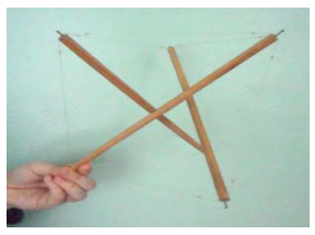
FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Yurii Hulyi, Liudmyla Bezperstova | Secondary school | Gorishni Plavni | Ukraine

Self-stressed Structures Tensegrity

The project demonstrates the original teaching method to improve students' constructivism by using the stability and the equilibrium state of tensegrity systems. It can be used as a kit for creating new models tensegrity at the lessons of Physics and Technology and beyond, where students can make models themselves and it helps to demonstrate the models transformation, make understandable the implementation of the principle of minimum potential energy The word TENSEGRITY is a combination of two ones: tensional and integrity, which means tension connection. clear structure also helps the reader to quickly understand, what your poster is about so highlighting facts with a bold typeface and colour might be useful.



Materials used:

- ❑ Wooden sticks, pencils
- ❑ Nylon fishing line, rubber threads
- ❑ Springs
- ❑ Plastic transparent tubes

Category of project participants:

- ❑ Students of 10th - 11th grades
- ❑ Physics teachers

Conclusion: This project will be useful for STEM teachers to develop students constructivism , 3-D imagination and engineering skills

SCIENCE ON STAGE EUROPE

ELIXÍR DO ŠKOL

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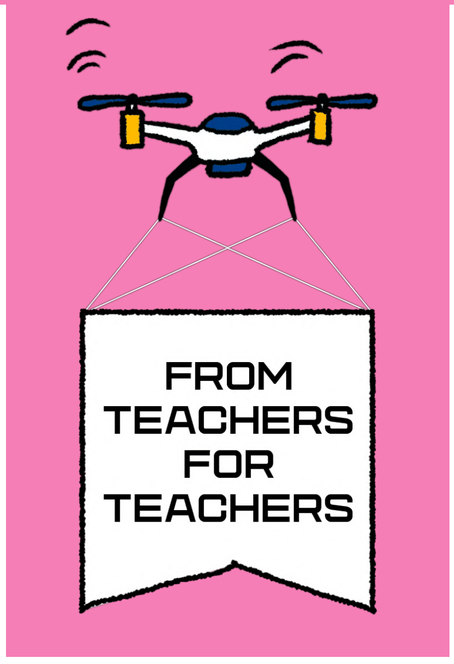


STEM WITH ARTS

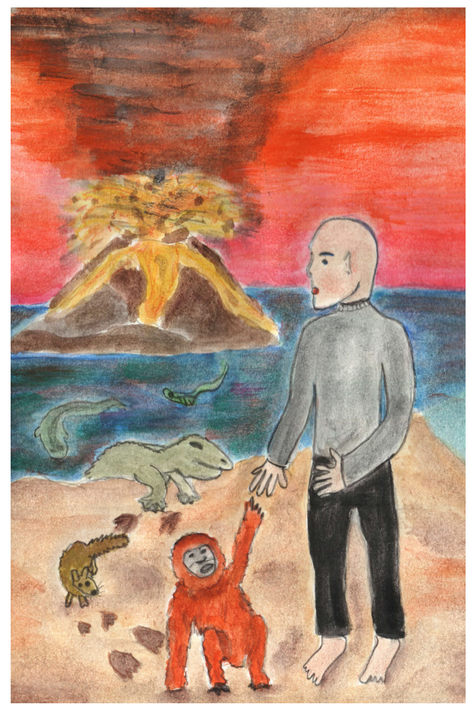
Zuzana Johanovská | In Teacher Training at Faculty of Mathematics and Physics,
Charles University | Prague | Czech Republic

What it's all about?

One of the most interesting things, that is natural for people but quite exceptional otherwise, is the ability to narrate stories. They guide us from young age to adulthood, and they are sometimes more approachable than scientific rules of our world. So can we and our students tell our own story, the story of people on Earth, more easily than we do in classical lessons? And what it is about?

I. How did we get to the point where we are now

The chapter in which mankind arises through the Evolutionary game:
from simple cells, through multicellular organisms crawling out of the sea,
to the intelligent creatures capable of creating civilisation!



II. Spreading of the civilization

The chapter where we can meet a Mind Map full of essential milestones
of the civilization development.
Agriculture, the outburst of technology, improvement of the hygiene and much more.
And that is not all:
also the Codex of the civilization is formulated there, by student-leaders themselves!

III. Nowadays

Main event of whole story! Student- heroes are facing challenges
of the civilized world: from the times of the prosperity to the times of deep crisis.
There is no wrong or right, no direct aim – just a life of the civilisation itself.
Until the Big Bad guy comes... Then all student-heroes will need to assemble to defeat it.

Conclusion – So „What it´s all about?“

What it´s all about? Only student-narrators themselves know that.
The story they went through, is just up to them to tell:
through the papers, pens, glues, reminders from previous parts and
their own special experience.

Do you already know, What it is all about?

It´s about open-minded activities, challenging thinking and actual topics in wider point of views.

And especially about not being afraid of playing with interdisciplinary science.

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SCIENCE ON STAGE 2022 PRAGUE

FROM TEACHERS FOR TEACHERS

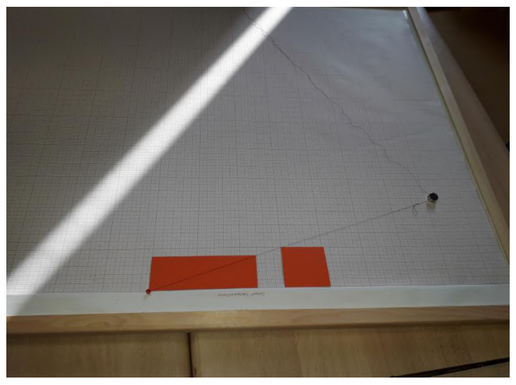
STEM WITH ARTS

Mostefa M. Mesmoudi| J. Y. Cousteau secondary school | Bussy St Georges | France

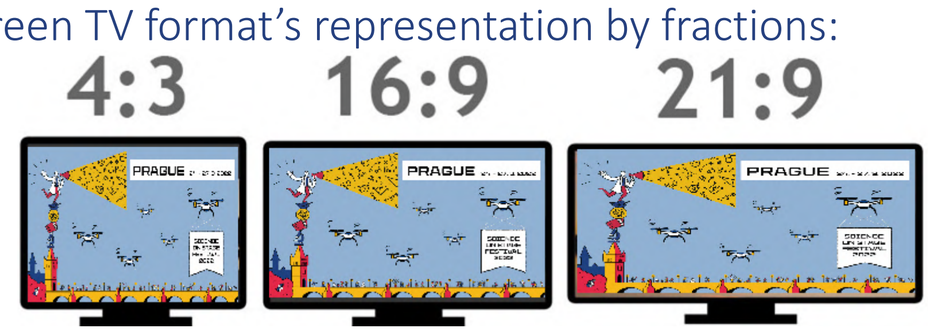
The Fractiometer

from a new mathematical tool to applications in Music, Acoustic, Astronomy and Biology

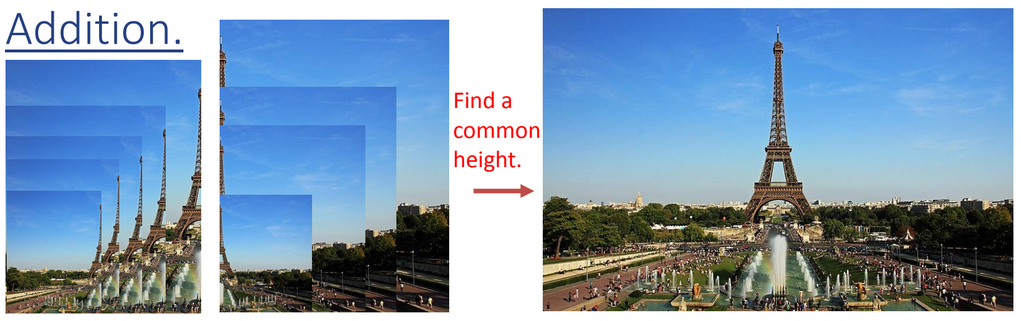
Project description. In this project we have invented and constructed a new mathematical tool to perform fractional calculus in a pure geometric novel way using rectangles. We have called it the **Fractiometer**.



The starting point was the transition from Pythagoras theorem to fraction calculus. The 2nd idea came from screen TV format's representation by fractions:

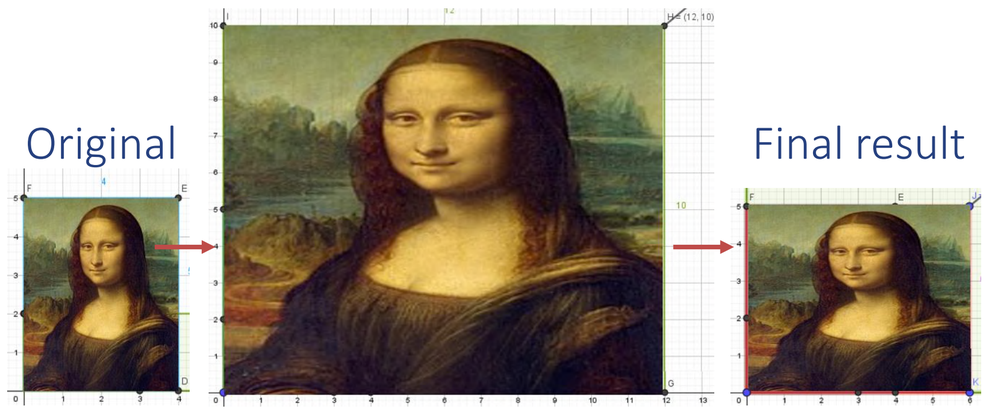


Addition.



https://commons.wikimedia.org/wiki/File:Eiffel_tower_from_trocadero.jpg

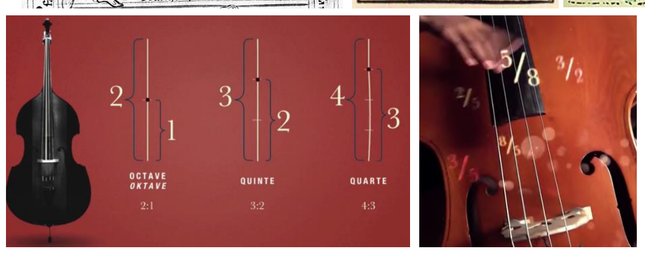
Multiplication. $\frac{3}{2}\times\frac{4}{5}=\frac{3\times4}{2\times5}=\frac{12}{10}=\frac{6}{5}$



Conclusion: This project shows how scientific disciplines and art are linked together. It allows to pupils to explore some exciting and funny ways to learn science.

