think that the moon and the other planets have gravity. Also to distinguish the difference between mass and gravity.

Our way

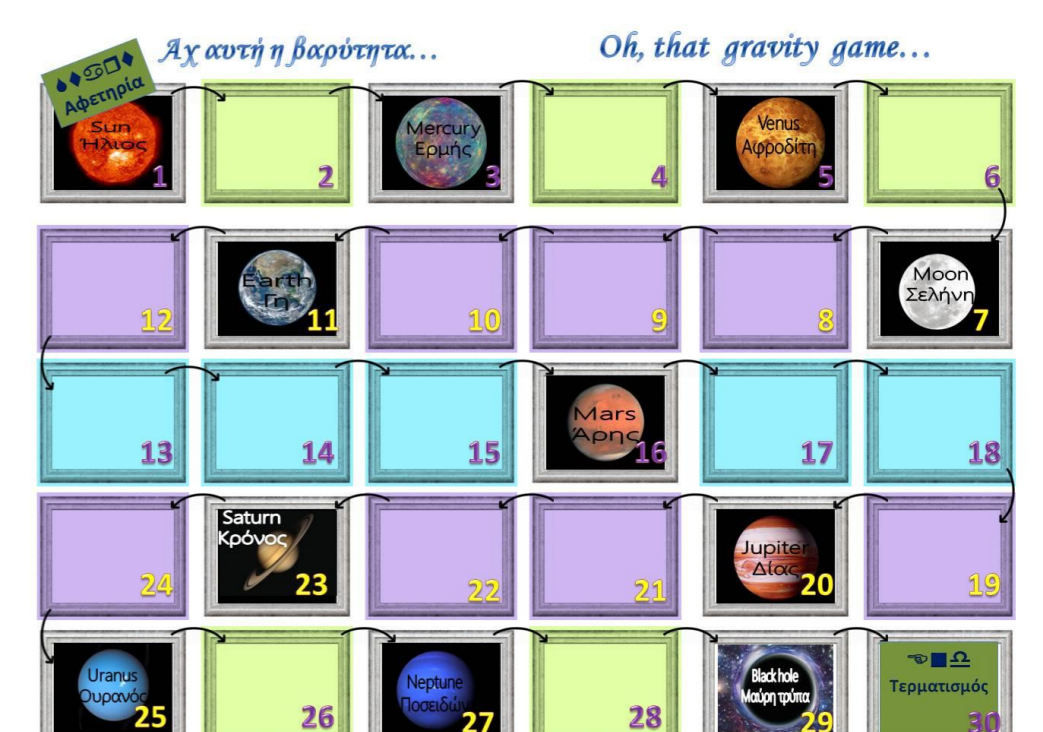
Inquiry teaching is really helpful in making students accept different ideas. In this project, students were called to search, study videos, try to simulate moves, wonder, discuss and finally construct. Our project included activities :

- 2 scale constructions using Arduino platform
- 2 scale construction using everyday materials
- a smartphone application
- a pc application
- a board game and a classroom game



The game – fun and knowledge

Our team created a board game and a classroom game where the players can test their knowledge , new and old , just to have fun . The game will be in Cascais from 31/10 to 3/11. Come and find out by yourselves.



For more informations , questions or just curiosity , please visit :
<https://ohthatgravity.weebly.com/>

Katalin Papp, Fanni Flach | Szent-Györgyi Albert Agóra | Szeged | Hungary

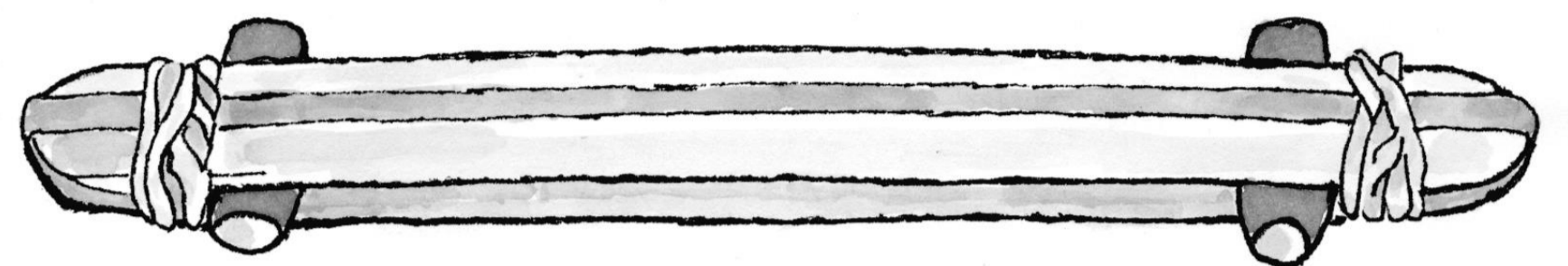
First Kiss with Science

Science experiments outside the classroom

Abstract

Low motivation and weak attitude are great problems of science teaching internationally and in Hungary. Our aim is to address this problem with self-developed experiments and programs, that have been part of "Let's Play Science" classes. The thematic experiments support the establishment of interest in science in the early years and help the development of thinking skills. The main goal of our project is to show an example of low-cost scientific experiments that are suitable for children in kindergarten and primary school. [1]

