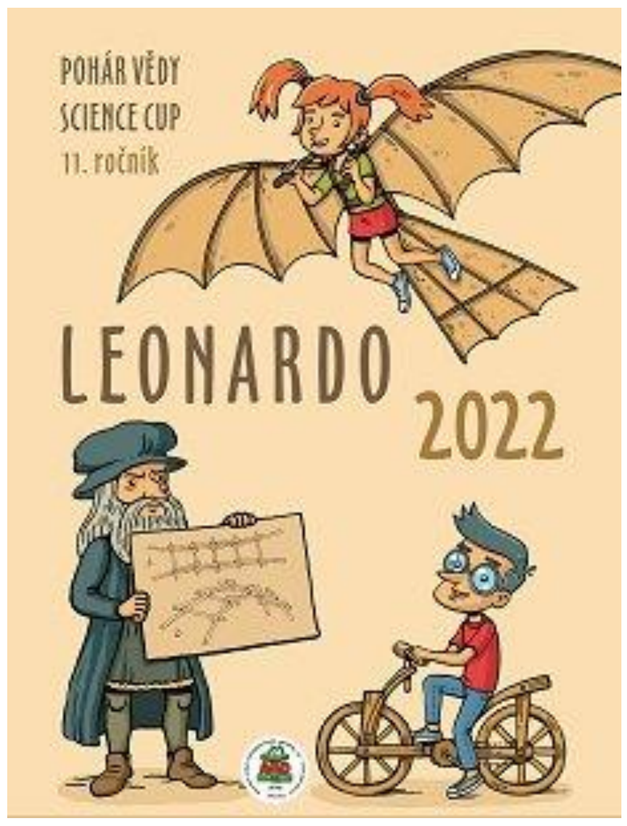
FROM TEACHERS FOR TEACHERS

DIVERSITY IN STEM EDUCATION

David Michálek | ZŠ Tyršova 446 | Nymburk | Czech Republic

Pohár vědy – Science cup

International science competition for children's and youth teams



Science cup is international science competition for children's and youth Teams. The assignment of the competition is bilingual - Czech-English. Team solutions are also submitted in Czech or English. The competition has 4 rounds, each round contains three parts - creativity, theory and research, practice and project.

WHO CAN PARTICIPATE:

- Debrouillards clubs – you can solve contest tasks as a team in your Debrouillards club.
- School or class teams - you can sign up for the contest as a class or any other school group.
- Friends & Family teams - if you have enough relatives or friends, you can also build your own team.

The competition is open in four age categories and two language mutations.

STATED AGE GROUPS:

- Kindergartens and pre-schoolers - aged 2 to 6 years
- Primary school - aged 7 to 10 years
- Secondary school - aged 11 to 14 years
- High school - aged 15 to 18 years

In each of the four contest rounds, you will complete tasks from the following areas:

- Creativity – 20 %
- Theory and research – 30 %
- Practice and project – 50 %

Maximum score in each round is 100 pts., given precentage represents the highest number of points one can get in each area of the competition. You are assigned to write down the solution procedure of individual assignments, research results and other information relevant to contest assignments and document it all with your own photos. For the sake of evaluation, the actual work of the team (images, photos, drafts, products, etc.) is crucial – not the work of the leader. You have one month to complete each assignment and submit your solution.

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DIVERSITY
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Milan Chalupník| ZŠ Seč, okres Chrudim| Seč| Czech Republic

Eggs

Physical games for the 5th year of elementary school

Physics games are a set of six motivational lessons for the 5th year of elementary school. The aim of the lessons is to motivate students for the subject Physics. Lessons are included throughout the year.
The egg is one of these lessons, we usually teach them before Easter.

The experiments will be familiar to you, but they are set in a certain sequence so that they connect knowledge from natural history, geography, architecture, history and, of course, physics.

What questions do pupils look for: How big are the eggs of different animals? How strong is the egg? Where is the fortress used? How do you recognize raw and boiled eggs? How to put eggs on top? How do you teach eggs to swim? How do I get the eggs in the bottle and out again? ...etc..

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Konstancja Nowakowska and Gabriela Pluciak | Tadeusz Kosciuszko Primary School | Zloty Stok | Poland

Dizziness from the windmill

The project "Dizziness from the windmill" takes us into the world of windmills, which are buildings equipped with wings. During the project participants constructed windmill models powered by wind, water, gravity and elasticity. During the presentation of individual models their construction, principle of operation and application is discussed.

. To make their models students used commonly available materials such as PET bottles, ice cream sticks, drink pipes, rubber bands, sticky tape, cardboard rolls, string, water, hot glue, recycled boards.

The project "Dizziness from the windmill" attempts to answer the question: Which is the best way to drive a windmill?

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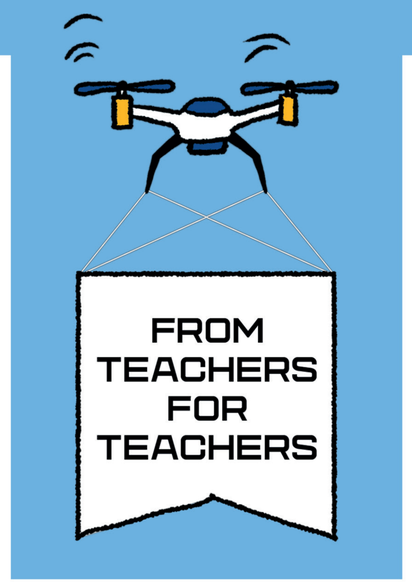


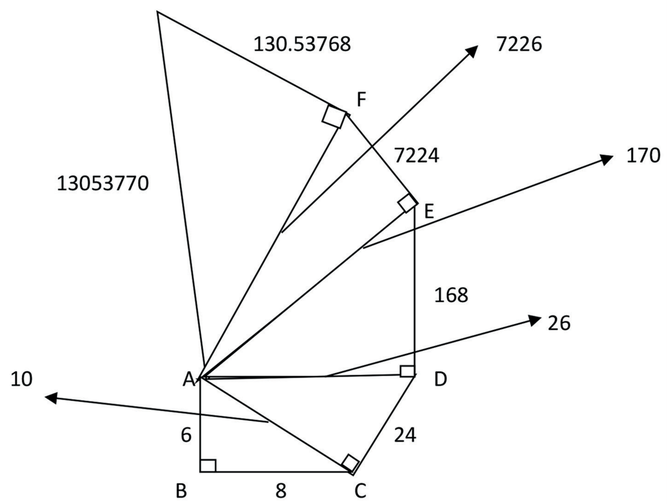
DIVERSITY IN STEM EDUCATION

REMZİ AKTAY | ÇUBUK BİLİM VE SANAT MERKEZİ | ANKARA|TURKEY

TEACHING MATHEMATICS WITH ENCRYPTION ALGORITHMS FROM PAST TO PRESENT

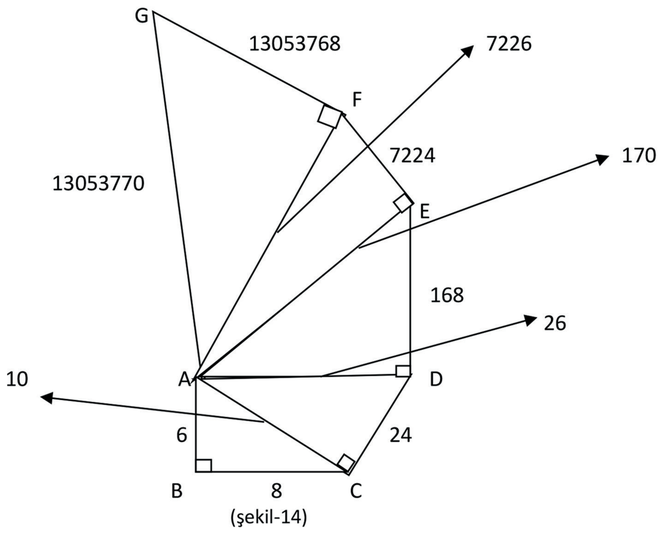
PURPOSE

In this study, applicaiton-oriented activities were organized that can be used by our teachers working all over the world. The activities were organized as STEM studies, and some concepts of the maathematics course and some of the computer science courses were intertwined. The aims is to enable students to make algorithms and coding by using the main discipline of mathematics, together with some of the achievements of computer science. These activities can be done by using only papaer, pencil, ruler, proteactor, compass and calculator for teachers working in unforable environment, as well as in environments where there is a computer and internet, they are arranged to be done with coding and software. In this way, the activities carried out allow teachers and students to do practical work in any environment.



(figure-4)

When the degrees of angles are calculated according to the tangent values of the angles of the A corner in the spiral, the following results are obtained approximately.
m(BAC)=53
m(CAD)=68
m(DAE)=81
m(EAF)=88.4
m(FAG)=88.5
Note: Triangle AFG is nested with triangle ABC due to its angle values. Because it crosses 360 degrees.



(şekil-14)

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Tablo-11

The triangle given in Figure-4 is distributed to the students . Let them think about why these triangles form a triangular spiral and how the r value should be used. If necessary, they are asked to draw the spiral with a ruler or measure its length. The following rule is then distributed to the students. In particular, the meaning of the tangent value and the angle finding rule are taught and they are provided to find the tangent values and angles depending on the side lengths given above. After which triangle the spiral is intertwined is shown in practice.