Application cases in Science and Arts

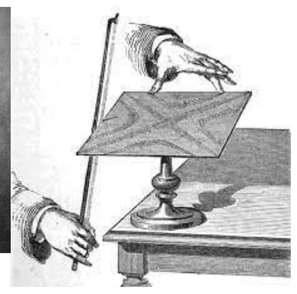
In Music and sound's physics. Pythagoras linked fractions to string vibration and music.



ARTE documentary images: Le grand mystère des mathématiques.

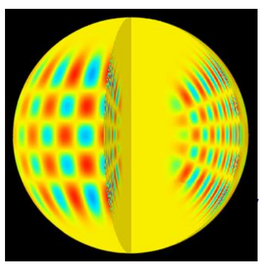
The surface of a violin also vibrates. Stationary waves are used by violin makers to tune boards.

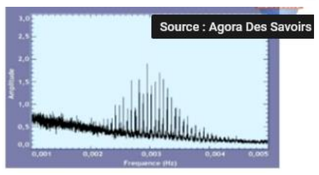
The Cajón is a rectangular drum



E. Chladni presented his work on sound to Napoleon (1808)

In Astronomy. → Helioseismology





www.nasa.gov/feature/goddard/2018/sounds-of-the-sun

- Sounding the Sun and stars from their surface vibration → physical & chemical characteristics.
- Vibrations at the origin of galaxies formation.

In Biology. Bioacoustics, Dopler effect, acoustic ecology. Other questions related to Chladni figures in biology.

ARTE documentaries images: Le grand mystère des mathématiques & Images sonores de l'eau par Alexander Lauterwasser

SCIENCE ON STAGE EUROPE

ELIXÍR DO ŠKOL

SCIENCE ON STAGE 2022 PRAGUE

STEM WITH ARTS

Marine Bagalishvili| 145th Public School | Tbilisi | Georgia

In The Footsteps of Traditions

Project idea: Restore the forgotten tradition of dyeing with vegetable dyes.

Why should we use natural dyes made from plants and lichens?

- They are non-toxic;
- Gives a sustainable color that does not fade in the sun and during washing;
- It is possible to get many different tones of the same color;
- Can withstand centuries.

Problem:

- In almost every field, even in the confectionery industry, we use synthetic dyes that are toxic and cause cancer;
- There are ancient and diverse traditions of making and using natural dyes in Georgia, which are forgotten;
- Georgia is distinguished by the diversity of plants and therefore there is a great opportunity to get natural dyes of different colors, which are practically untapped.

Project Research Questions:

- Do the colors of different materials painted with the same paint differs from each other?
- Do the colors of different materials painted with the same paint differs from each other in the case of using different fixatives?

Project activities:

1. Finding and processing the necessary literature; **2**. Virtual tour of the Georgian Silk Museum; **3**. Development of simple technology for dyeing plants; **4**. Wool processing; **5**. Preparation of dyes and several substance for fixation; **6**. Dyeing wool and bandage cloth (cotton) in different dyes and with the addition of different substances; **7**. Analyze research results and make conclusions; **8**. Creating a felt composition from dyed wool and preparing an exhibition stand; **9**. Organizing a school conference and presenting the work done to the school community;



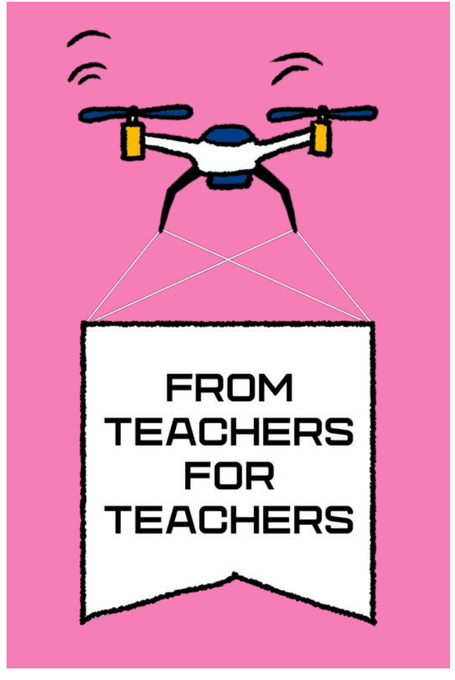




Project results:

1. Cotton and wool are dyed in different colors in the same dye, and the same material - wool is dyed in completely different colors with one dye, but with the addition of different substances; **2.** Students got acquainted with the methods and traditions of using natural dyes in Georgia and developed a simple dyeing technology; **3**.With the obtained colored wool, the students learned and created a felt composition as well as an exhibition stand; **4**. The works created by the students and the school conference held by them will help to restore the forgotten traditions of using natural dyes in Georgia.

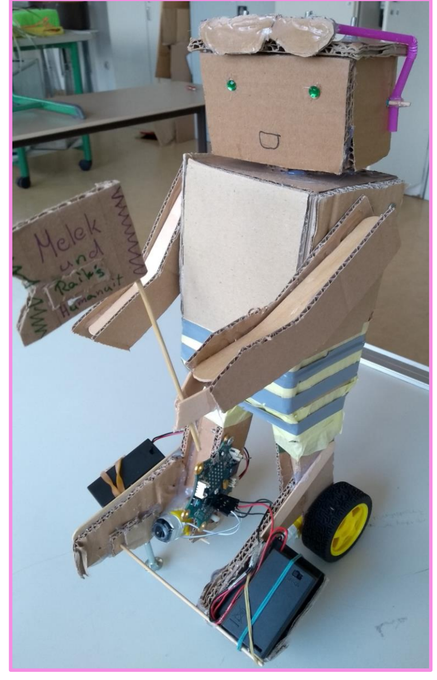
In our opinion we offer teachers a fun and exciting low-budget project that can be implemented in all school labs.



Jan Günther
Maria Hellmann
Julia Trummheller

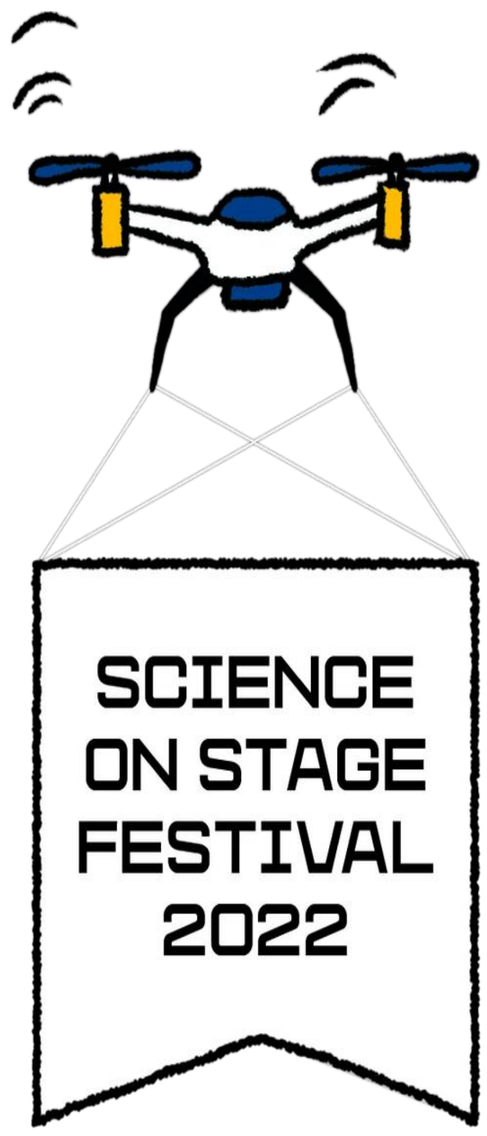
STEM WITH ARTS

Ernst-Göbel-Schule Höchst Germany



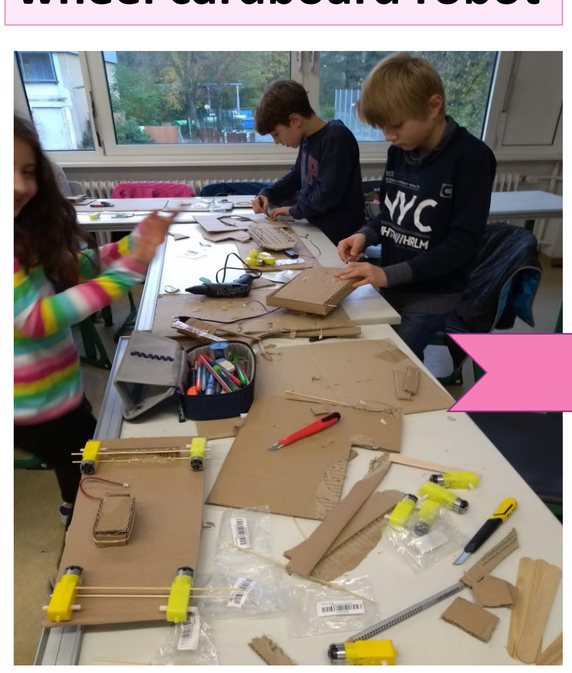
Create and code your own artful cardboard robot

The students can create and code their own cardboard-bots with the help of the Calliope mini (a single-board computer). The students are highly motivated because they can express themselves creatively.
The low-cost project attracts both boys and girls.