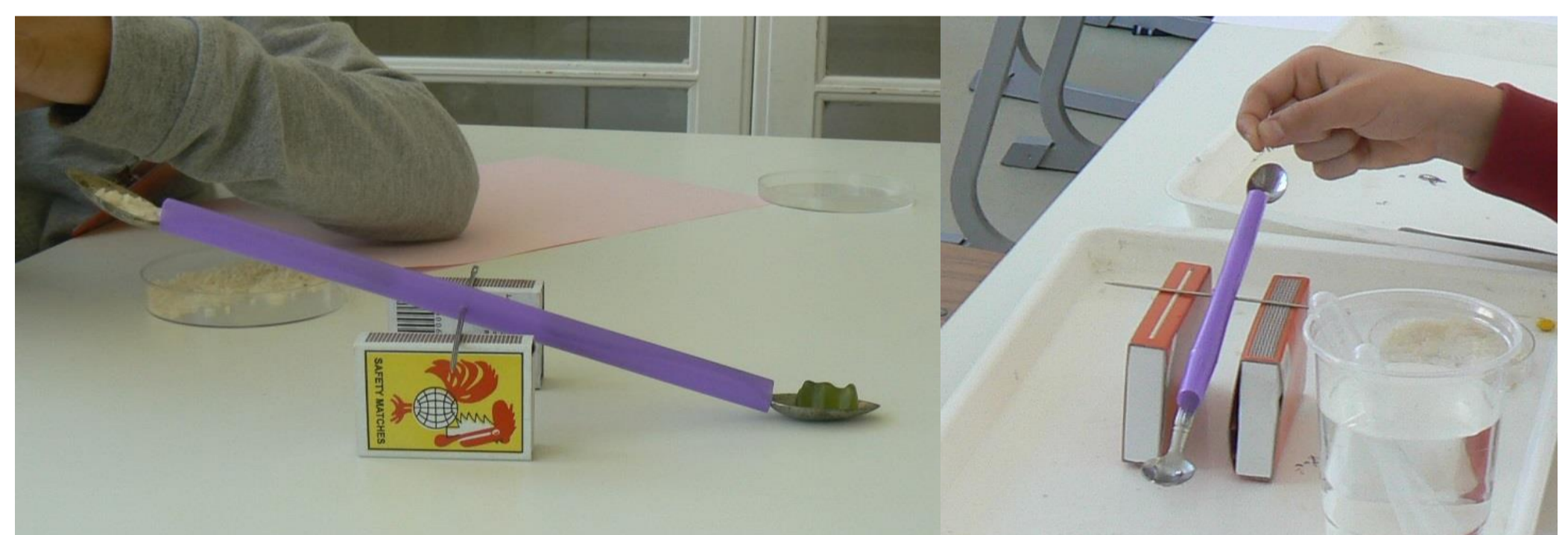
Sandwich horn



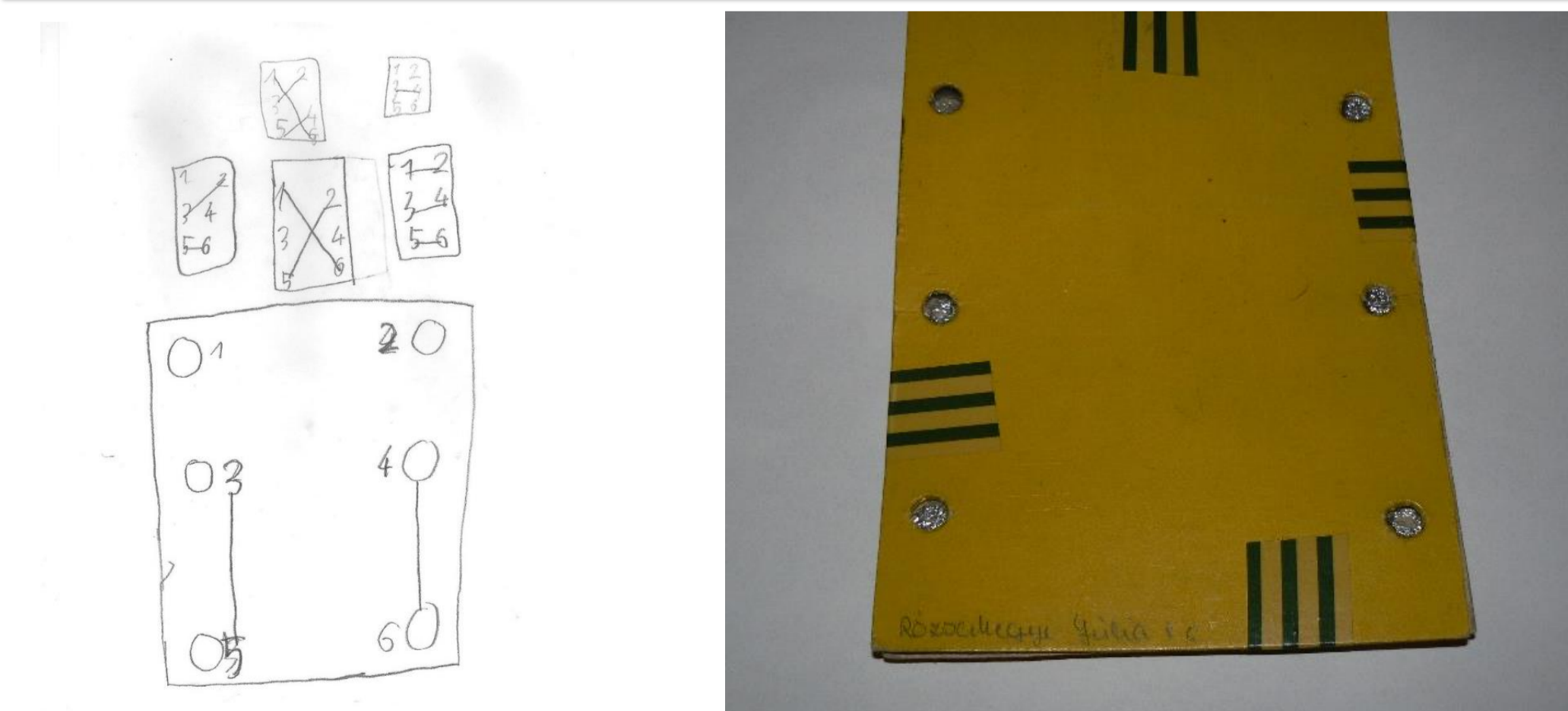
Oersted's experiment



Straw balance



Electric black box



Conclusion

"Let's Play Science" is unique in Hungary. This program promotes inquiry-based activities, therefore help to develop scientific skills and motivation of 6-10 years old children.