For example , if the lACl edge is deleted in figure-14 , ABCD rectangle becomes a Heron Quadrilateral. Because it is formed by the union of two right triangles, both the perimeter and the area are integers. For example, if the lADl edge is deleted in figure-6, the ACDE rectangle becomes a Heron rectangle. The same logic applies here as well. For example, if the edge LAEl is deleted, the ADEF rectangle becomes the Heron Square. From this point of view, we can obtain the infinite Heron Quadrilateral by continuing on the spiral. Also, since there will be infinitely different spirals, there are Heron Quadrilaterals in infinitely different ways. Table 4 ' when examined AFG wherein the angle values of the corner angles of the triangle after the next triangle is no problem in terms of not drawn any selected rectangle will remain between 88.5 degrees and 90 degrees.

Thanks to the method found, students can draw infinitely different spirals. The angles and side lengths of the triangles in this spiral can be found. Heron polygons can be found, especially the Heron Triangle.

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FROM TEACHERS FOR TEACHERS

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Tetiana Korets| Municipal special primary school «IRC № 2» | Melitopol| Ukraine

Educational game “Aroma and K”

“Aroma and K” is a game that combines three perception feelings: smelling, hearing and student’s sight. Due to the influence of the game, both of children’s cerebral hemispheres can be developed harmoniously and therefore their intellectual abilities can be seriously increased.

The purpose of the project: increasing a child’s ability to perceive and organize sensory information, to develop adaptive responses using olfactory receptors, visual and auditory channels; to develop kid’s memory, attention, mental capacity, logic, speech, worldview, improve kids vocabulary through different scents.

The more zones of perception are involved in the brain, the more mental connections can be formed during learning. Smells have a direct impact on the limbic system of the brain. This system plays an important role in the learning and organization of short-term and long-term memory, participates in the formation of orientation and research activities, and organization of motivational and informational communication (language).

Using the game “Aroma and K” children will be able to think critically, contrast different objects and compare them.

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DIVERSITY in STEM Education

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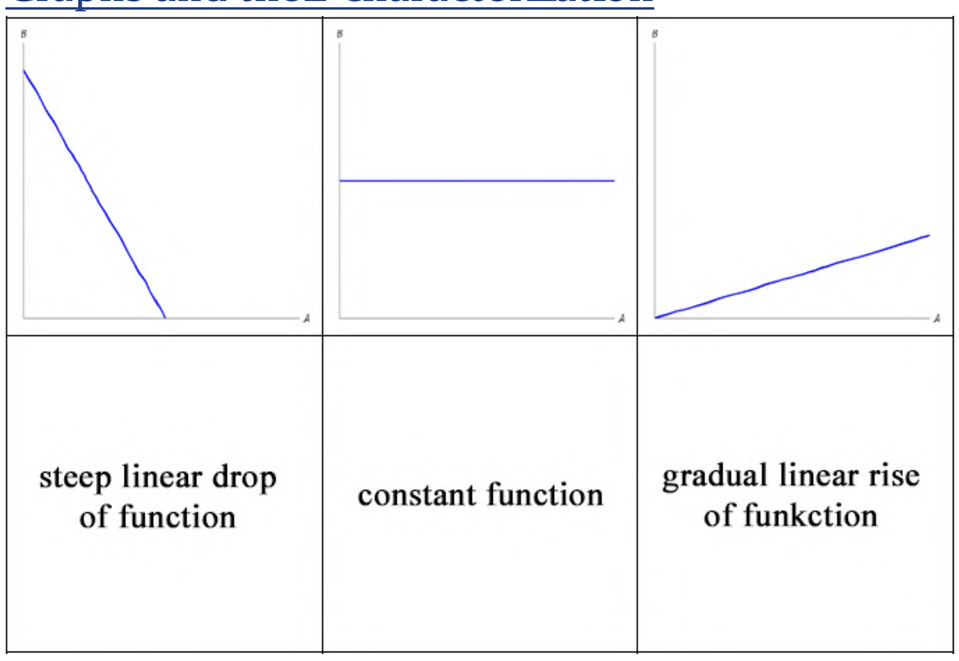
Jaroslav Reichl | The Secondary School of Telecommunication and Broadcasting Technologies | Prague | Czech Republic

The sets of revision cards for math and physics education

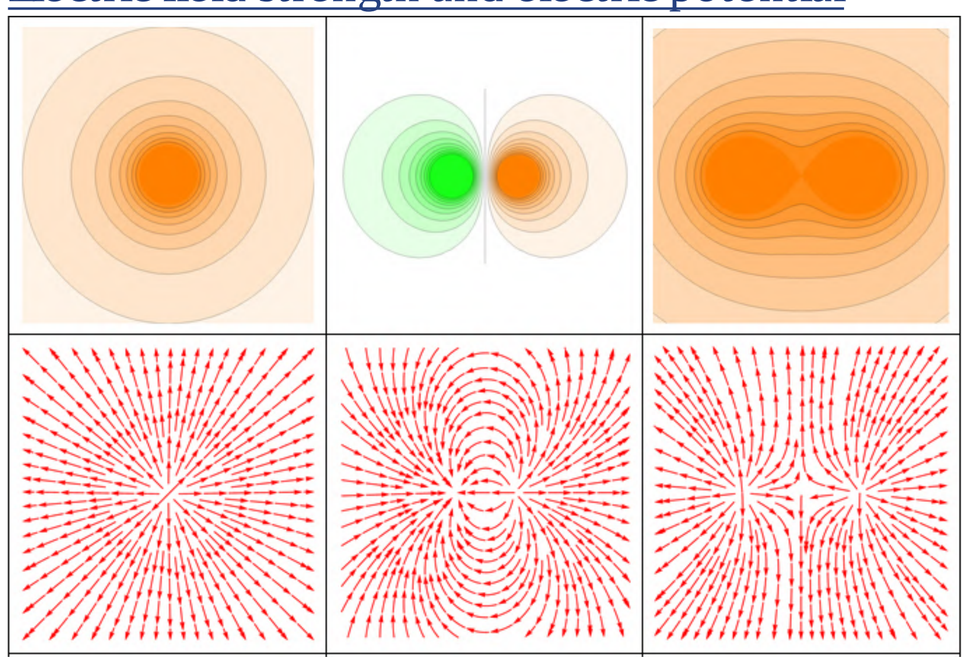
These cards are prepared for pupils on high school. They can revise with them explained math or physics parts and find new connection in the parts. These sets of cards are very useful for promotion activities of school where I have been taught for 21 years. Pupils from basic school can understand that math and physics are not tedious subjects.