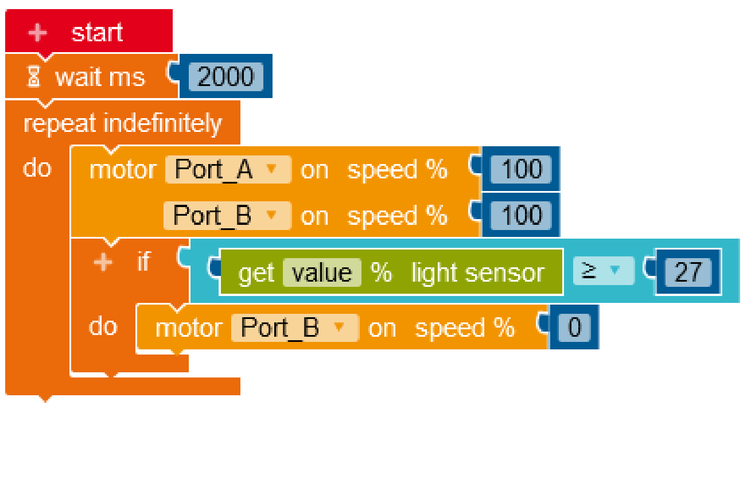
Group of learners:
16 students from all types of (secondary) school, aged 10-13
(also possible at an earlier age, probably 8)

<u>step 1:</u> build a two-wheel cardboard robot

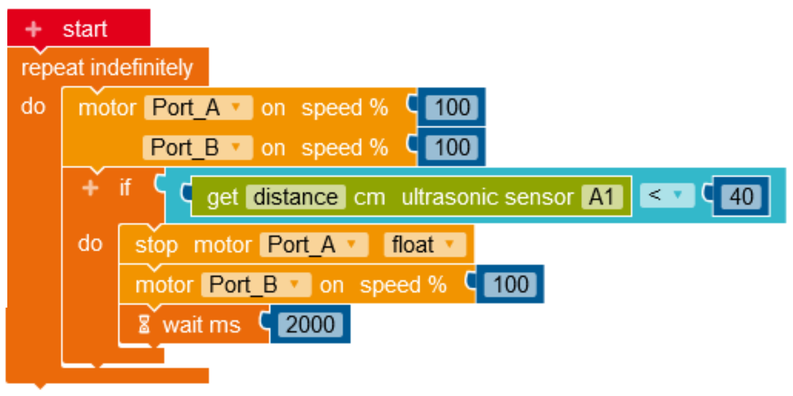


<u>step 2:</u> decorate it with different materials, using a hot glue gun

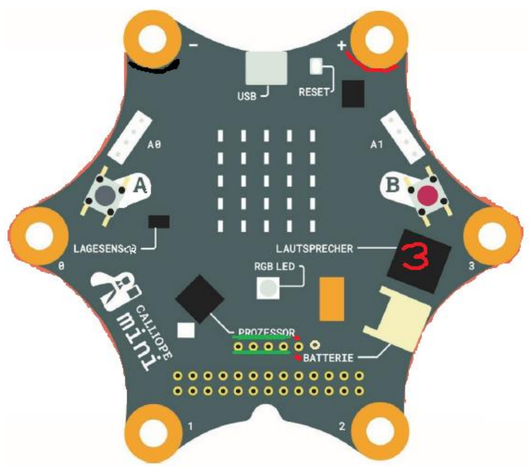
<u>step 3:</u> coding



Scratch: NEPO by
Open Roberta Lab



microcontroller
Calliope Mini



This leads to a great variety of individual, artful cardboard bots. As the materials are very cheap and easily available, students may carry out further projects at home.

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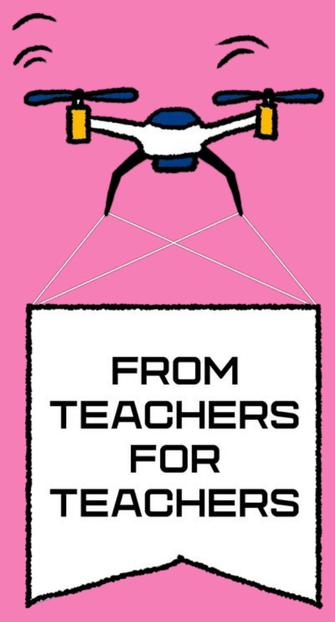
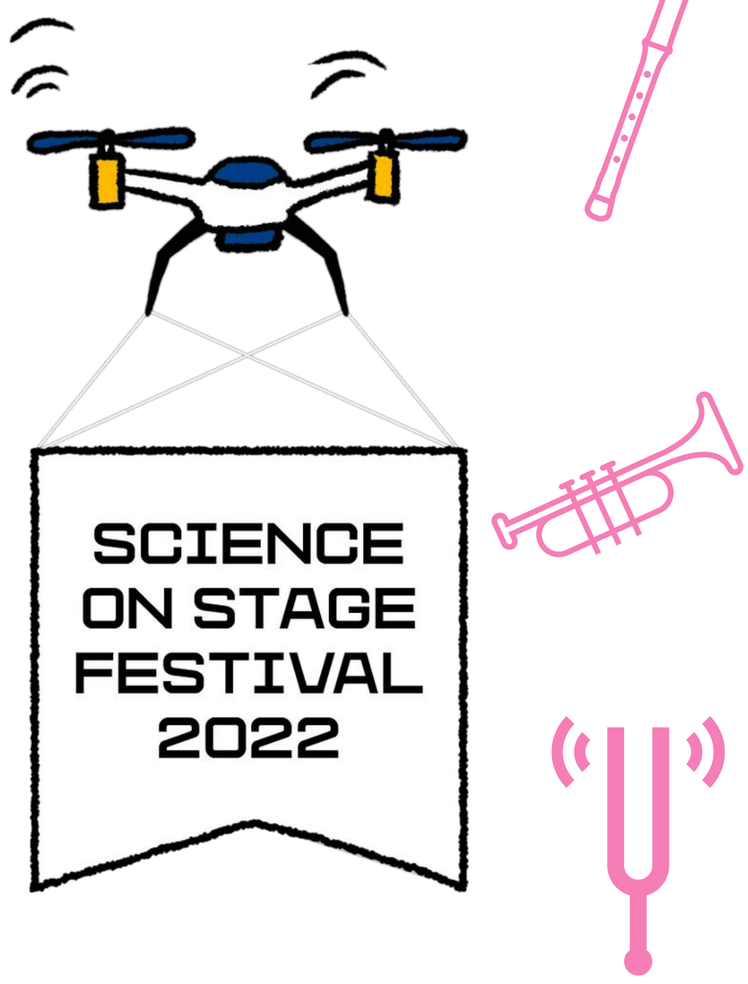


STEM WITH ARTS

Kardos Gergely, Dr. Farkas Zsuzsanna PhD
University of Szeged
Juhász Gyula Faculty of Education
Szeged | Hungary

The Sound of Physics

Sounds play a vital role in our lives, even though we often don't pay much attention to them. It can be surprising how sounds are produced, which factors affect what kind of sounds instruments make or why can the same musical notes sound so differently to our ears. Fortunately, with the help of today's technology students can easily investigate even on their own.



SCAN ME

With homemade instruments the students can create their own band without significant musical knowledge to experience the joy of playing music together too.
Our goal is to show how this can be done with music and different musical instruments in focus.

How can we apply it in a classroom?
The task is the same as for every musician, stay tuned!

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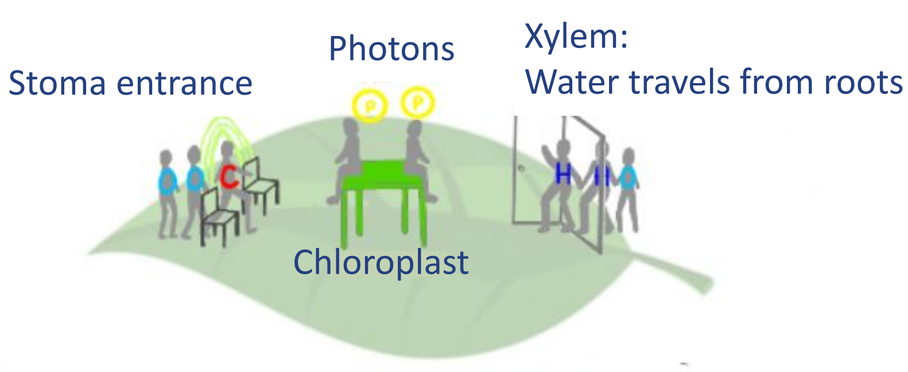
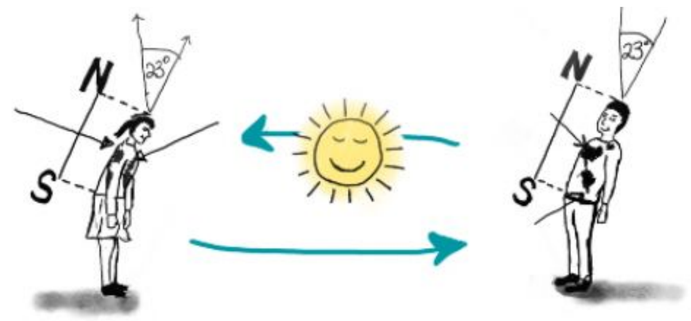
STEM WITH ARTS