[1] Molnár M., Papp K. (2014): Természettudományos nevelés kisgyermekkorban - egy példa Szegedről. Fizikai Szemle 64/3 p.74-79.

Jane Shimizu | Scoil Chaitríona Junior | Galway | IRELAND

STEM Learning with Projectiles

Using projectiles to engage early years primary school students in STEM education.

Using space and rockets/projectiles as a theme to encourage students to become interested and engaged in mathematics, science, technology and engineering and arts.

Encouraging active learning by

- Questioning
- Observing
- Decision-making
- Designing
- Making and researching
- Being enthusiastic



Using space as a topic to encourage young students to take an active interest in STEM and STEAM subjects.

- curiosity
- collaboration
- creativity
- critical thinking
- communication
- inquiry-based learning

Active Learning is FUN!

Teachers at the affiliate of Republican Physics and Mathematics School NCJSC in Nur-Sultan(Astana): Dana Salkhayeva, Gulnara Zhakupova

“Creative clay”

as an instrument for development of abstract thinking of students during math class.

This “Creative clay” project aims at the development of abstract thinking of students during math lessons. Applicable nature of the project stimulates students’ interest in the math from an early age, develops fine motor skills, improve the spatial awareness of students.

Objectives:

- motor development;
- development of color perception;
- development of the ability to work with geometric figures;
- development of skills in working with solid figures;
- development of abstract and logical thinking;
- to contribute to the creation of conditions for internal psychological balance.



Our studies show that there are some barriers to ensure high quality of education for students such as:

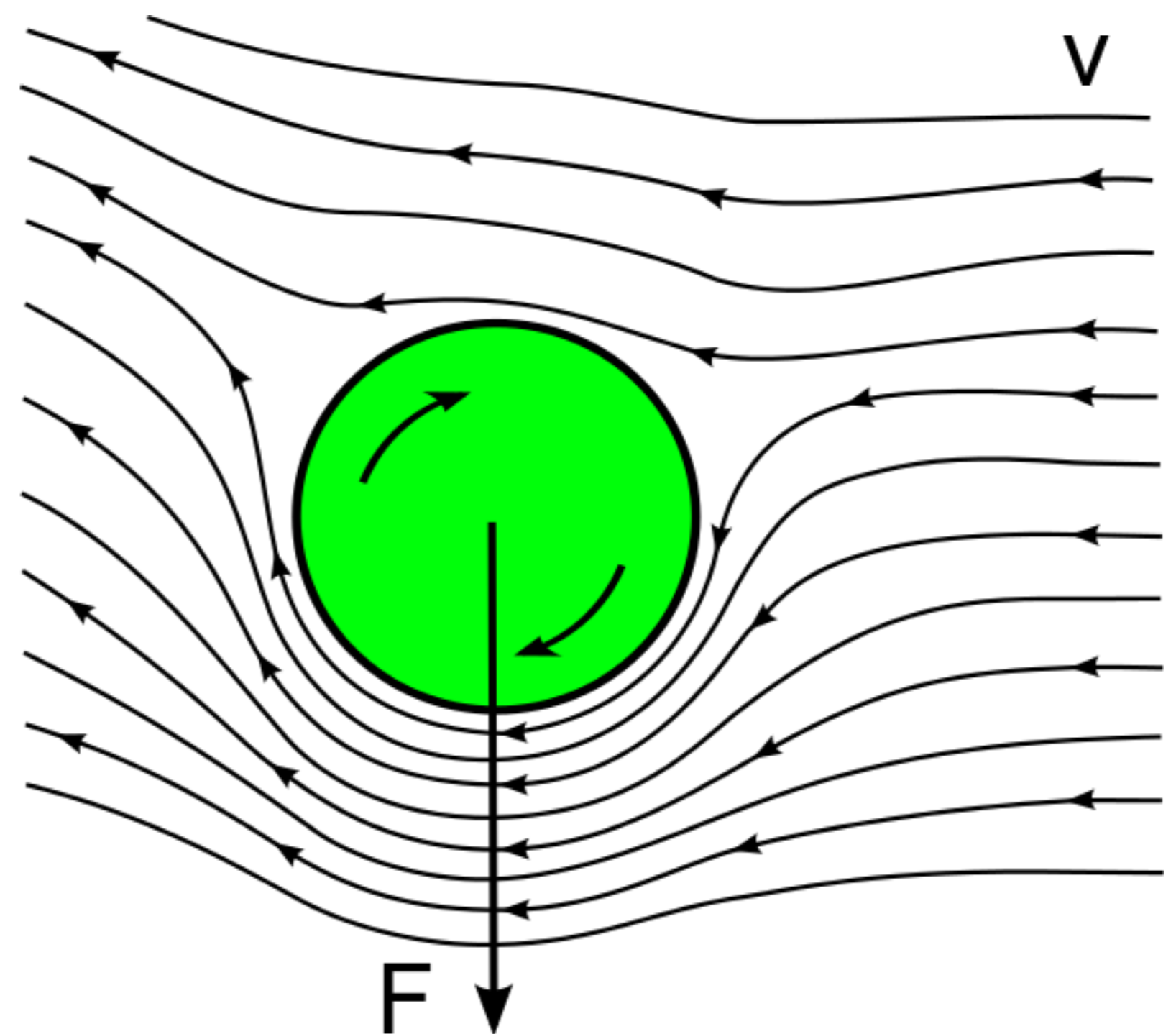
1. Unsatisfactory quantitative and qualitative level of tasks in existing textbooks and manuals.
2. The abstract content of the tasks of a high school mathematics course.
3. The lack of a course that gives opportunity to study all levels of modeling in mathematics..