Graphs and their characterization

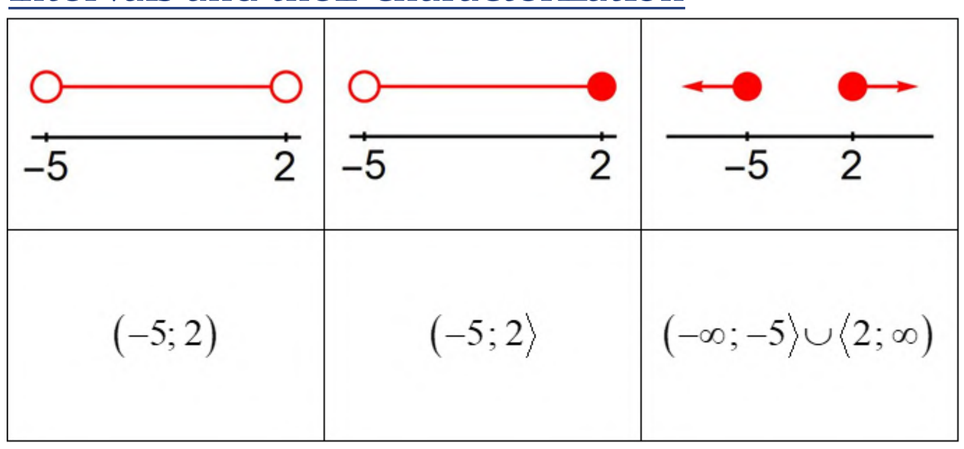


steep linear drop of function	constant function	gradual linear rise of funkction

Electric field strength and electric potential

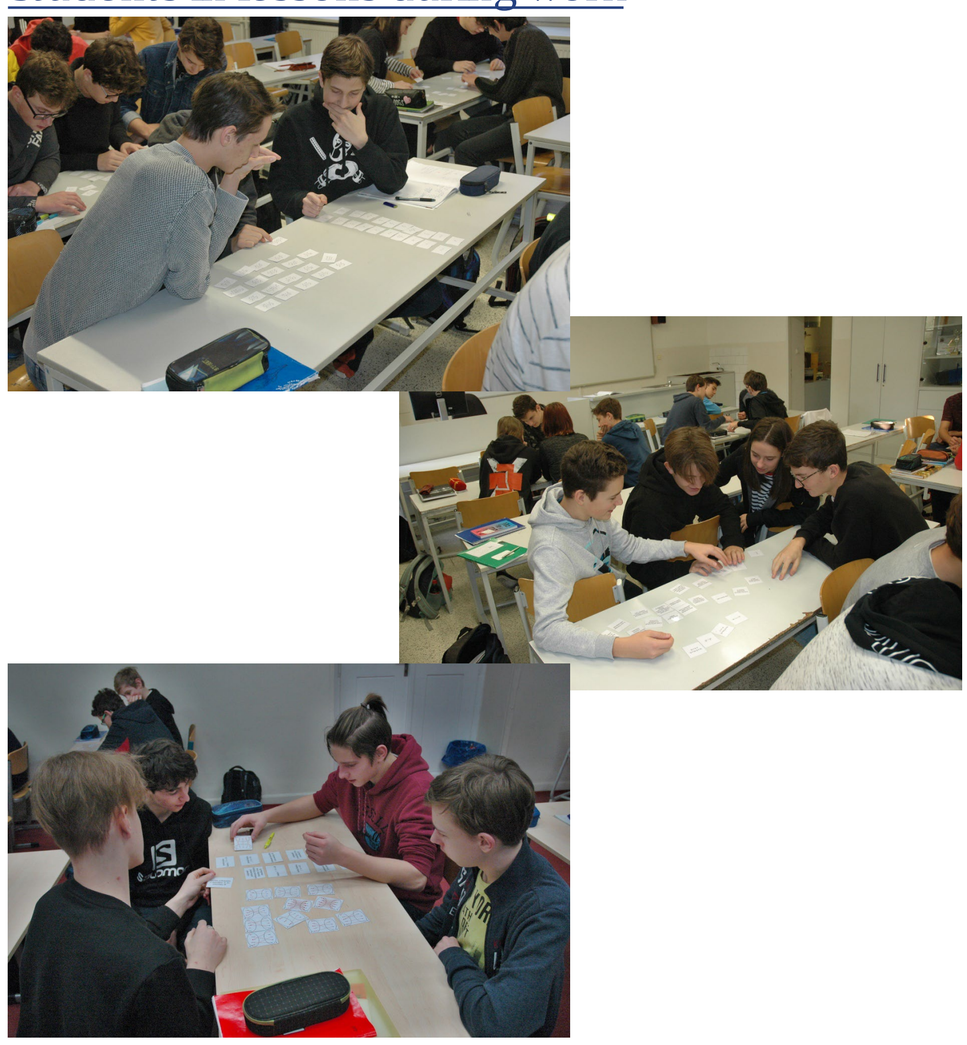


Intervals and their characterization



$(-5;2)$	$(-5;2\rangle$	$(-\infty;-5\rangle \cup \langle 2;\infty)$

Students in lessons during work



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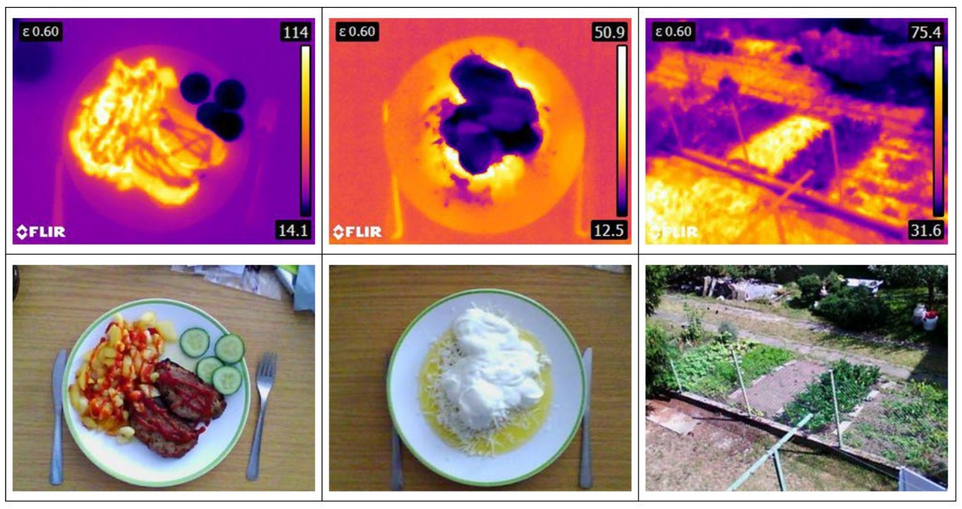

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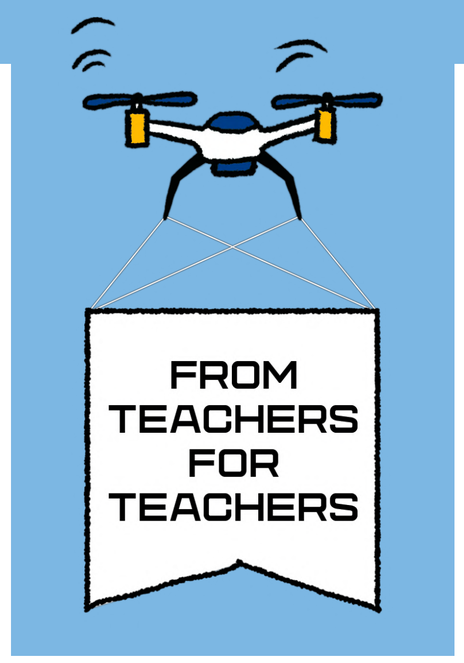


DIVERSITY IN STEM EDUCATION

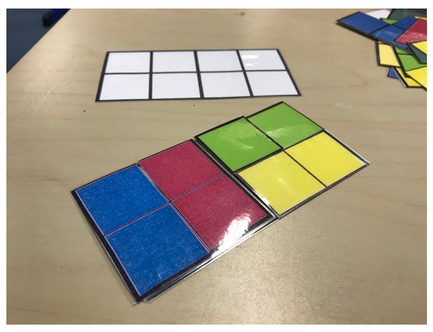
Daniel Vybíral | GALILEO SCHOOL | Frýdek-Místek | Czech Republic

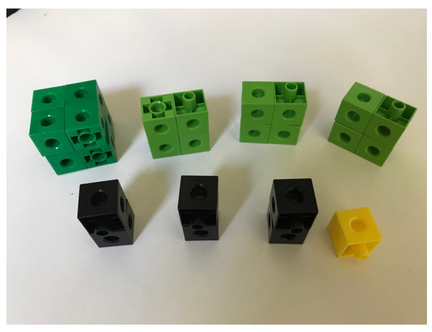
Manipulation to Understanding & Discovery

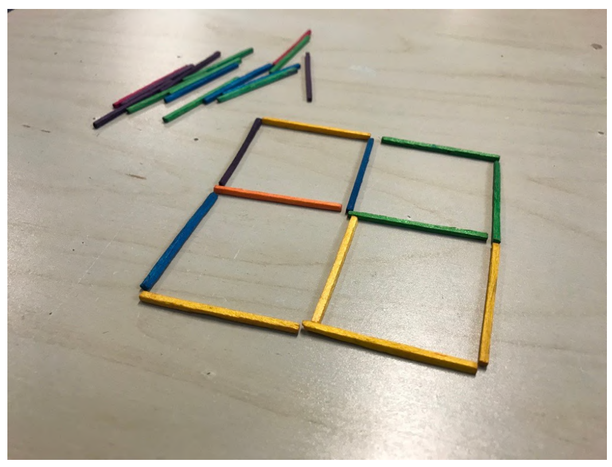
Abstract mathematical knowledge brought closer to students through manipulation with specific objects

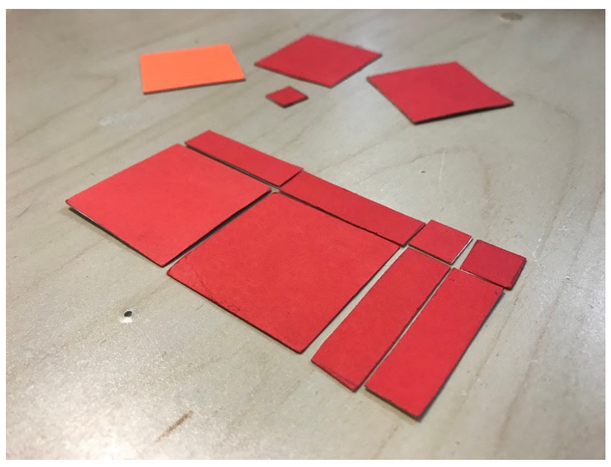
Grades 6-9

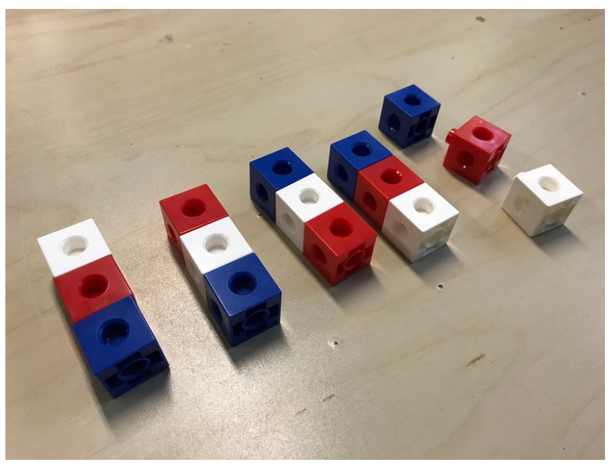
- Understand factorization of polynomials
- Discover the Fibonacci sequence
- Discover the factorial
- Find out the formula for the n-th member of an arithmetic sequence
- Solve combinatorics problems











Problem 1 - Sticks (6th grade)

Make a double window from 7 sticks. We will add more double windows to the right. In the picture, there are two double windows attached to each other. How many sticks do you need to make a) 3, b) 4, c) 5, d) 6, e) 7, f) 16, g) 50 double windows?

Problem 3 - Cubes (8th grade):

How many different towers can be built using a) white and red cube, b) white, red and blue cube, c) white, red, blue, and green, d) five cubes of different colors? In every case, all cubes have to be used.

Problem 4 - Squares and rectangles (8th grade):

Make a rectangle with 1 big square, 4 rectangles, and 4 small squares. What is its area?

$$a^2 + 4ab + 4b^2$$

Problem 6 - Candy (9th grade)

Frank got a bag of candy from his grandmother. When he emptied it, he counted 42 pieces of candy. "Tomorrow I will eat or give away half of the pieces to my friends. The next day I'll take half of the rest again. If it is not possible to divide the number in half exactly, I will take half a piece more than the exact half."

a) How many days will the candy last?

b) How many pieces of candy would he have to have at the beginning to make them last 10 days? What is the maximum and the minimum number of pieces he can have?

Problems are suitable for students of different levels.

Students with learning difficulties solve problems by manipulating shapes and objects.