Julia Dolan | Clonkeen College | Dublin | Ireland

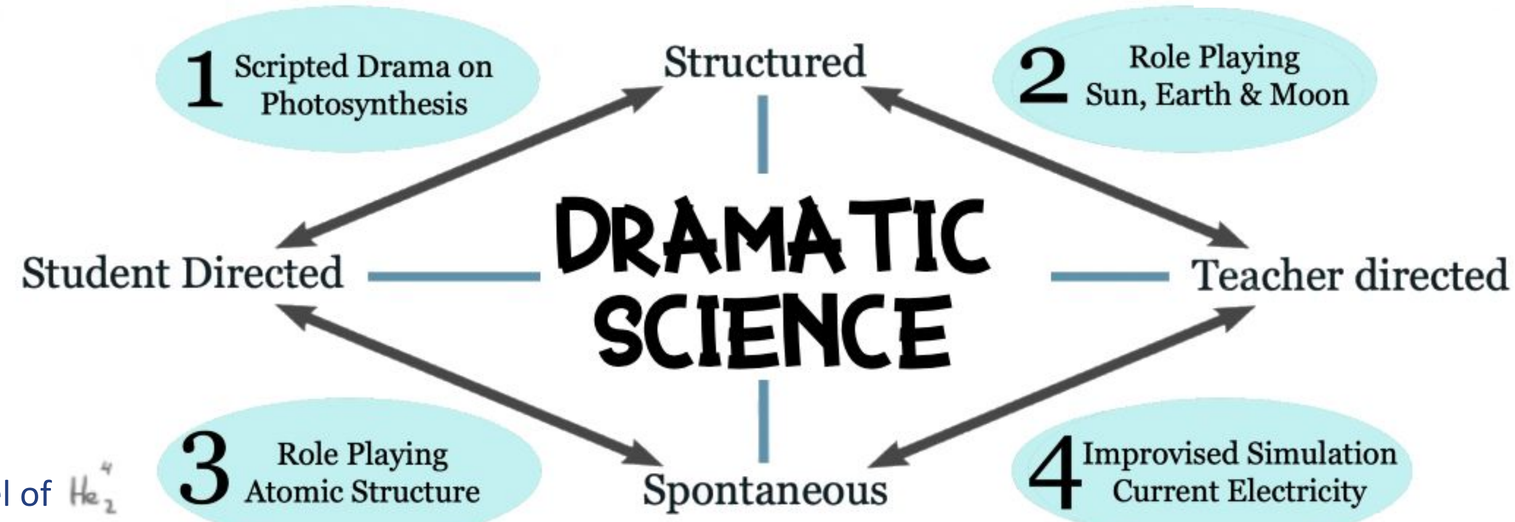
Dramatic Science

'Play is the greatest form of Research' Albert Einstein

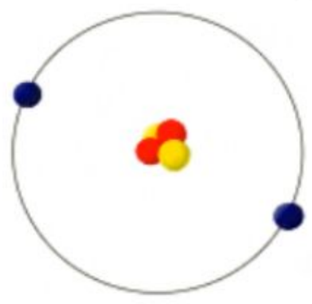




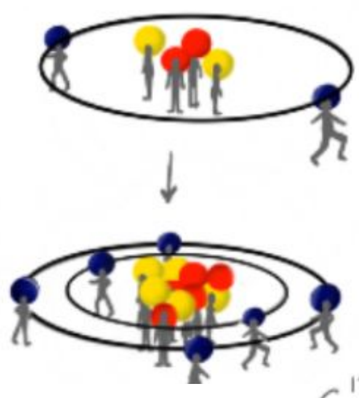
Investigating seasons of the year



Bohr model of He^4_2

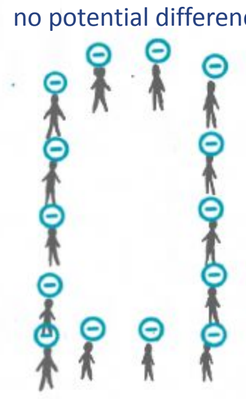


Students model of He^4_2

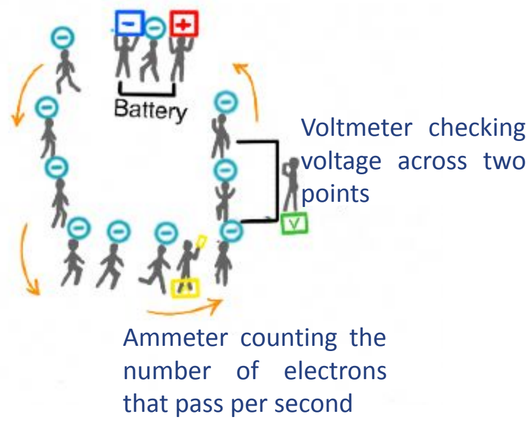


Students model of C^{12}_6

Students represent the electrons in a wire. No movement as there is no potential difference



Students move as the battery provides a potential difference and gives each electron a push.



Voltmeter checking voltage across two points

Ammeter counting the number of electrons that pass per second

Description

This project consists of a sample of science lessons which use specific drama-based pedagogies (DBP) as seen in the image above. The need for methodologies that optimise students' authority, engagement and interest in the scientific subjects has been a key goal as the traditional classroom fails to meet the needs of students today. The drama used in this project has been seen to provide a model for learning, allowing students to communicate the nature of science, advance social interaction and debating. The aim is to attract more students into the world of science, captivating their imagination and creativity.

Results

Observations of these lessons show the positive effects of drama on students' conceptual understanding of the scientific concepts.

1. Students developed models leading to a deeper understanding.
2. Students had much learner agency and took ownership for their own learning.
3. Drama lessons provided structure and control and improved students' social behaviour.

Conclusion: The use of drama in a well-considered manner, guided by reflective science teachers, may provide empowering learning environments for students

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

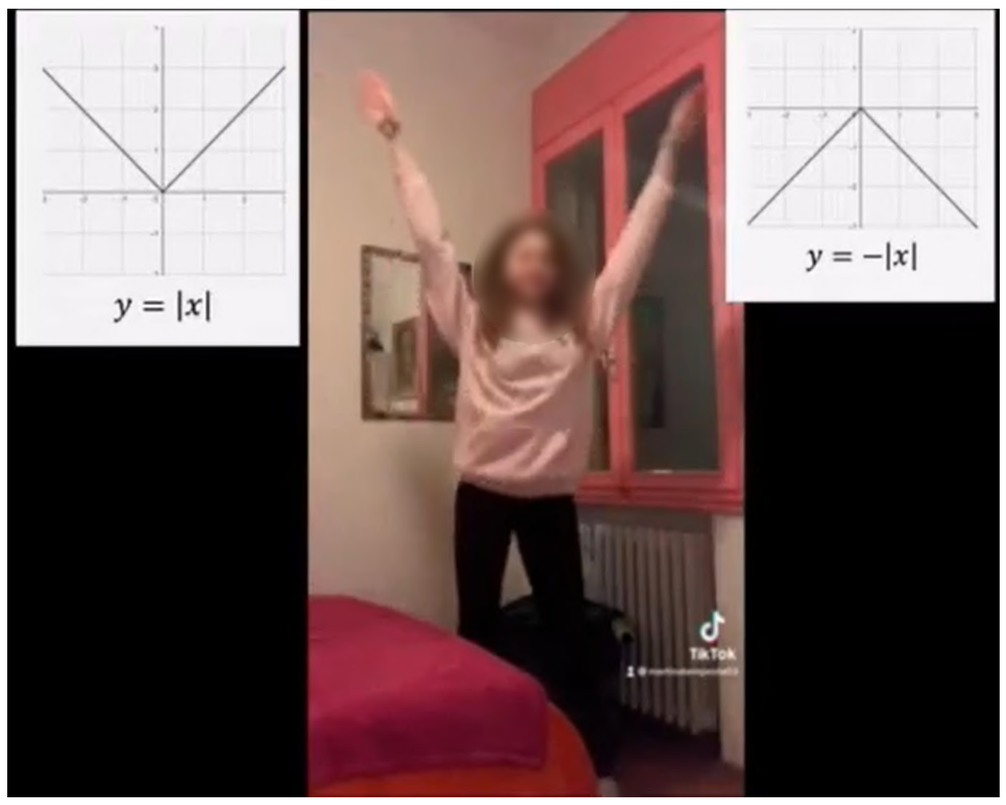
Federico Ballanti| Liceo “Torricelli-Ballardini” |Faenza| Italy

Math’s Got Talent

Learning Math Functions while dancing

What is *Math’s Got Talent*?

The project consists in the creation of educational videos in which the students involved reproduce the graphs of the most famous mathematical functions through dance and body movements.