During the project, the following results were obtained: development of natural skills of students helped them to demonstrate their own uniqueness and creativity.

Zintis Buls | Zemgale Region Human Resource and Competences Development Centre | Jelgava | Latvia

And yet it moves

- Experiments and demonstrations on rotation;
- Performed with simple, easy to find materials;
- Demonstrate physical phenomena in an easy to understand manner;
- Early Years experience improves understanding in later classes.



Aim: Provide knowledge and experience that helps children understand the associated laws of physics when they are introduced in primary and secondary school.

Activities can be implemented to diversify the natural science curriculum in elementary school or vocational programs. Physics teachers can use the demonstrations to illustrate the associated forces and laws when they are being learned in the class.

Maria Dobkowska | Primary Integrated School no 339 | Warsaw | Poland

Teens for kids

The aim of this project is to explore secrets of science by first and second elementary grade children. Older students, through attractive activities and games with funny toys and devices, explain the phenomena and principles of their operation.

Older students prepare their self made devices and sets



Pitagorean cup



air driven car



solving problems



walking Minions

Conclusion: Children, with great pleasure and joy, perform observations and simple experiments and their older colleagues explain HOW and WHY in an understandable language. Children, while playing, acquire new knowledge in an easy way.

Izabela Kaleta | Primary School | Wola Jachowa | Poland

Journey to the Land of Geometry

Theater and mathematical educational project



The effect of children's work was the performance entitled „THE BOX”

The plot of the performance shows the adventures of several gnomes living in a box, which turns out to be a fairy-tale land of geometry.



The viewer sets off on a journey through this land and, together with the characters, learns about its geometric world: point, straight lines, curves, broken, horizontal, vertical, square, rectangle, circle, quadrangle, diamond, etc.



During the preparation of the performance, the children led, among others:

- **mathematical experiments** - measuring with tape measure and protractor;
- **artistic and technical** - creating scenery in the yard - experiments with cardboard and paper - creating geometric figures - including circle, square, rectangle, trapezoid, etc.
- **experiments with your own body** - using elements of sports acrobatics and circus pedagogy to create geometric figures in space;
- took part in **physical games with music, danced, arranged and sang songs about geometry.**



Learning through image and theater action teaches more than 1000 words read.

Beata Źarska | Primary School No. 68 | Wrocław | Poland

Colors

Once upon a time in the Land of Colour there lived a beautiful Lady Cabbage. There were two admirers who tried to woo her. In close proximity of Mr Alkaline she would go green (out of anger perhaps?) but Mr Acid... made her blush.

Magic? No. A tale? Yes, created and illustrated by children in order to help understand the pH indication from red cabbage experiment.



Children's imagination, having fun, an interesting story, magic of chemistry, lights, music and of course dressing up in costumes are the keys to successful interdisciplinary learning.

Marta Ferreira e Sandra Vasconcelos | AE Pedro eanes Lobato, Amora | Seixal | Portugal

MOON SHELTER

Abstract:

To celebrate the 50th anniversary of the Moon landing we wish to teach our students more about the natural satellite of our planet Earth, to improve their knowledge.

What our project is about:

We pretend that our students learn more about the Moon, about its characteristics, and use the TIC to produce a Moon Shelter.

Materials used in this project:

Flash cards, Moon photographs, computer program Tinkercad, PC, paper crafts, posters and Moon shelters models.



How it works, how others could do it too:

This is an ESA contest that teachers can work inside their classroom using a PC and the computer programme TINKERCAD and have FUN!

De Aymerich, B. and Oyanguren, J. | Espiciencia | Espinosa de los Monteros | Spain

Fighting against rural development with technology. Our mobile apps.

USING DESIGN THINKING AND TECHNOLOGY AGAINST RURAL DEPOPULATION

1.- IDENTIFICATION OF THE PROBLEM SITUATION.-

We visualized some videos and read articles related to rural depopulation and initiatives that were being carried out in Spain to stop this problem to empathize with situations similar to ours. We specify that we were going to try to solve it by designing mobile applications related to the approach to services, education and agriculture and the environment.