Gifted students are able to discover how the sequences work or create formulas for different mathematical phenomena.

$$(n+1)!$$

$$a_n = 3n \cdot (n+1)^2$$

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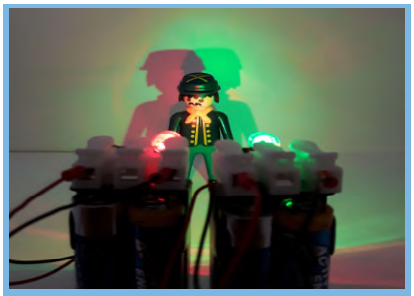
SCIENCE ON STAGE 2022 PRAGUE

Wolfgang Zeitter| Gymnasium Starnberg | Starnberg| Germany

Click Your Circuit

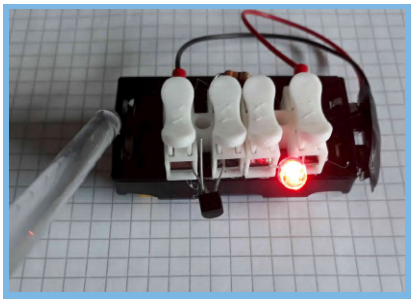
Simple circuits

Rapid construction – No tools – No risk of injury



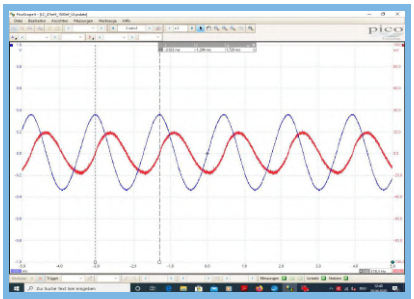
Light and shadow

Fluorescence



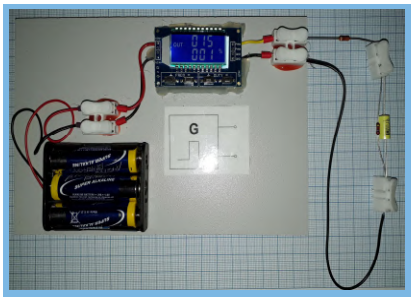
Charge detector

More complex circuits

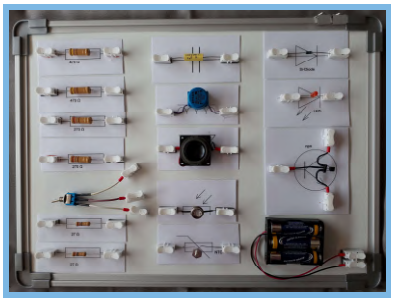


LC Oscillator

Pulse sensor



RC model Biomembrane



DIVERSITY IN STEM EDUCATION

Gabdullina Assel, Shamanova Oxana| NIS PMD| Shymkent| Kazakhstan

Biometric analysis

The project's **objective** is to develop students' interest and motivation to research through STEM projects. This project can make all students, include disabled, because they need only phone or laptop & internet. Also this project can helps to save houses of unprotected segments of population.

First activities:

- Elective course for students
- Meeting with teachers
- Decision integrated topics
- Selection theme for researching
- Beginning of work

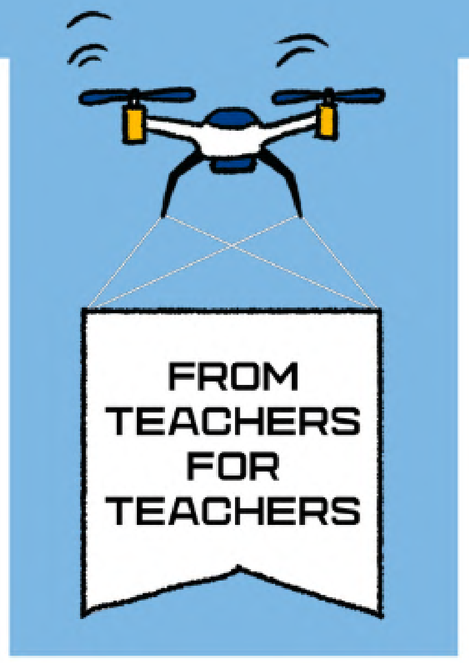
Project development

- Study of theoretical materials about biometric analysis and its types
- Identify methods of researching
- Collect permission from parents
- Creating a database (measured distance of key points and took photos)
- Practical part: work with Betaface API
- Presentation of projects by students & teachers

Results and achievements

- Increasing students' interest in the study of the structural features of the human body
- Application of Betaface API for identification in different angles
- The offering of using biometric analysis in our school

Students are introduced to types of biometric analysis and discover spheres of its application.



DIVERSITY IN STEM EDUCATION

projects including the variability of teaching methods, for talented students, for inclusive learning, cooperation between younger and older students etc.

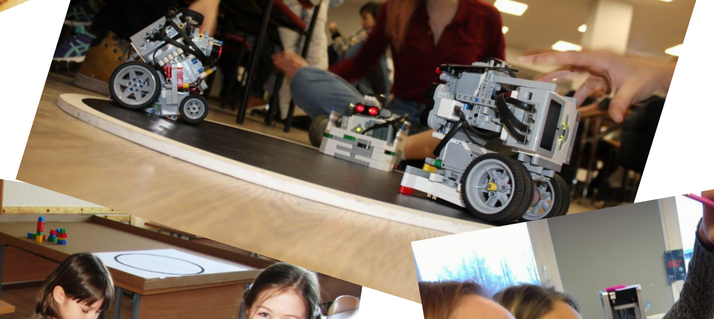
Aleksandr Smirnov, Josif Spirt | Jelgava 5th secondary school | Jelgava | Latvija

"How it works?". Development of science and technology competencies.

Pupils scientific and technological competences are developed using Lego,Robotics, Electronics and other kits.

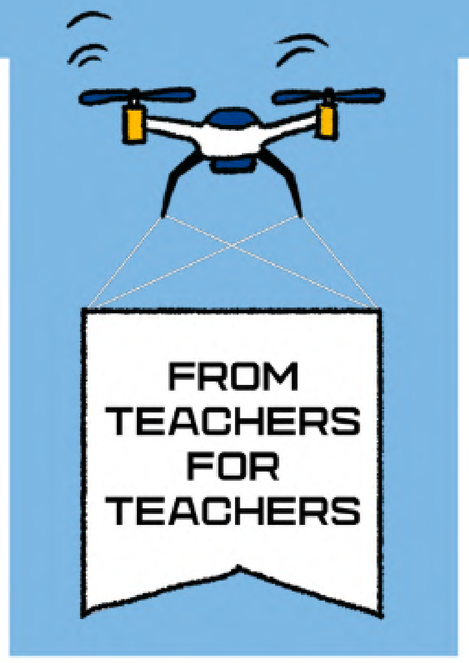
Using various resources,pupils research the problems raised,plan the steps to solve the problem.

If necessary,look for alternative solutions,using existing materials design,model,construct and program the necessary mechanisms using which to solve the set tasks.



Throughout the work there is cooperation between the school children. Pupils share experiences and skills among themselves.

Pupils not only learn the basics of robotics, electronics, programming, design and modeling, but also put the acquired knowledge into practice and train others.



DIVERSITY IN STEM EDUCATION

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STEM as a means of developing key interdisciplinary competencies in schoolchildren. 10 years of experience in applying the competency-based approach.

Thanks to the STEM approach, students can develop in several subject areas at once - computer science, physics, technology, engineering and mathematics. They understand that the studied, sometimes boring, theory also has an applied character. Apply their knowledge in practice. Gain critical thinking skills. Choose their future professions.

The curriculum of our school includes various areas of Robotics, such as Mechanical Engineering, Structural Engineering, Electrical Engineering, Electromechanical Engineering, Aerospace Engineering, Marine Engineering, Technology.

STEM lessons develop logic, engineering and analytical thinking style, give experience in teamwork and competitive activities. The structure of the lesson includes the stages of setting the problem, finding solutions, theory, practice (design, implementation, testing), engineering discussion and presentation.

In our school, elementary school students and high school students build their models, both from parts of various designers and from improvised materials, successfully present them at competitions, exhibitions, olympiads and competitions of various levels.

STEM subjects - the basis for the development of students' important transversal competencies

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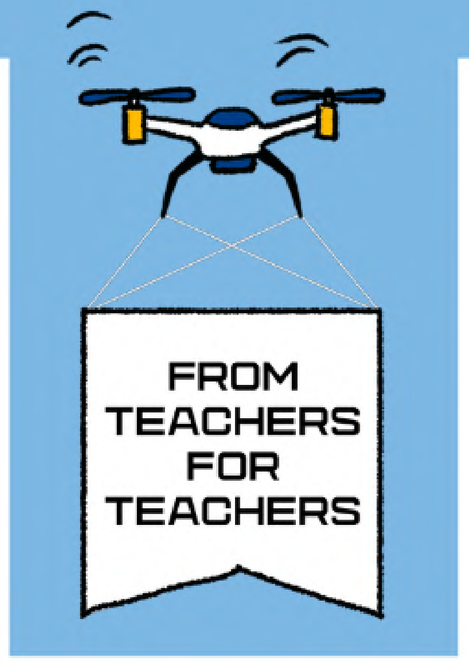

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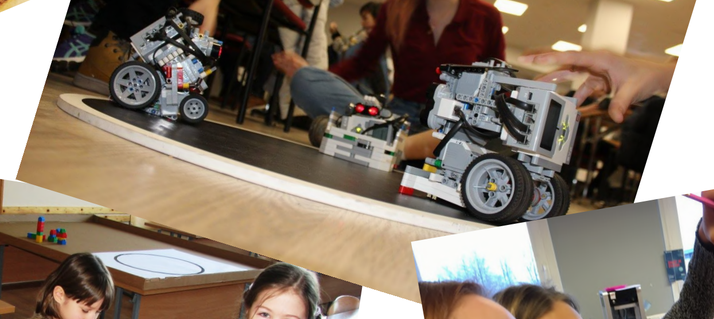

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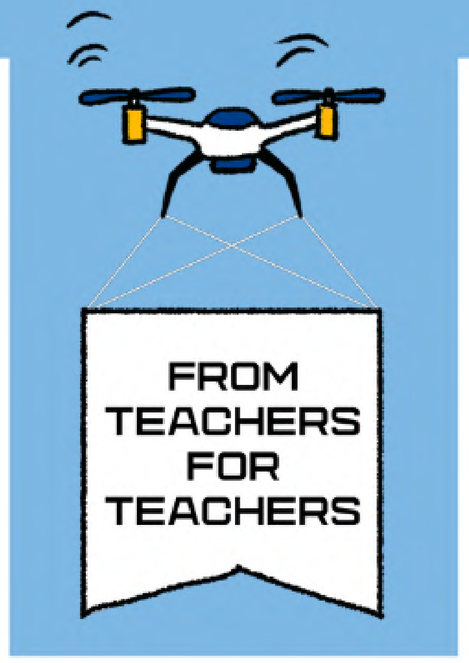

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DIVERSITY IN STEM EDUCATION

Simeon Eversen | Revius Lyceum | Wijk bij Duurstede | The Netherlands

Crazy-55

Project of the subject ecology.