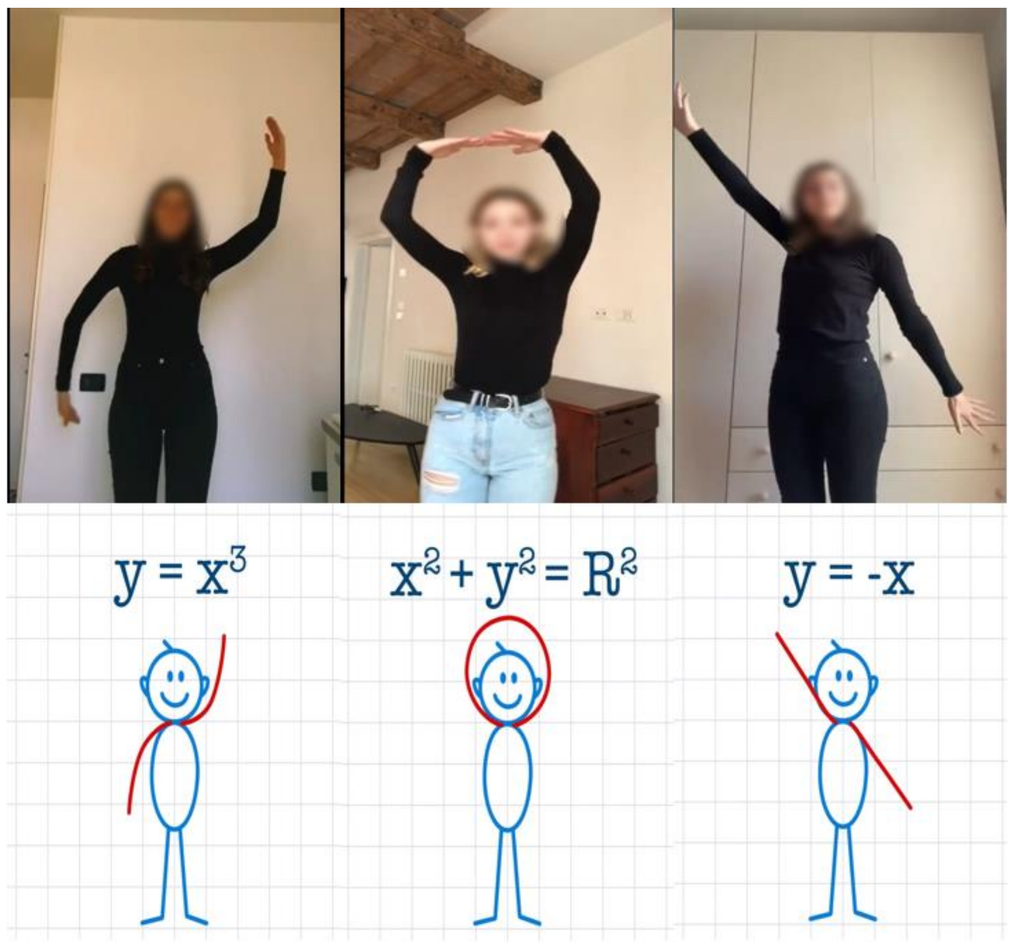


So it’s all about the student’s dancing abilities…

Not at all. The students involved were not only asked to dance, but also to follow the part of video-editing and audio-mixing, and to reproduce the graphs using specifical mathematical software in order to put them together with the ballets in the final video. The aim is to make them improve different skills.

How can *Maht’s Got Talent* help the students in their studies?

The project comes out as a more playful way to introduce and deepen the topic of mathematical functions, which is part of the learning path of mathematics in all the years of secondary school.



Math’s Got Talent is… inclusive, technological, original, effective and multidisciplinary!

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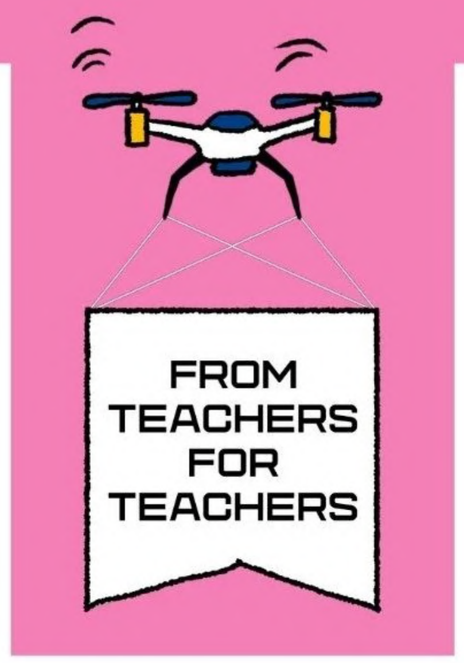
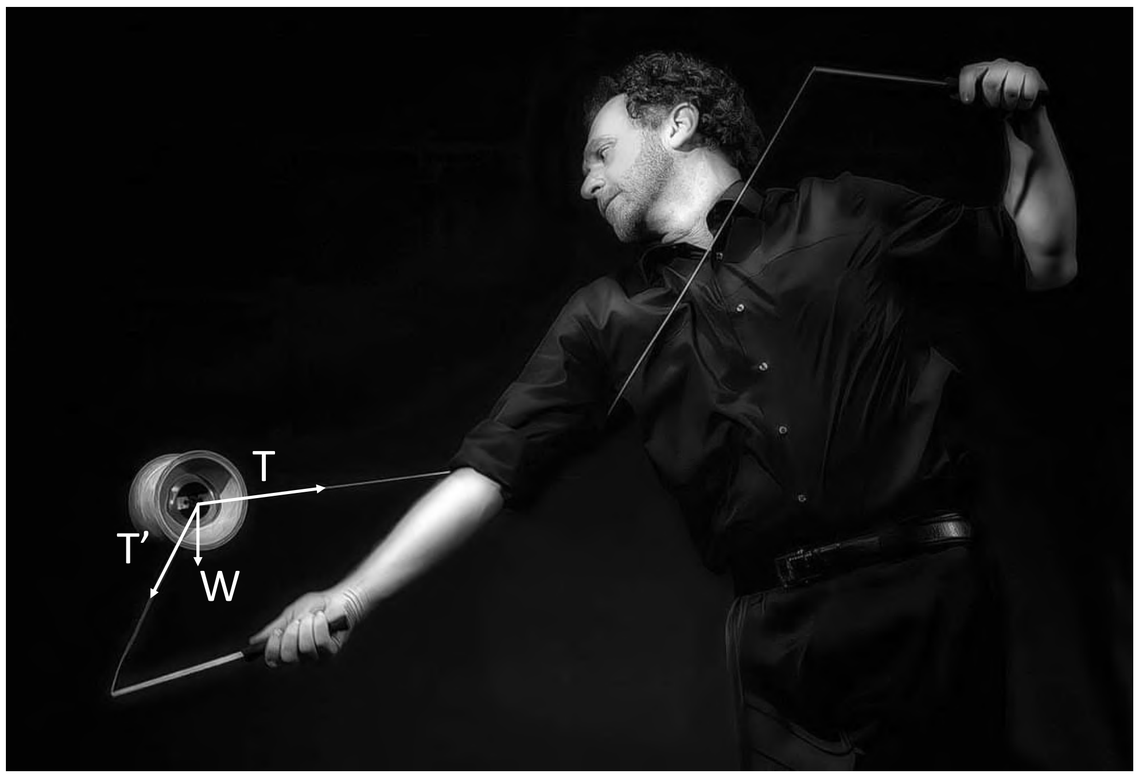


STEM WITH ARTS

Prof. Federico Benuzzi - Liceo Laura Bassi, Bologna IT

Dreamy Physics

a new way to have fun, to ask questions, to understand



Physics is an experimental science, with its own history, its method, its language.

Theater is a millenary art form where voice, body and soul find an interesting balance.

Juggling refers to circus, open spaces, training.

Hence different colors, sounds, scents…

May they have anything in common?

Dreamy Physics is a lesson, a show, a conference... and much more!

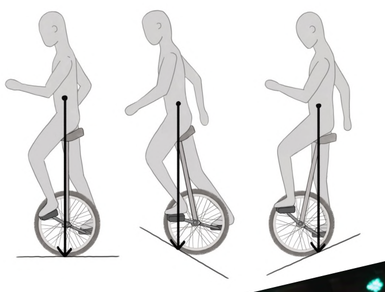
Connections between physics and juggling are shown by alternating good level technical exhibitions and immediate scientific explanations; theatre monologues and improvisations; videos and animated images.

The goal is explaining the one through the other one!

One hour long, Dreamy Physics deals with cigar boxes and friction, free fall, forces; juggling balls and mathematical description, parabolic motion, power; unicycle and levers, balance, the third principle of mechanics; diabolo and the principle of conservation of angular momentum with very interesting consequences in “making art”.

It is perfect to introduce physics, to restructure learned, or to present it in a different way.

Dreamy physics is unique!



"good teaching is for a quarter preparation and three quarters theater" - Galileo Galilei

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Teresa Cecchi, Arianna Giuliani| ITT Montani | Fermo (FM) | Italy

A Symphony of Atoms, an Alchemy of Notes "The School of Athens" by Raphael

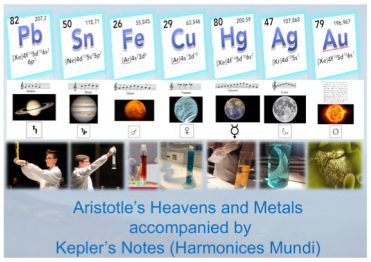
An edutainment live performance about Philosophia Naturalis during Covid pandemic

Pythagoras taught four elements doctrine. The 1st "element" is fire. Chemistry produces a synesthesia between electromagnetic and sound waves of the octave interval from a Theremin.

The 2nd "element" is Air.
We emphasize the significance of N_2, O_2 and CO_2. We make them flow with Vivaldi's Wind notes

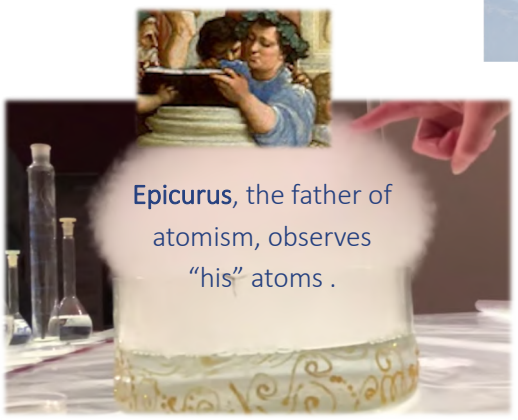
Earth and water are the 3rd and 4th "elements". Listening to ancestral rhythms, we simulate the cosmogonic separation of earth from waters (Winkler's reaction)

Aristotle introduced the concept of Quintessence. His 7 heavens, linked to the 7 metals of the ancient world, produce the harmony of the Universe



Aristotle's Heavens and Metals accompanied by Kepler's Notes (Harmonices Mundi)

We show metals reactivity while listening to Kepler's notes, whose pitch is proportional to the velocity of planets in aphelion and perihelion



Epicurus, the father of atomism, observes "his" atoms .

Diogenes' lantern and cosmopolitanism:
Chemoluminescence echoes in Beethoven's Anthem of **Europe**

The alchemists **Gonzaga** and **Averroes** celebrate our spectacular reactions, with the Sorcerer's Apprentice notes by Dukas.