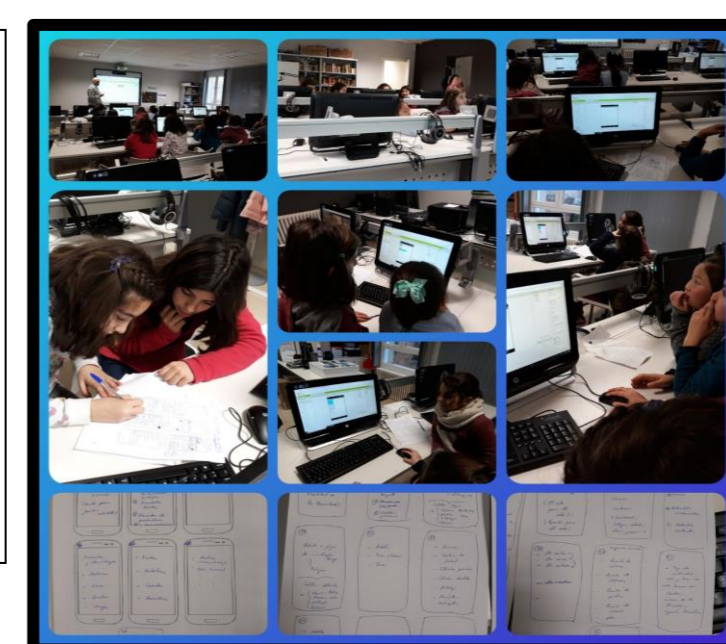
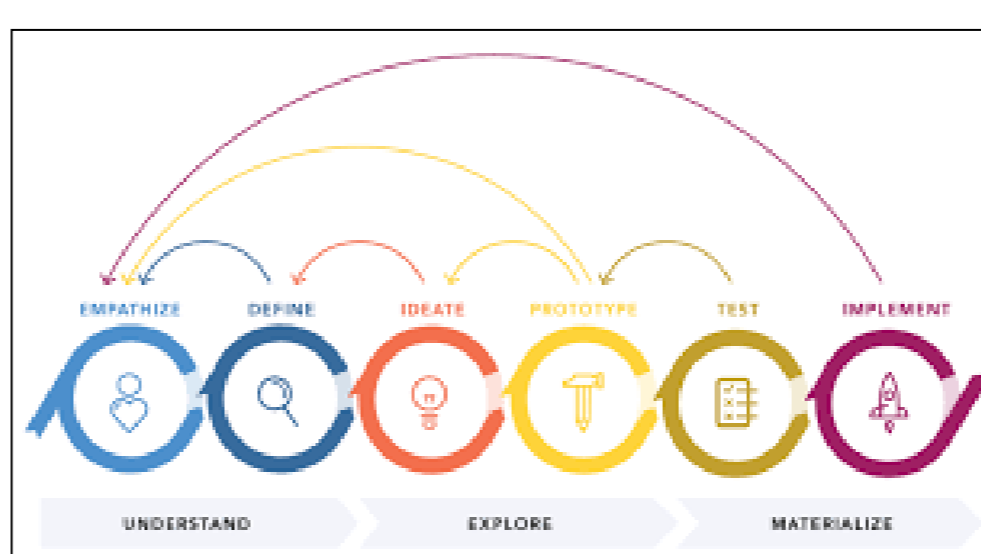
2.- BRAINSTORMING.-

We exposed our different points of view and suggest several possible applications. Among all, we chose three according to the following criteria: simplicity in execution, efficiency in solving the problem, possible commercialization.

3.- APPLICATIONS DESIGN.- To carry them out, we use the Appinventor2 program designed by MIT, based on the block programming we already knew thanks to Scratch. Previously we made a design on paper, specifying what would be the content of each screen and the interactions between them.

4.- PRESENTATION OF THE APPLICATIONS.- Once finished, we call a meeting with our parents and explain what they were and how they were used. They helped us to observe possible failures and improvements.

5.- IMPROVEMENT.- Once the applications have been evaluated, we make the pertinent improvements and make an audiovisual presentation to make them known.



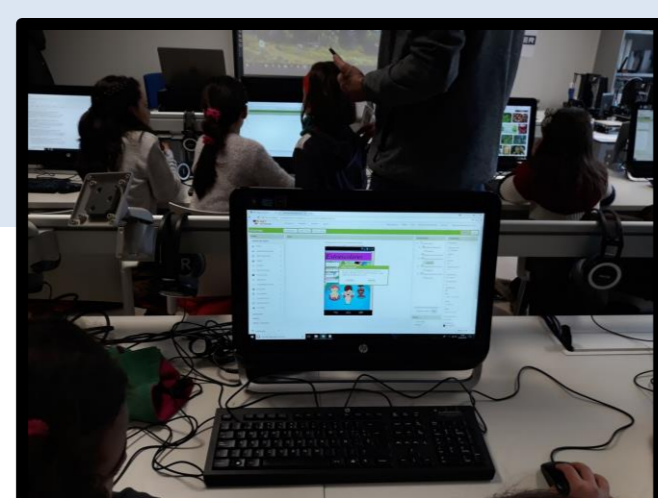
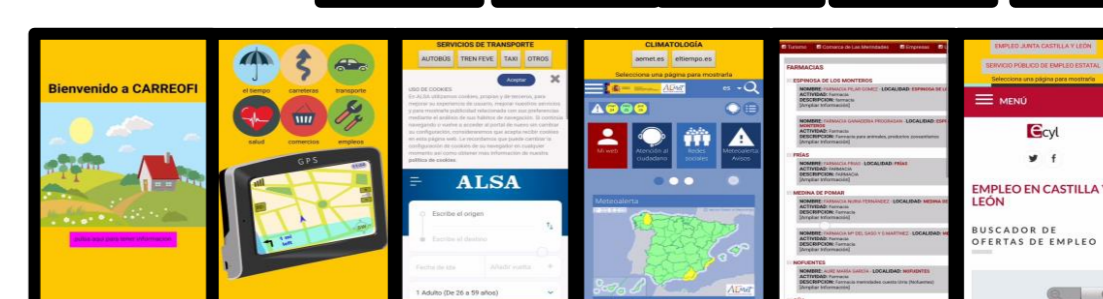
SCHOOLAPP



PLANTA Y RECOGE



CARREOFI



- Science and technology are means and ends to fight against rural depopulation because they help to bring the population closer to primary services, education, leisure and mobility.
- Science does not know ages or sexes, is universal and it has to be available to all mankind.

M^a Aranzazu Pera Gilaberte CEIP JOAQUÍN COSTA SCHOOL | GRAUS (HUESCA) | SPAIN
Alfonso Alés Tejero



The effects of acid rain on plant growth.