Students are spending too much time in front of their laptops and telephones. That's why I thought they should get out and experience biology outside in their environment. In this student-driven project, students have to work in couples through the assignments . The students choose their own photo assignments. In order to choose the right assignments, the students must master and read through the material of Ecology. In the end, every photo has to be justified and explained.

<u>Three example exercise of the crazy-55</u>

- Kiss a carnivore and make a photo and explain why this animal is a carnivore. Explain clearly why your photo shows this.

- make I love biology with small chemical waste. Explain clearly why your photo shows this.

- Have a "chubby bunny" contast to see who can take te mocst dcomposers. Explain clearly why your photo shows this.

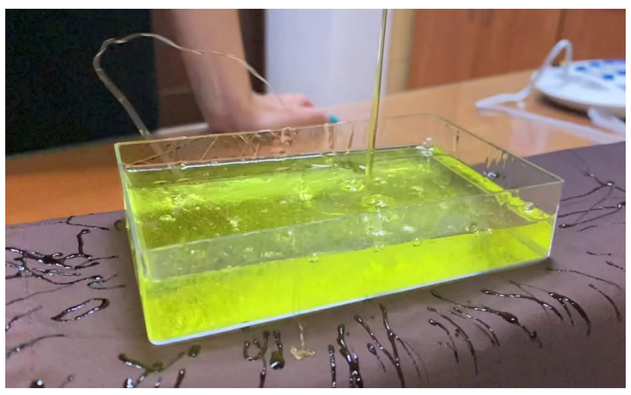
I hope you'll all have fun.

FROM TEACHERS FOR TEACHERS

DIVERSITY
in STEM Education

Magdalena Grygiel | High School of Nicolaus Copernicus | Kalisz | Poland

Investigating optical properties of non-Newtonian liquid

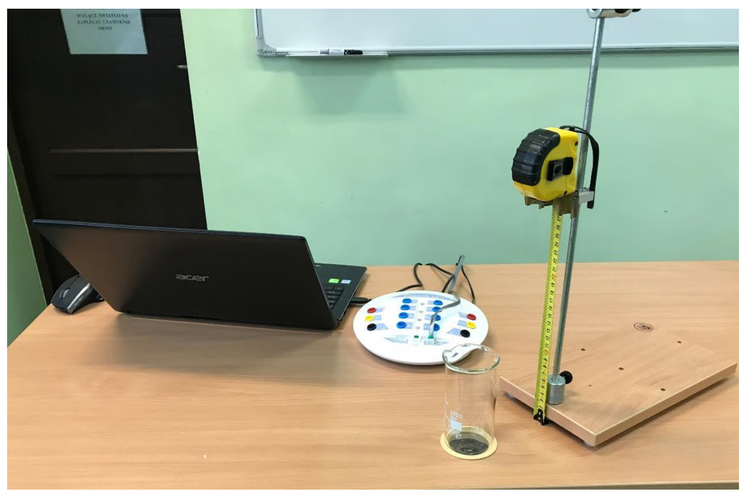


The Kaye's effect occurs when a thin stream of non-Newtonian liquid is poured onto a surface. Suddenly, a small stream of liquid occasionally leaps upward from the heap. This effect is named after its first observer A. Kaye.

Bouguer's law

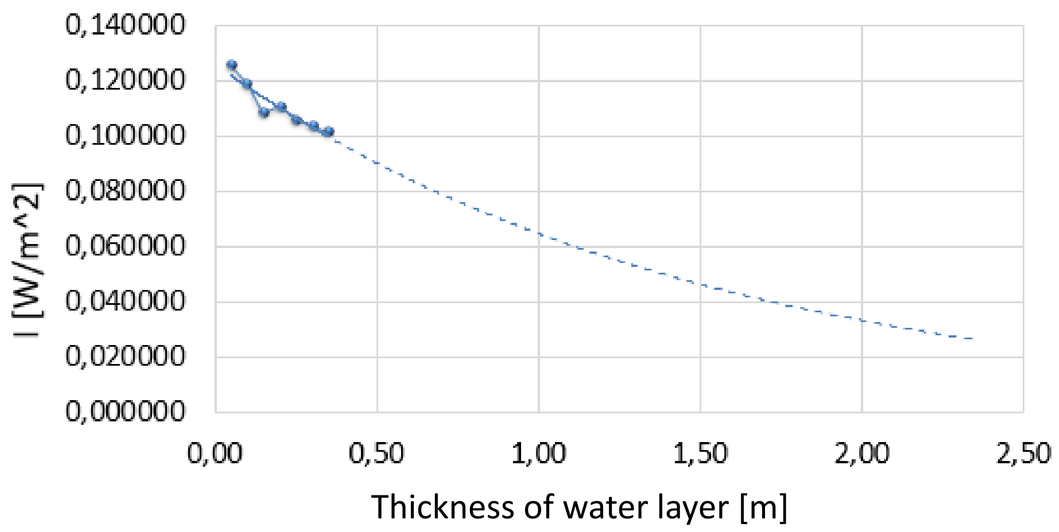
$$I(x) = I_0 e^{-\alpha x}$$

x – thickness of liquid layer
I_0 – intensity of light
α – absorption coefficient



Experimental set

Testing Bouguer's law of light absorption in non-Newtonian liquids.
As control samples we used water, colored water and canola oil. We changed the layer of water (and other liquids) thickness and measured light intensity by a sensor and COACH LAB II+. We tested non-Newtonian liquids: shower-gel, honey and slime. Graphs present our results.



Conclusion: non-Newtonian liquids obey the Bouguer's law just like ordinary Newtonian liquids.

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FROM TEACHERS FOR TEACHERS

DIVERSITY
in STEM Education

Magdalena Grygiel| High School of Nicolaus Copernicus | Kalisz | Poland

Investigating optical properties of non-Newtonian liquid

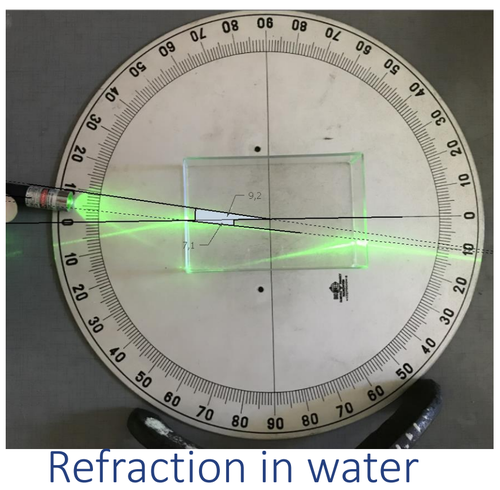
Observation of refraction in non-Newtonian liquids gave an opportunity to take photos and by using sfotware to determine angels of incidence and refraction light in water (as a control sample), dish soap and slime. The experimental results were used to calulate the speed light propagation in the liquids by using MS Excel.