Hazard Risk Rating of all the experiments (MoVaRisCh, art 223 D.Lgs 81/08): R<15

Italian art is an original tool to teach Chemistry
The emotional energy of the Science on Stage performance helps rationalize the chemical theory

SCIENCE ON STAGE EUROPE

ELIXÍR DO ŠKOL

SCIENCE ON STAGE 2022 PRAGUE

FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

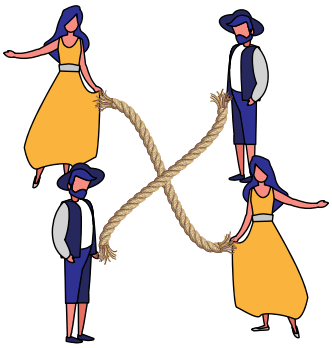
projects combining STEM with other disciplines,
i.e. arts, music, sports, history, etc.

Stefano Alberghi | Science Gym & Liceo Torricelli-Ballardini | Faenza | Italy

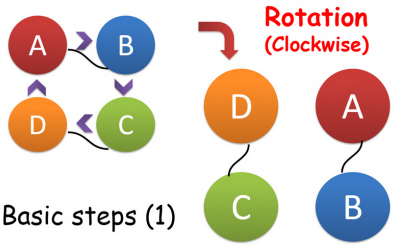
TANGLES, DANCES... AND MATHS!

Untie tangles, cut ribbons, magically extract rings from wires, count holes in your pants... discover Topology.

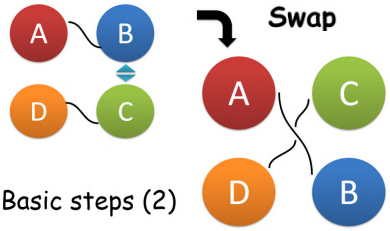
It's a "**Topological**" dance:
Four people, two ropes, two simple steps.



Step 1: Rotation R (clockwise)
Step 2: Swap S (B over C)
For example, a simple step sequence could be:
S S R S S R S S S
If you dance it, a knot is created in the middle.



Basic steps (1)

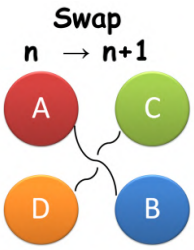


Basic steps (2)

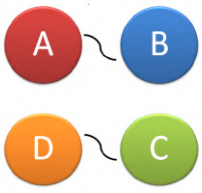
The answer now is: **how to untie this tangle** using only **Swap** and Rotation?
(please note that you can't go backwards!)

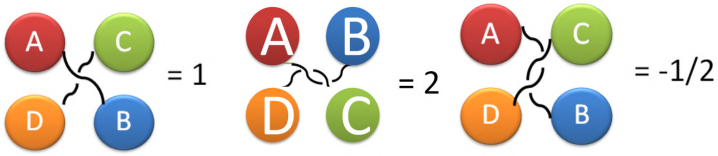
Fraction algebra is needed!!
A number is assigned to each knot and an algebraic operator to each step.
Swap is equivalent to adding 1
Rotation is equivalent to inverting and changing sign

Zero corresponds to the initial configuration (no tangle)
and now you'll have to get back **Zero**.

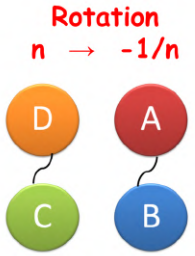


...this knot = 0





Some examples of knots and their equivalent number



The main steps and their equivalent operator

S	S	R	S	S	R	S S S
+1	+1	-1/n	+1	+1	-1/n	+3

0	1	2	-1/2	1/2	3/2	-2/3	7/3

Example of a sequence of dance steps...

7/3	-3/7	4/7	-7/4	-3/4	1/4	-4	0

-1/n	+1	-1/n	+1	+1	-1/n	+4
R	S	R	S	S	R	S S S S

...and its solution

Play topology, dancing to the sound of fractions !

FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Regīna Urbanoviča| Daugavpils secondary school N16 | Daugavpils | Latvia

The music of equations

Pythagoras established his school of the wisdom, based on two subjects - Music and Mathematics.

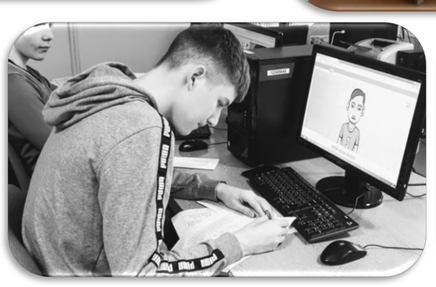
Our project brings together students from different countries who are interested in the development of mathematical and logical thinking, linking mathematics with music. At the same time expanding and deepening the knowledge of solving equations. The given project is aimed at teachers of Mathematics, IT, Music, foreign languages as well as all interested members.

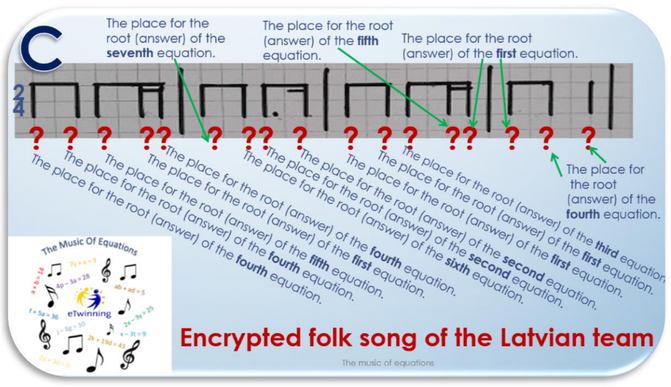
Aims:

- enhance students' interest in Mathematics and develop mathematical thinking, to deepen their knowledge on the topic "Equations"
- improve students' English language skills and use of communication technologies (ICT), make connections with the peers in other countries who are interested in maths and music
- enhance students' interest in folk songs and music, as well as to develop creative and communication skills.
- create an e-book of equations with the solutions and video album with folk songs.

Work process:

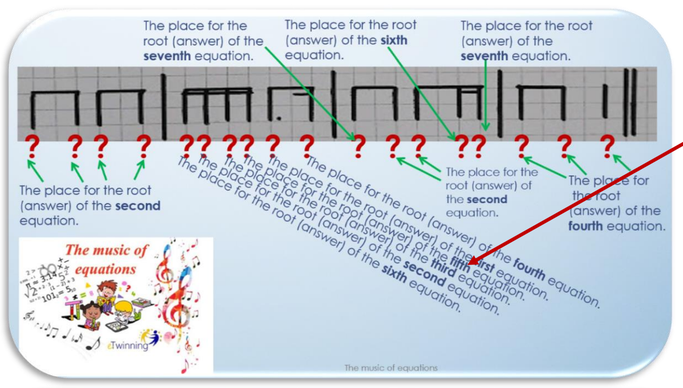
During the project, students make up interesting equations as well as word problems that can be solved using equations. The roots of equations must necessarily be natural numbers from 1 to 7. Each number means a name of the notes: **Do - 1, re -2, mi - 3, fa - 4, salt - 5, la - 6, si - 7.** Project participants exchange the collected material for further decision. At the same time, each team sends an encrypted melody of a folk song of their country, with a volume of 8 measures. Each team needs to make a video of the musical playback of the melody of their team and the melodies of the teams of partners.

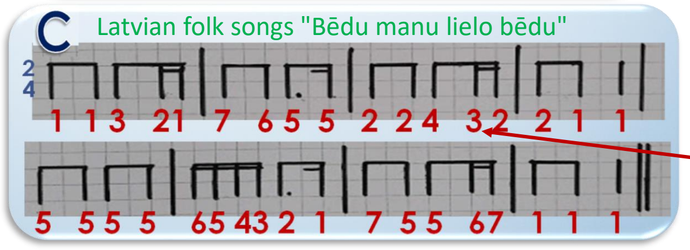




Why was this project worthwhile?

- Promoted students' interest in mathematics, folk songs and music,
- Developed mathematical thinking and solving skills,
- Gained in-depth knowledge of the topic “Equations”,
- Created electronic book with equations and their solutions





For example

Task 5

Solve the equation $\log_x \mathbf{81} = \mathbf{4}$

Solution:

$$\begin{cases} x > 0 \\ x \neq 1 \end{cases}$$

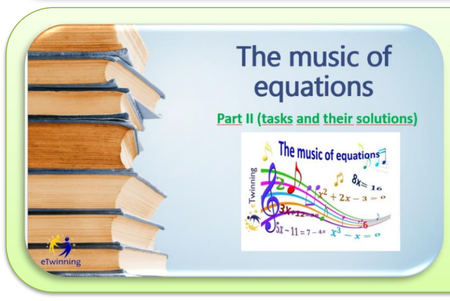
$$x \in (0;1) \cup (1;+\infty)$$

$$x^4 = 81$$

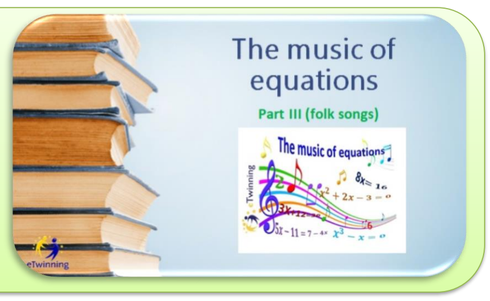
$$x^4 = 3^4$$

$$x = 3$$

Answer: 3



The authors of the books and video - the participants of the project “The music of equations“ from Latvia, Lithuania and Azerbaijan.



Music is mathematical and mathematics is musical.

Dina Kirnarska Doctor of Arts

Expected results: Creating video album with folk songs and a website with a tutorial, interactive e-book that helps to understand and consolidate the knowledge on the topic "Equations," to acquaint students with the folk songs of other countries.