Experiment carried out by a group of students of **5th** and **6th** grade of Primary Education to study, using **the scientific method**, the impact of this environmental issue in their own village (Graus, Huesca, Spain).

HYPOTHESIS:

If we water the plants (with acid rain, they will grow less or even die.

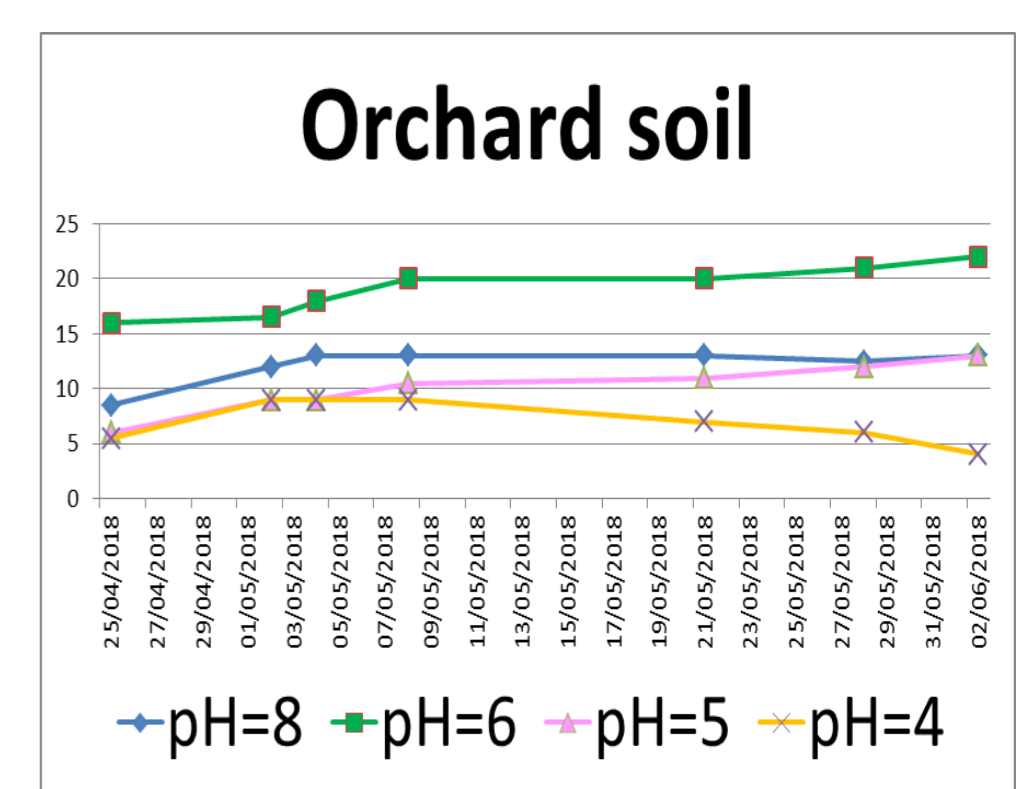
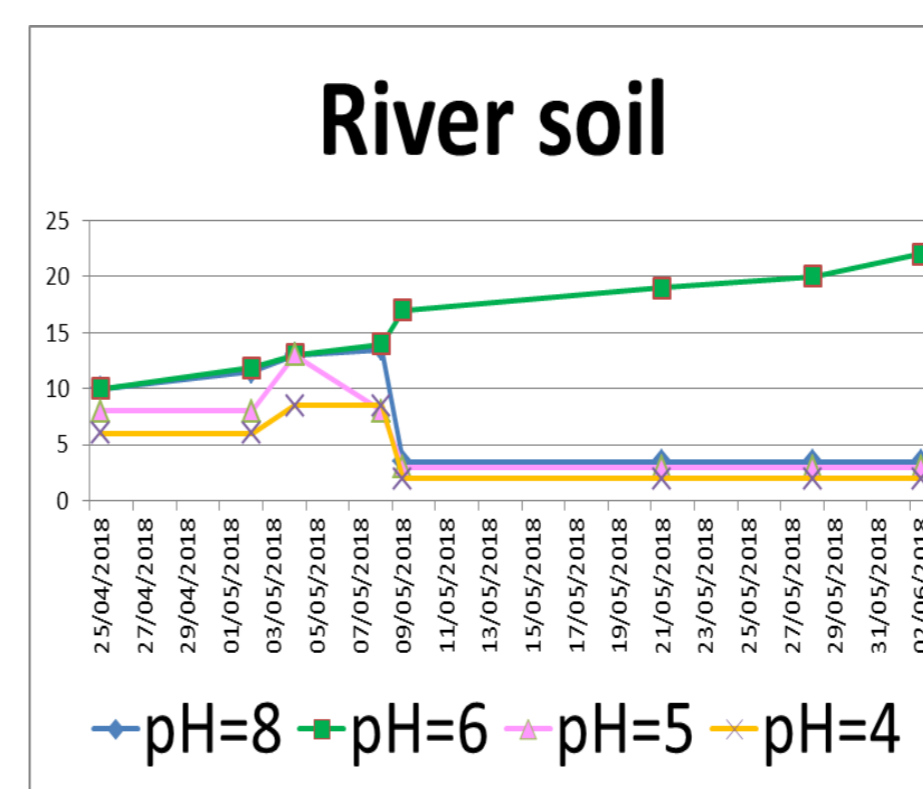
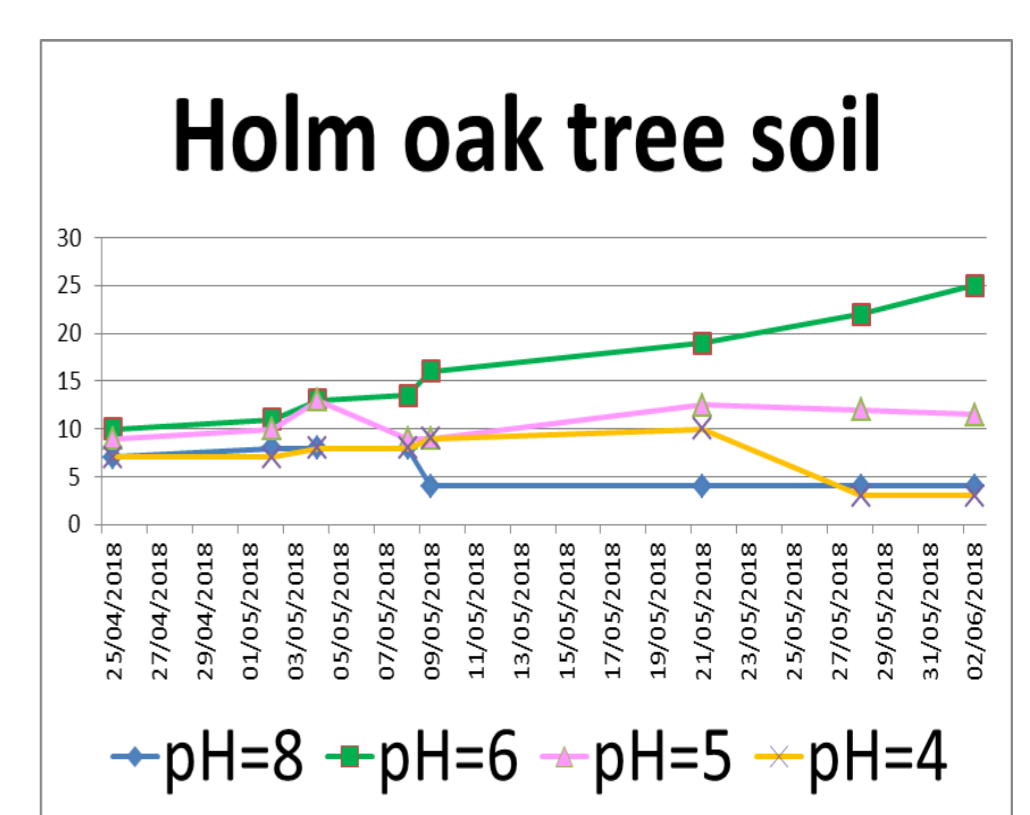
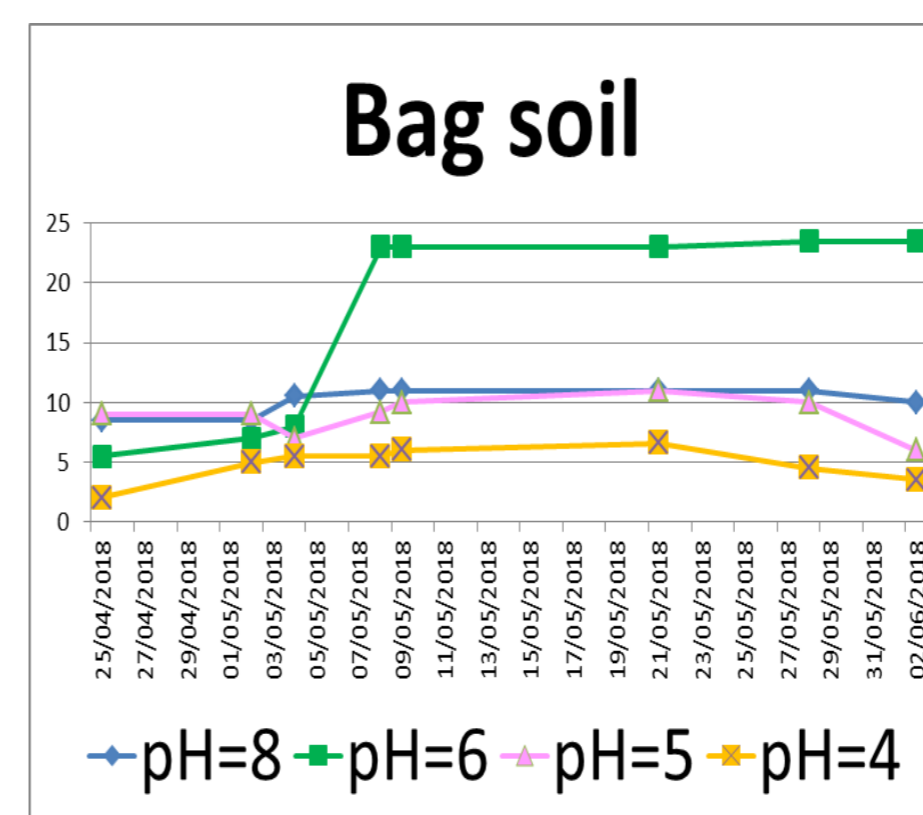
STEPS:

- 1) Fill the seedbed with the types of soil (one row with each type)
- 2) Plant tomatoes and beans.
- 3) Once the plants have just germinated, they are irrigated with water with different types of pH: 4-5-6-8). The plants are placed in the seedbed with a color code and irrigated with water of that pH (orange=4, pink=5, green=6/7 and blue=8) → To avoid hazard in our results → 3-4 plants each pH.
- 4) Data collection (stem height).
- 5) Linear type graphs. Ordinate axis, dates. Abscissa axis, the height of the plant.
- 6) Data analysis and conclusions.

Our students: Ángela, Carmen, Javier, Laude, Lucas and Sara



RESULTS



Seedbed with the final plants



CONCLUSION: As expected in our hypothesis, the lower the pH of the acid rain, the easier the plants die.

FURTHER OBSERVATIONS: pH around 8 (tap water) is neither good for plants growth.

Sharon Durant | Bexhill Academy | Sunderland | United Kingdom

Sing a Song of Science

Using singing to explore and remember scientific information



Science has its own language; special vocabulary that needs to be used in specific ways.

Songs have long been a valuable tool in language teaching and here we combine singing and scientific knowledge to create useful curriculum-based songs to help retain the important ideas and words for various topics across scientific disciplines and student age groups

In the classroom, the children (and teachers) are taught a variety of science songs. Some are well-known tunes e.g. current pop songs and others are original melodies. The lyrics are created directly from the curriculum.

Classes have recordings and lyrics to practice from before presenting their own performance to parents and the rest of the school.

There is also an interactive show which features live science experiments and songs performed with a band for children and parents.

music: traditional
lyrics: by Sharon Durant

Animal Cells

$\text{♩} = 120$

Oh, there's in - fo in - side the nu - cle - us, nu - cle - us, nu - cle - us. There's
Cy - to - pla - sm ev - 'ry - where Chem - i - cals re - act - ing there
Cell mem - brane, so cle - ver: keeps the cell to - ge - ther
in - fo in - side the nu - cle - us of an an - i - mal cell. Oh, there's
Cy - to - pla - sm ev - 'ry - where in an an - i - mal cell
Lets things pass in and out of an an - i - mal cell

Copyright © Sharon Durant 2012
sedurantuk@gmail.com



Science songs help students to feel more comfortable with scientific words and ideas, helping them to learn in a fun way

www.sharondurant.com/science



Olena Antykuz, Tetiana Andrieieva | "Prestyzh" Gymnasium | Kurakhove | Ukraine

«Explore the Nature Together»

The project proposes a system of experimental problems using the digital laboratory "Einstein" and household rubbish.

Development of creative thinking of students occurs with the help of the non-standard use of sensors, different levels of complexity and the content of tasks that combine Physics, Chemistry, Mathematics, English and close to the phenomena that students observe around them.

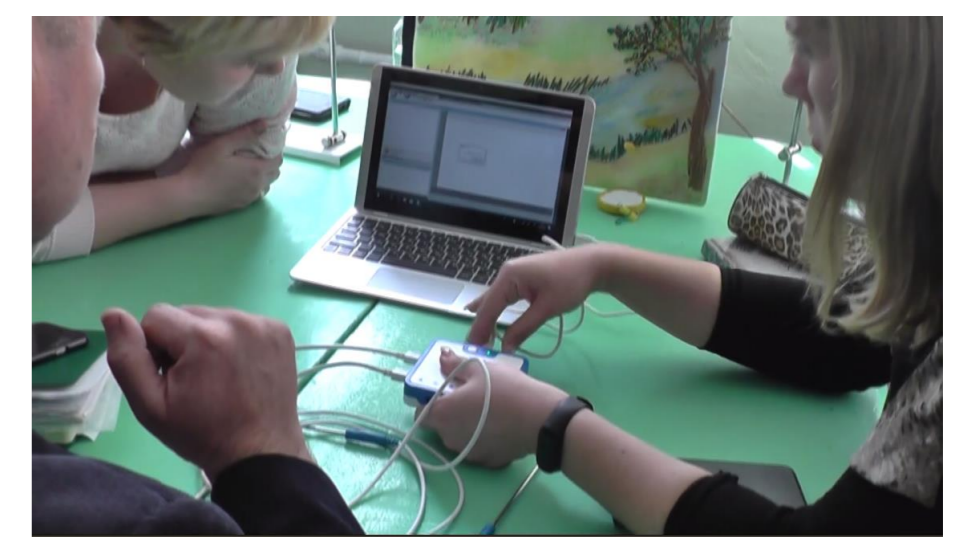
The aim is the formation of students' competence on the topic "Thermal phenomena" (the surrounding world, Geography, Physics, Chemistry, Biology), improving skills:

- 1) to use modern technical means during the experiment,
- 2) to explore the resulting graphs,
- 3) to use natural concepts and terms in English.

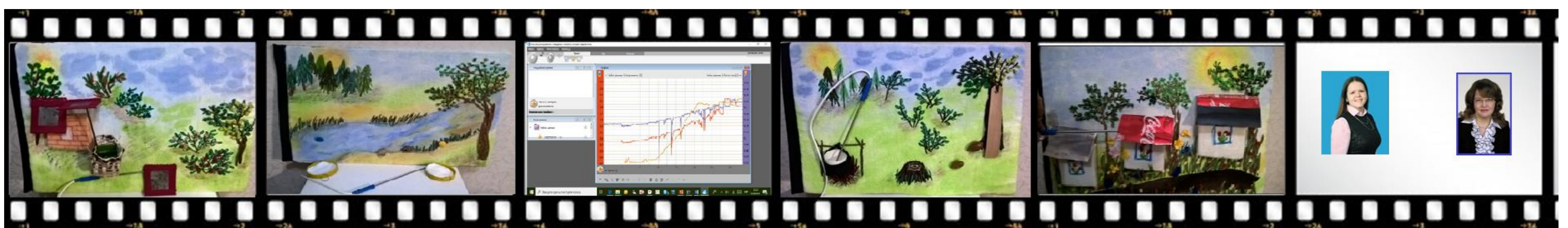


The motto: if you have learnt smth, teach others

A teacher - teachers



A pupil - pupils



During the implementation of the project, an interactive book "Thermal Phenomena Around Us" was developed, the students designed and tested a thermal sensor on Arduino, 150 teachers of the region were acquainted with the teaching methods