Calculation of light speed in liquid

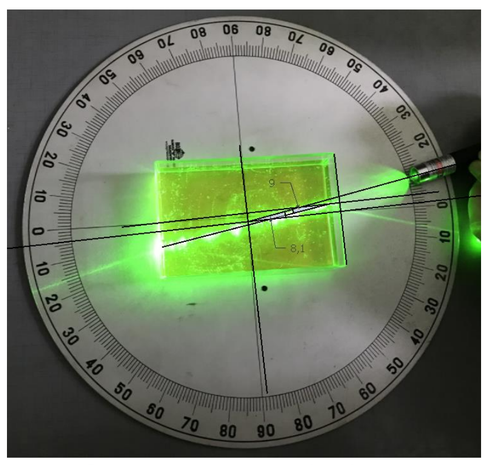
$$\frac{\sin\alpha}{\sin\beta} = \frac{c}{v} \rightarrow v = c\frac{\sin\beta}{\sin\alpha}$$

α – angle of incidence

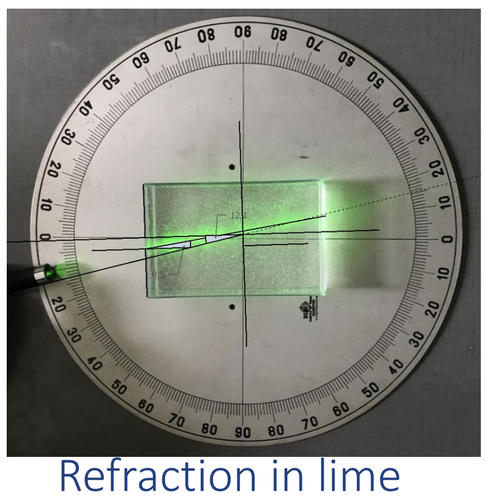
β – angle of refraction



Refraction in water



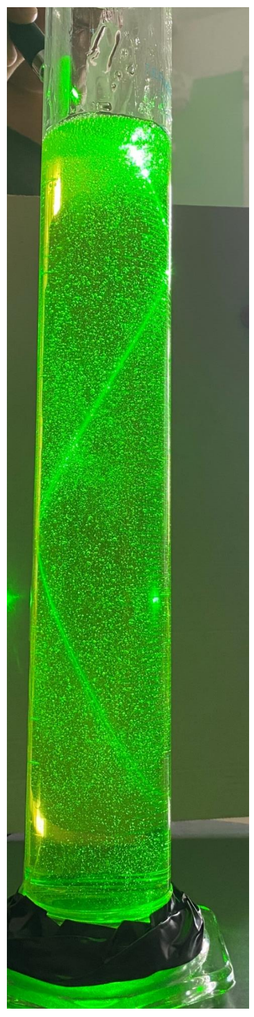
Refracrion in dish soap



Refraction in lime

liquid	water	dish soap	slime
α	9,2	9,0	12,1
β	7,1	8,1	8,5
v [$\cdot 10^8$ m/s]	$2{,}316 \mp 0{,}068$	2,700	2,114

Tab. Experimental results, for water it was possible to calculate measurement uncertainty.



In non-Newtonian liquid phenomenon of total internal reflection is also observed. The photo presents the phenomenon in shower-gel.

Special thanks to my studenst: Hanna Kłysz, Ada Wojterska, Natasza Jarecka and Michał Młynarczyk, who colaborated in the project.

Conclusion: optical properties of non-Newtonian liquids are similar to Newtonian liquids.

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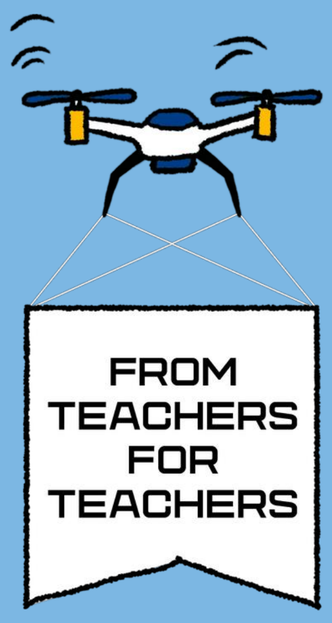

DIVERSITY
in STEM Education

Nina Cielica, Barbara Szymańska-Markowska, Adam Buczek

Youth Palace | Katowice | Poland
University of Silesia | Katowice | Poland
Primary School 5 and Primary School 25 | Zabrze | Poland
Poznan University of Technology | Poznań | Poland

Hurricane in the cup

Turbulent flow is quite difficult in mathematical description. On the other hand, vortices in the liquid are visually beautiful. These phenomena can encourage young people to become interested in science. For this reason, two methods of observing "hurricanes" in fluids are presented in this poster.

In the first method diffusion of milk poured into coffee was observed. Vortices formed during this process were recorded. The experimental setup is shown in Fig. 1.

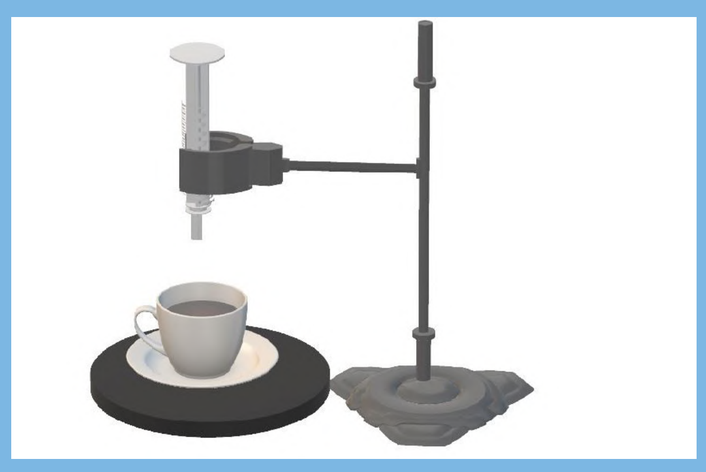

Fig. 1. Scheme of the setup used in the first method.

Ordinary and a thermal imaging cameras were used to record the phenomenon, which enabled a more accurate analysis of the vortex properties (Fig. 2ab). The control of the necessary parameters was possible in system which contains of a cup placed on a rotating disc with adjustable rotation speeds and a syringe on a tripod above the vessel. During the experiment, the temperature of the fluids, the ratio of their volumes, the direction and speed of rotation of the disc, as well as the substances themselves were changed. Dependences of movement parameters on the factors mentioned above were observed. It was also possible to compare them to phenomena occurring on a larger scale.

For instance when the milk is poured into the coffee, the first characteristic form can be observed, consisting of two vortices rotating in opposite directions, known as mushroom vortex rings (Fig. 2b). This occurs as the liquid being poured in, meets resistance and gradually curls, forming spirals. This process disappears as the energy dissipates in the fluid.

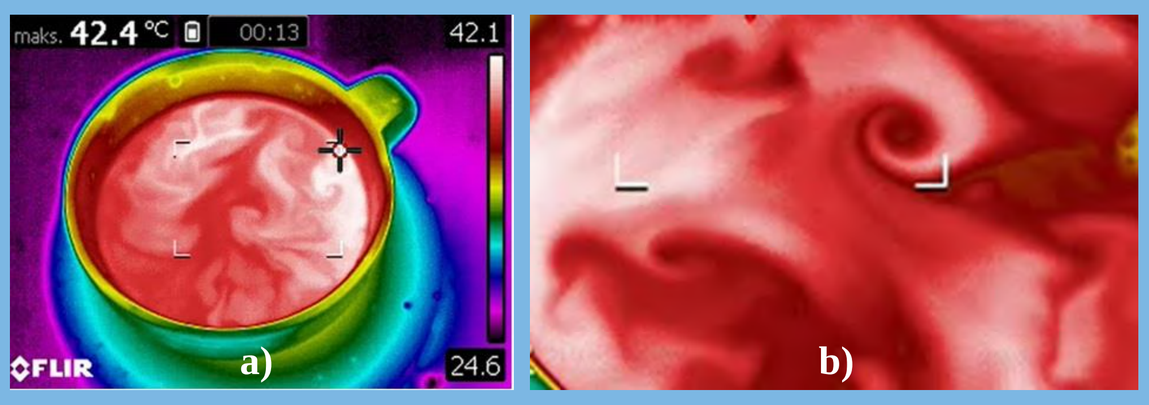

Fig. 2. Pictures from the thermal imaging camera.

In the second method a mixture of powdered mica with water has been used (2g of powder for every 0.2l of water). The movement of mica particles reflecting light in different directions allows the observation of fluid "hurricanes" in various situations – for instance while rotating the liquid in a round (Fig. 3) or square (Fig. 4) vessels.

Fig. 3. A mixture of powdered mica and water rotating in a round vessel.

Fig. 4. A mixture of powdered mica and water rotating in a square vessel.

Conclusion: Fluid dynamics involves many beautiful phenomena that may be observed in every day. For instance enables didactically valuable experiments with "hurricanes" in safe, small scale - just in the cup.

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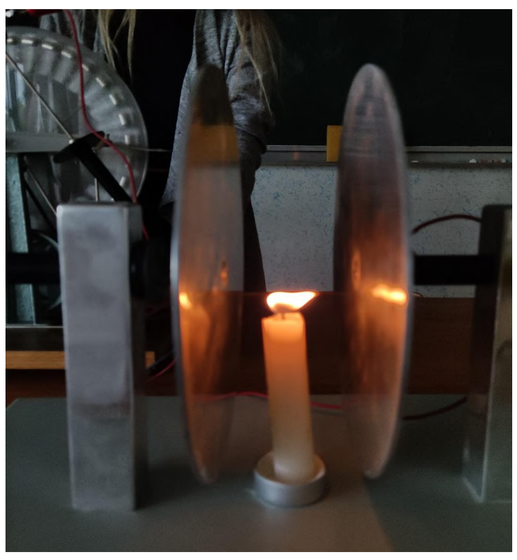
DIVERSITY IN STEM EDUCATION

Zenona Stojecka |Tadeusz Kosciuszko High School| Wielun | Poland

A candle and its (extra)ordinary flame

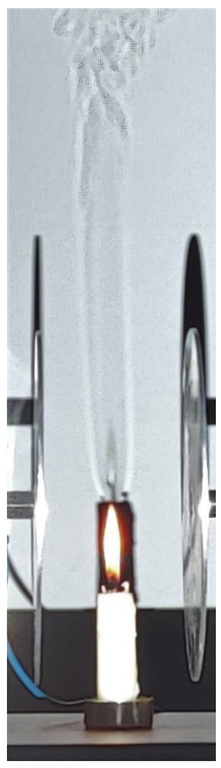
Interesting ideas for experiments

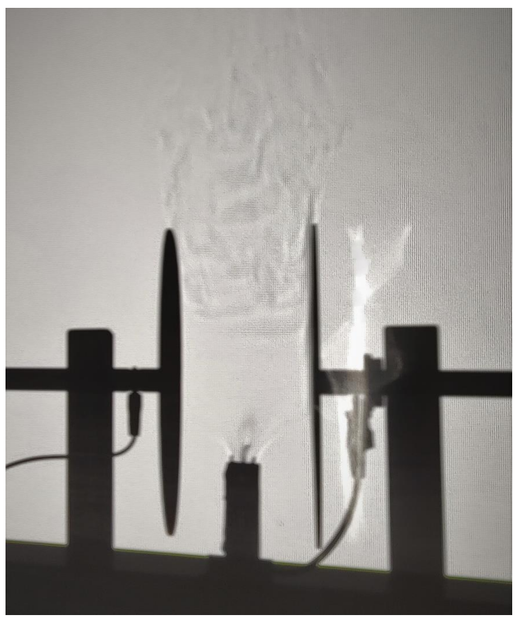
- How does the candle flame behave in a uniform electric field?
  The flame assumes the shape of so-called **"Napoleon's hat"**



- What is the **convection current** in air caused by a hot candle flame? The observation will be made possible by the **so-called shadow projection**.