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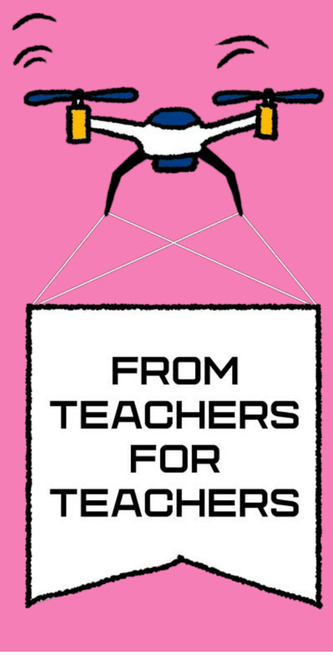


STEM WITH ARTS

Gintarė Marmokaitė and Rokas Gedrimas | Zapyškis primary school/ Ežerėlis primary school/ Steponas Darius and Stasys Girėnas high school | Kaunas county | Lithuania

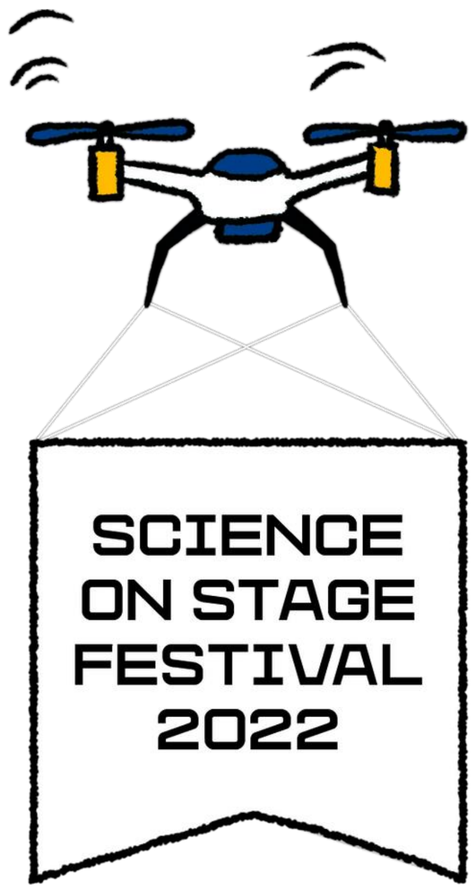
Cardboard portrait for a teacher

This project integrates math, technology (arts and crafts), IT, biology and art together.

- From biological viewpoint students get to know with carboard characteristics as well as ecology (recycling).
- Math and IT are involved when students are calculating dimensions and sketch portraits using the help of computer applications (for ex. GIMP).
- Students use their technology (arts and crafts) skills when they cut the carboard following the sketch.
- With the help of arts all of these operations are combined into one masterpiece.

The main goal of this project is to create carboard portrait for the teachers and
to celebrate the International teachers day, as well to introduce students to the limitless
opportunities that lies behind the idea of recycling.

Furthermore, this project does not require any additional funding.



Other teachers can implement this carboard cutting technique to their classes by changing the topic
of the picture that will be cut, it all depends on their imagination and creativity.

This project does not require a lot of skill, so the students can enjoy the cutting process from the get go, since there is a
huge range of variable activities involved.

Cardboard cutting is one of the most simple way to bring back to life reusable materials. Also, this project is adaptable to any topic.

STEM WITH ARTS

projects combining STEM with other disciplines,
i.e. arts, music, sports, history, etc.

Goda Kovalenkienė I Engineering Lyceum of
Vilnius Gediminas Technical University I Vilnius I LITHUANIA

• EthnoClips

The assignment of creating music videos based on Lithuanian folk songs

S SCIENCE: analysing symbolism and metaphors of folk songs and music and researching contexts

T TECHNOLOGIES: pupils learn to use filming equipment and software for animation and editing

E ENGINEERING: the creation process is based on engineering research: analysis, planning, implementation, improvement, reflection and dissemination of results

A ARTS: the synthesis of music, applied arts and cinematography

M MATHEMATICS: figuring out the time frame in a montage

STUDENT REFLECTION

"it opens up more opportunities not only in music but also in projects on other subjects"

"it was rewarding to see the final result"

The goal of this project is to release students' creative powers and introduce foreign audiences to Lithuanian folk music

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

projects combining STEM with other disciplines,
i.e. arts, music, sports, history, etc.

Anetta Mamczarz | ks. Jan Twardowski Primary School | Chwiram | Poland

Tell me grandpa who they were...

A fascinating grandfather's story about outstanding physicists and their achievements.

In an innovative and unusual way, it presents a lot of content and scientific curiosities related to the life and discoveries of famous physicists - Galileo, Newton and Archimedes.

The staging is a combination of a mime theater and a research laboratory.

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Laura Javoršek | Osnovna šola Ob Rinži Kočevje | Kočevje | Slovenia

Encouraging creative approaches in teaching and learning Chemistry in Primary School

LEARNING GOALS
(8th grade):
- cations and anions, **ionic bonds**, ionic structures
- **covalent bonds**, covalent structures

PROJECT WORK
MODEL OF AN IONIC OR COVALENT BOND

1. Differentiation, individualization:
- different students – **different models of compounds**

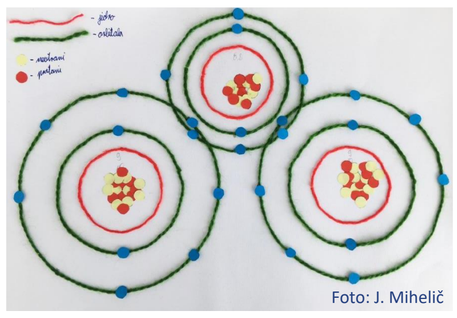

Foto: J. Mihelič

2. **Success criteria** (formative assessment):
- What are the characteristics of a good model and presentation?

Mentimeter

3. Don't miss the **deadline**.

4. **Model making plan**:
- molecular formula
- type of chemical bond
- sketch model to explain the formation of bonds
- material selection

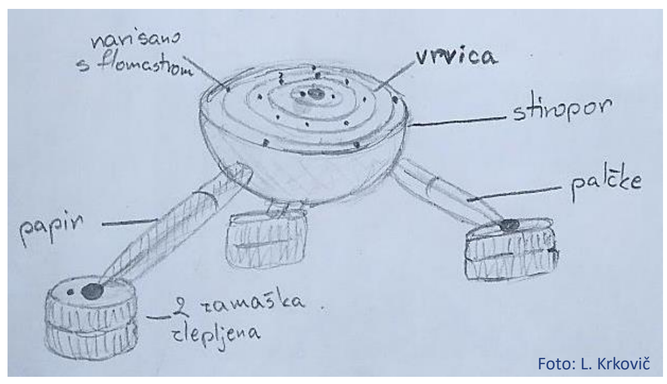

Foto: L. Krkovič

5. Formative assessment **feedback**:
- teacher feedback
- classmate feedback

padlet

6.
- Making a **chemical model**
- interesting informations, animations, crystal models, poster, PPT etc.)

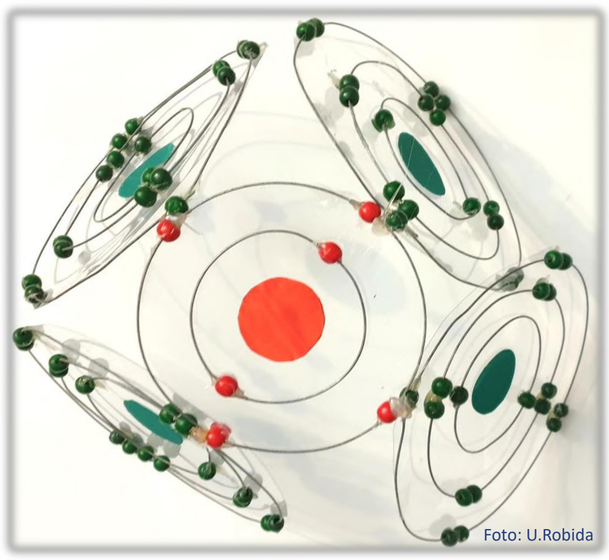
Foto: U.Robida

7. **Presentation** of the project work, **evaluation** and **grading:**
- distance learning (online classroom, Zoom)
- live at school

Conclusion: Creativity is one of the key transversal skills that enables the student to co-create their own learning path and the teaching process.

SCIENCE ON STAGE EUROPE

ELIXÍR DO ŠKOL

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Luis A. Couceiro Herrero | IES David Buján | Cambre | Spain

Led's Dance

Led's Dance was developed for an inclusive talents project whose goal is to awaken STEAM vocations among young people while solving technological challenges posed by people with cerebral palsy.

We have created a performance that combines music and light so that it is attractive for the viewer. The artists (dancers, actors, etc.) wear suits with LEDs whose lightning is controlled remotely by means of Arduino devices.

The project is stimulating for the students because it combines both artistic and technical skills: design and sewing of the costumes, composition of the choreography of lights according to the rhythm of the music, hardware connections and programming of the controlling devices.

We should find ways to get science to the people. One of the main incentives of this project is that it is cool for both girls and boys, so that it contributes to fight against gender roles in the STEAM field.

We should look at art and science as inseparable parts of human expression.

FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Art is science that has become clever

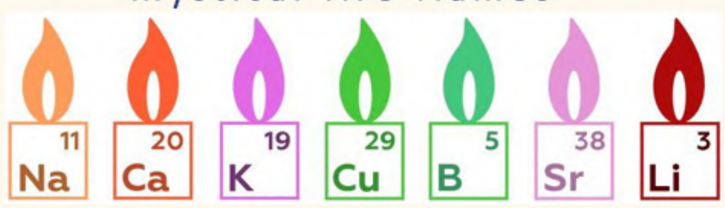
Ganna Sinitsia, Tetiana Kravets | private school «OCHAG» | Kharkiv | Ukraine

The Theatre Perfomance at the Physics Classroom

The aim of this project is to explore natural phenomenon by primary school.Older students, through attractive the theatre performance with funny toys and devices, explain the phenomena and principles of their operation.

Without enthusiasm in work, great goals are never achieved

Mystical fire flames



A common pyrotechnic effect when additional chemicals are added to the fuel burning

A horn is a paper sound amplifier

Demonstration of mechanical waves (sound)

Paper bridge

Equilibrist

Demonstration of body balance

Demonstration of the pressure of solid bodies

I liked the show because

- images of characters and interesting tasks (Vladyk)
- the main characters showed that almost all household items are closely related to physics (Leo)
- fun show, interesting experiments and delicious candies (Stefan)

The result of the work is the performance, the plot of which is based on Ukrainian folk myths and fairy tales, and the secret of fairy magic is explained by physical laws.

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

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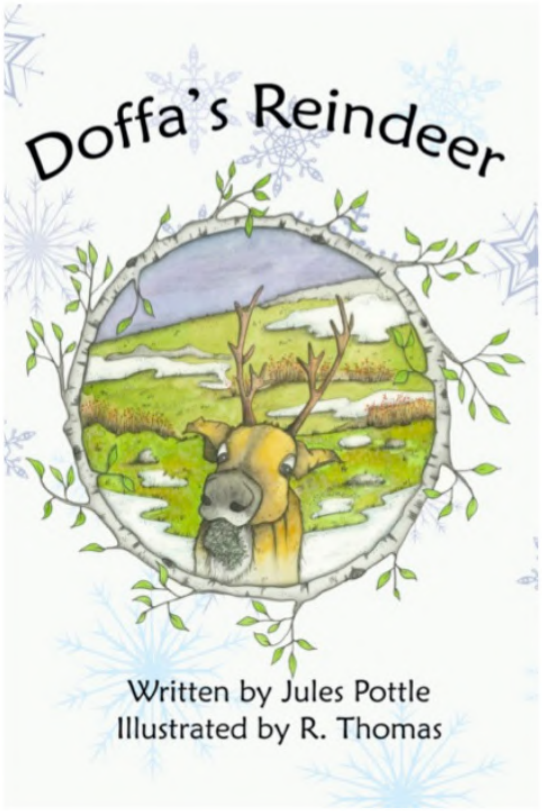
i.e. arts, music, sports, history, etc.

Jules Pottle, Cumnor Primary School, Oxford, UK

Factual Science Through Fictional Stories

Doffa's Reindeer - an **air pollution** story

Doffa's Reindeer is a story for use in primary schools with children aged 5-11. It tells the story of a reindeer herder and his granddaughter. When Doffa gets old, his granddaughter, Ibba, comes to care for him and his reindeer. In the neighbouring town, a new power station is bringing much needed work and electricity to the people. But it also brings something else - air pollution. This affects the lichens upon which the reindeer feed. The story follows the life of Ibba as she learns to adapt in a changing world.



Doffa's Reindeer is the third science picture book published by Jules Pottle and R. Thomas. See also, 'The Molliebird - an evolution story - ' Winner of ASE Book of the Year 2019 and 'Jasper the Spider', which is about classification.

This project aims to help children to understand the nature of air pollution – something which they cannot see or touch.

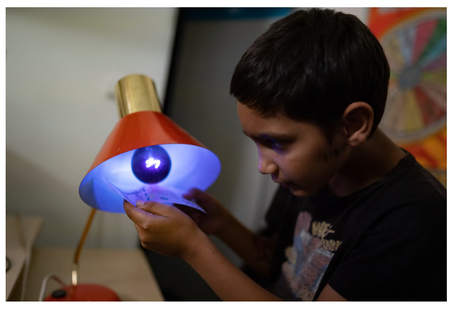
Children are introduced to the topic by way of a story. Research shows that stories with emotional content engage the human brain more deeply than non-fiction texts. Our brains our hard-wired to learn through stories. The story itself involves science and provides moments in which the science can be discovered by the character and thus the reader learns about the science too. The story does not end by solving the problem, but reflects real life, by minimising the air pollution whilst still allowing a comfortable existence for the characters.

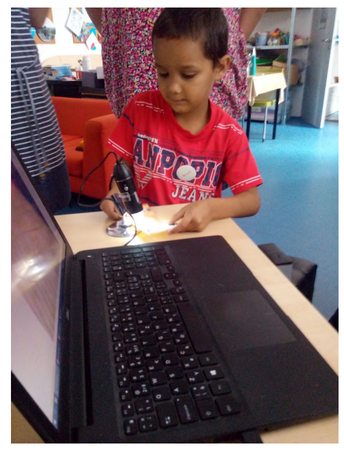
This is followed by demonstrations of how particulate matter is formed and how hot gases rise. Finally, the children create particulate matter traps and compare the particulate matter in the air in different places around their school.

Stories engage children.
The story makes the science memorable:
it is the peg on which we can hang science learning.

FROM TEACHERS FOR TEACHERS

STEM WITH ARTS





Bohumila Kroupová |ZŠ a MŠ Brno, Husova 17 | Brno | Czech republic

Money from A to Z

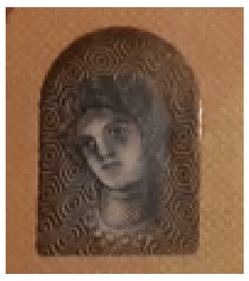
Protective strip

Variable color

Watermark

Elements visible under UV light

Foil with hologram



Microtext

Printing mark

Hidden shape

Window strip with microtext

Iridescent stripe

This project deals with banknotes of different countries and their security features. The project can be presented to students from the lowest grades. Children have the opportunity to explore the individual elements with their own eyes. Some elements are examined by children using a USB microscope. They use UV lamps to check the protective elements visible under UV light. Other elements can be visible with the naked eye. The result is finding out which security features have different national banknotes and which banknotes are best protected. We include the project in research hours of science subjects. The project can also support financial literacy.

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FROM TEACHERS FOR TEACHERS

STEM WITH ARTS

Daniela Válková | ZŠ Novolíšeňská | Brno | Czech Republic

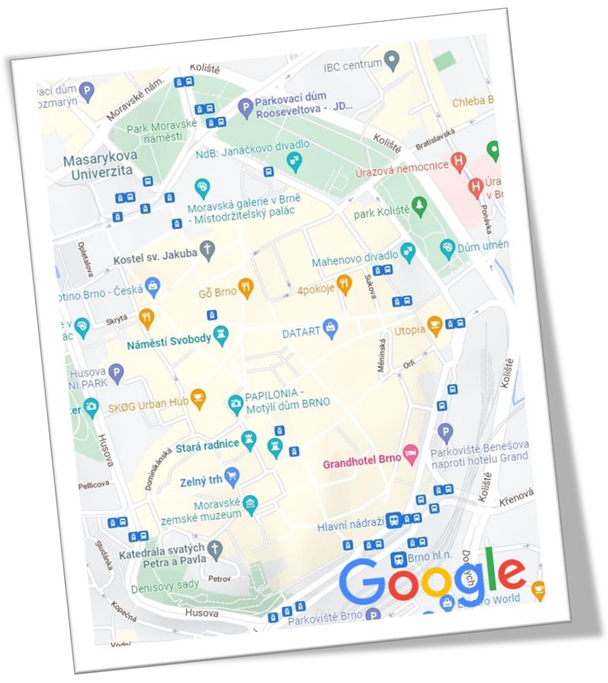
Getting to know Brno untraditionally with mathematics

Game not only for pupils of the lower-secondary school with practical and theoretical tasks for getting to know Brno.

The project supports interdisciplinary relationships. Game is about teaching mathematics in the field and supporting group work.

One part of the project is a geolocation game created using an app. Pupils play the game using their mobile phones or tablets while walking through the city. The game is accompanied by a story in which they learn about the history and interesting facts about Brno. Along the way, pupils complete mathematical and logical tasks, so they get to know the city in a non-traditional way with mathematics and it is necessary to involve more senses.

After completing each task, they will receive a card with a given monument, which they will eventually need in order to play a game focused on perception and spatial imagination.



For the use of the offline tour of the city of Brno, an escape game has been created that can be played on a computer or mobile device. In this way, it is possible to get to know Brno, for example, from the comfort of home.

SCIENCE ON STAGE EUROPE

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SCIENCE ON STAGE 2022 PRAGUE

STEM WITH ARTS

projects combining STEM with other disciplines,
i.e. arts, music, sports, history, etc.

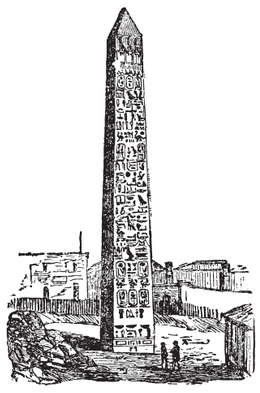
Zdeňka Kielbusová| VOŠ a SPŠE | Pilsen | Czech Republic

"Watches are not boots"

or

How time can be measured

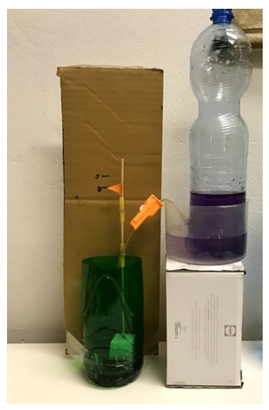
moon
sun



clepsydra

water
clock

gnomon
obelisk



other
tips

hourglass

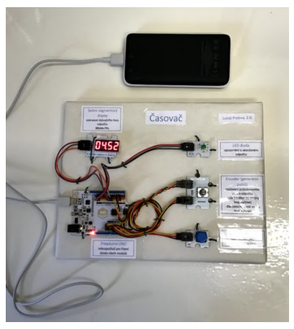
sundial

candle
clock

fire clock

cigar
clock

electrolytic
clock



other
clock