- The candle flame creates **ionization in the air.** We will see that the convection current in a uniform electric field splits into **two streams!**





- What is the difference between the **spectrums of light** emitted by candles depending on their chemical composition ?

These are just some examples of interesting experiments.

Conclusion: Interesting experiments with a candle and its (extra)ordinary flame will surprise students and make lessons in thermodynamics, mechanics, optics, electrostatics, electricity and magnetism more attractive!

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Milica Aleksic | Savremena gimnazija | Belgrade | Serbia

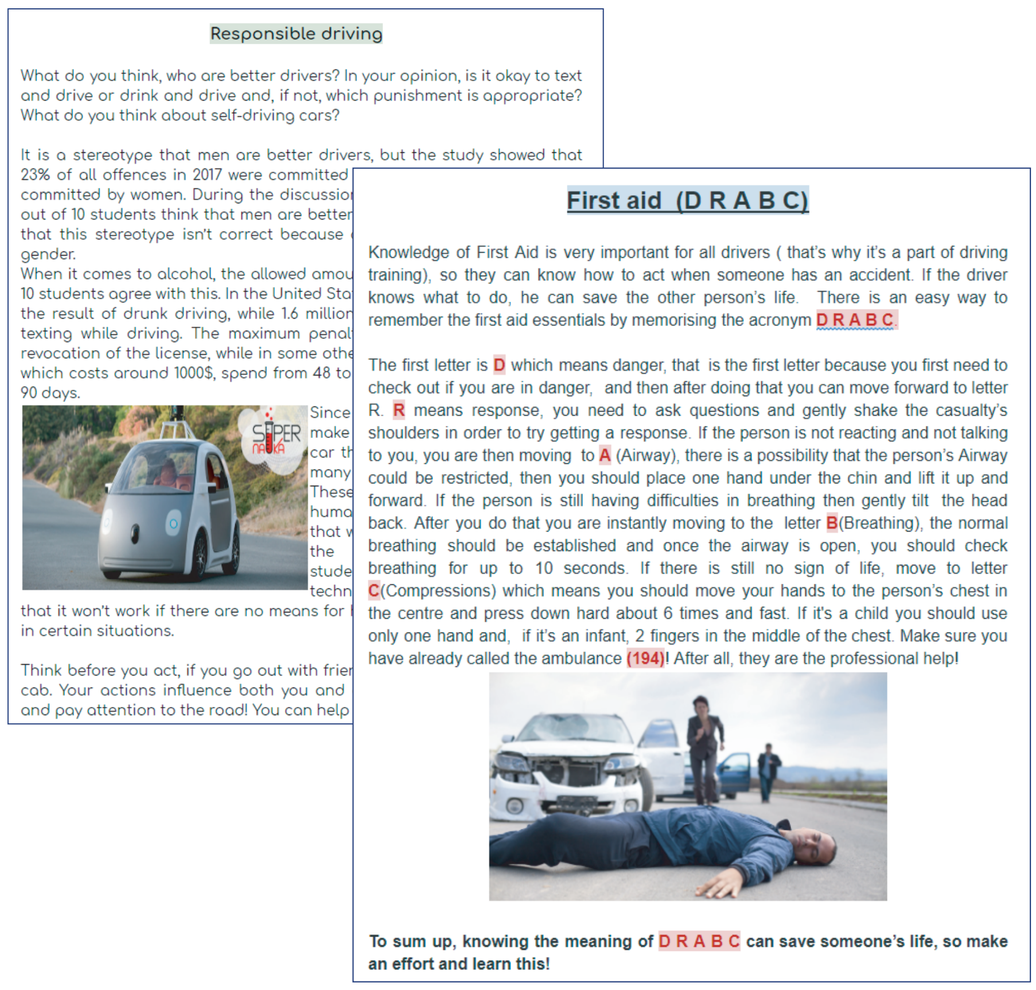
Drive Safely

Learning for life

Project overview and aims:

The goal of the project is to raise awareness among 18-year-old highschool students about the importance of safe driving. Students are expected to create a leaflet containing a QR code, which further leads to a web magazine with 6 texts on driving, each of which deals with the topic from the angle of one of the subjects (Physics, Chemistry, Biology, English, Physical Education, Civic Education).

The idea is to use an everyday phenomenon (driving) and leverage students' interest in it to engage and motivate them to uncover how STEM subjects help them be better drivers, and then use Arts to create an educational material for their peers about the knowledge gained.



Responsible driving

What do you think, who are better drivers? In your opinion, is it okay to text and drive or drink and drive and, if not, which punishment is appropriate? What do you think about self-driving cars?

It is a stereotype that men are better drivers, but the study showed that 23% of all offences in 2017 were committed committed by women. During the discussio out of 10 students think that men are better that this stereotype isn't correct because gender.
When it comes to alcohol, the allowed amou 10 students agree with this. In the United Sta the result of drunk driving, while 1.6 millior texting while driving. The maximum penal revocation of the license, while in some othe which costs around 1000$, spend from 48 to 90 days.

Since make car th many These humo that the stude techn

that it won't work if there are no means for in certain situations.

Think before you act, if you go out with frier cab. Your actions influence both you and and pay attention to the road! You can help

First aid (D R A B C)

Knowledge of First Aid is very important for all drivers (that's why it's a part of driving training), so they can know how to act when someone has an accident. If the driver knows what to do, he can save the other person's life. There is an easy way to remember the first aid essentials by memorising the acronym D R A B C.

The first letter is D which means danger, that is the first letter because you first need to check out if you are in danger, and then after doing that you can move forward to letter R. R means response, you need to ask questions and gently shake the casualty's shoulders in order to try getting a response. If the person is not reacting and not talking to you, you are then moving to A (Airway), there is a possibility that the person's Airway could be restricted, then you should place one hand under the chin and lift it up and forward. If the person is still having difficulties in breathing then gently tilt the head back. After you do that you are instantly moving to the letter B(Breathing), the normal breathing should be established and once the airway is open, you should check breathing for up to 10 seconds. If there is still no sign of life, move to letter C(Compressions) which means you should move your hands to the person's chest in the centre and press down hard about 6 times and fast. If it's a child you should use only one hand and, if it's an infant, 2 fingers in the middle of the chest. Make sure you have already called the ambulance (194)! After all, they are the professional help!

To sum up, knowing the meaning of D R A B C can save someone's life, so make an effort and learn this!

Project benefits:

Throughout the project, students are expected to apply practical skills in the field of computer science, master the techniques of data analysis and drawing conclusions, utilise the appropriate writing techniques to be persuasive and target the desired audience, develop creativity, communication and entrepreneurial skills and exercise peer education.

In addition to this, students master the techniques of evaluating one's own and other people's work and develop numerous interdisciplinary competences (working with data and information, cooperation, digital literacy, aesthetic competence, competence for lifelong learning, problem solving, team work, responsible attitude towards health).

Tapping into students' interests is a powerful tool to make them discover, acquire and apply knowledge and skills needed for life.

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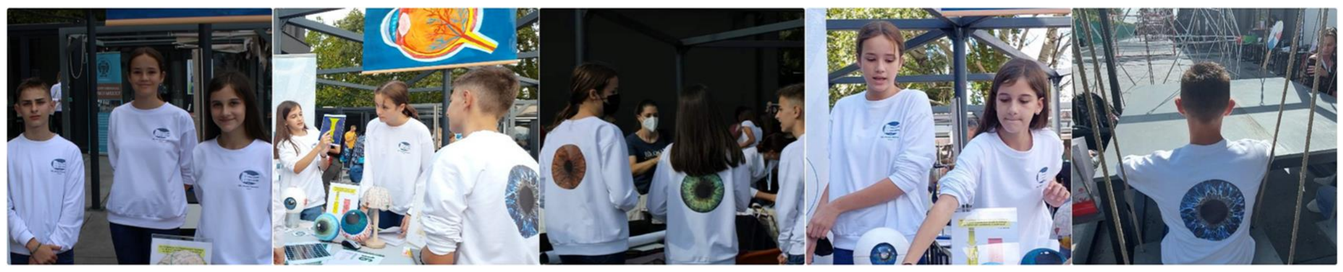


Biljana Uskoković Brković| Milica Pavlović Primary School | Čačak | Serbia

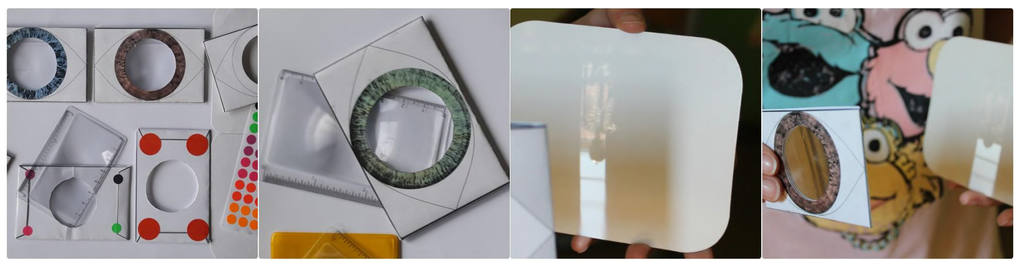
Visual perception

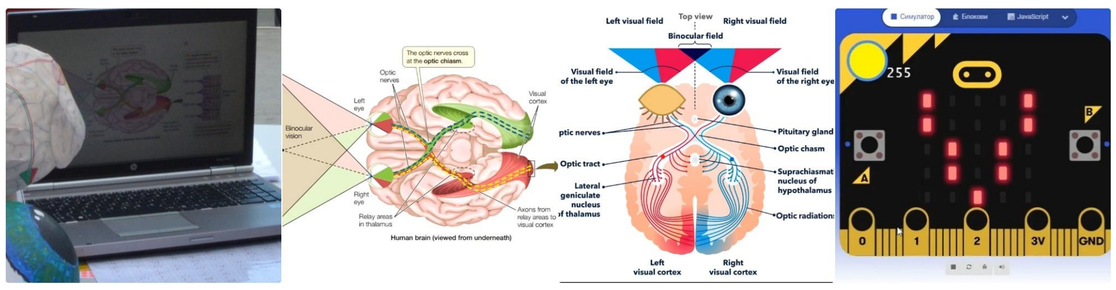
Biology, Physics, Art, IT

When we see our reflection in the mirror, we cannot help wondering: What lies behind? How do our eyes help us get to know the world around us? How do our eyes actually function? Answers to these questions are interspersed with challenges that pupils find inspiring enough to strive to explore this mystery further.

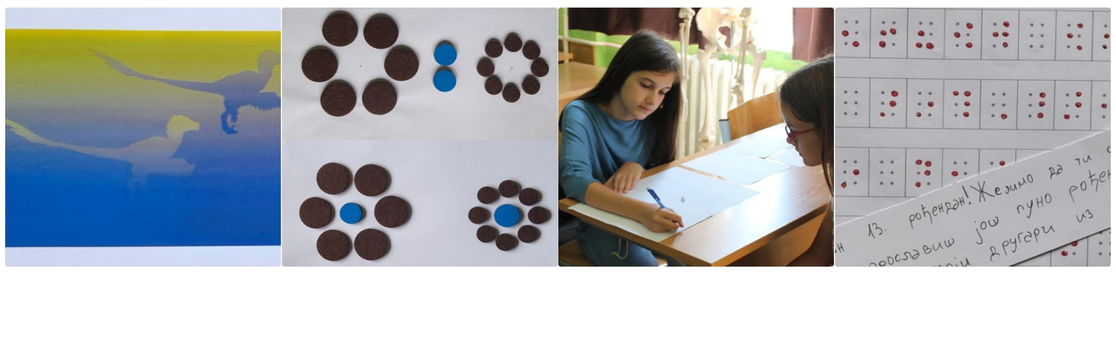
Eye anatomy: assembling a model using various materials found at home.

An image on the retina: a model of the anterior and posterior segments of the eye assembled using paper and a magnifying glass, an experiment in person.





Visual pathway simulation: an animation of a nerve impulse transmission and possible irregularities.
Coding with micro:bit: conversion of a physical stimulus - light of certain intensity - into electrical impulses.



Optical illusions. Reading with your fingers. Examples of optical illusions in person. Composing a message in Braille for a classmate.

The project involves challenge-based and experiential learning as well as extensive research into the topic by young, self-taught enthusiasts.

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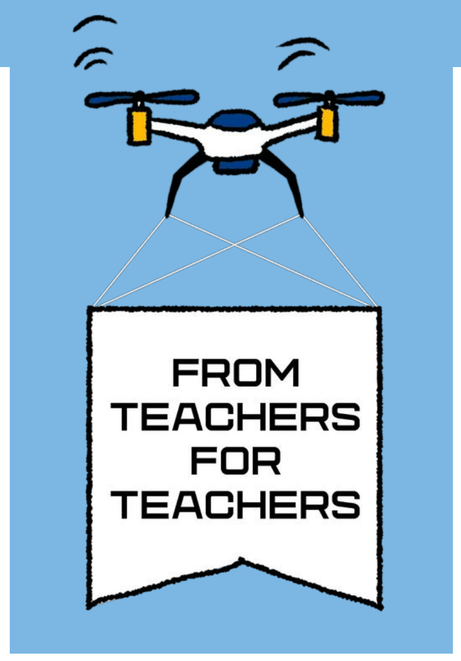


DIVERSITY IN STEM EDUCATION

Ivan Nadal Latorre| Institut Carles Vallbona | Granollers (Barcelona) | Spain

STE(A)M WITH *SPHERO*

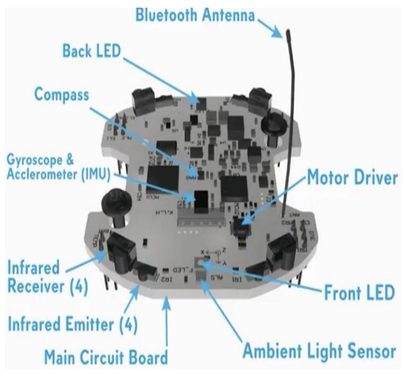
DESIGN AND CREATION OF ACTIVITIES WITH ROBOTS. THINKING ABOUT DIVERSITY

A series of educational proposals associated with robotics and different STE(A)M areas are collected using *Sphero* robots. They act as learning tools in a more attractive environment for students.

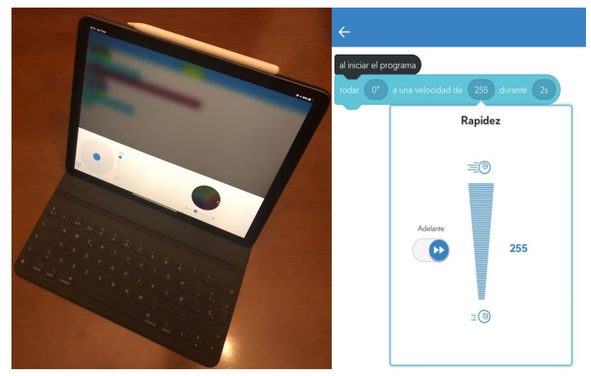
They have sensors that allow you to track kinematic variables. *Sphero Bolt* also floats in water, so you can work in the field of fluid dynamics. Here are some examples of its applicability.

Finally, the work environment, *Sphero Edu*, is very intuitive. It can be programmed in different levels of complexity, from drawing to using JavaScript. All this with the possibility of sending written messages or sounds, allowing a more inclusive learning (sensory diversity, for example).

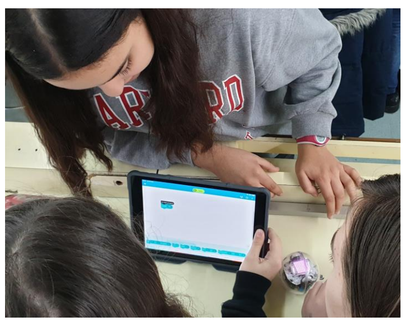
Sphero robots can use: Spark, Bolt and Indi.

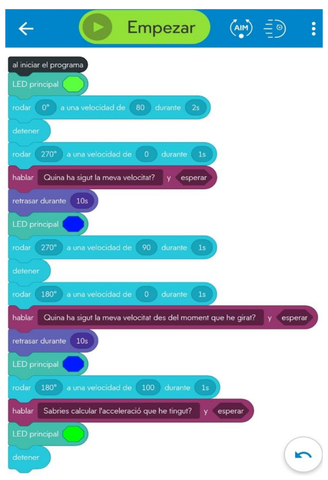


Some parts of the robot.



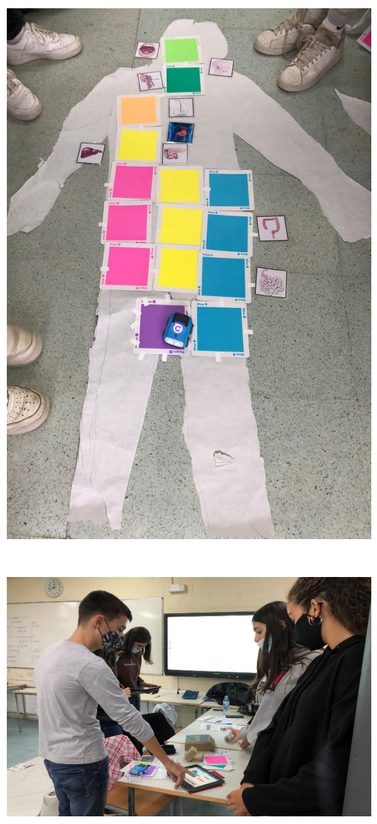
Sphero Edu app (driving and programming).





Students working with Sphero Bolt in Physics class (Kinematics).

Video and program of one of the activities in the Physics class.



Activities in a Science class (Biology and Ecology) with Sphero Indi.

Together these focus on areas as diverse as Physics, Biology or Social Sciences, and many others. First it can program challenges in relation to the different types of movement; secondly, it can create a circuit of the digestive system, it can also design and create a surface cleaning system in small ponds; and thirdly, help with road safety.

Although the activities are centered between 12 and 15 years old, the fact that they favor inclusive learning is also important, since robots can send written messages thanks to the small LED screen they have, as well as sounds via the mobile device.

Conclusion: both, teachers and students, can be stimulated with the use of robotics in the classroom. Through experience I know this has helped the students, even those with special needs, to achieve the objectives set, respecting the individual rhythms of each one.

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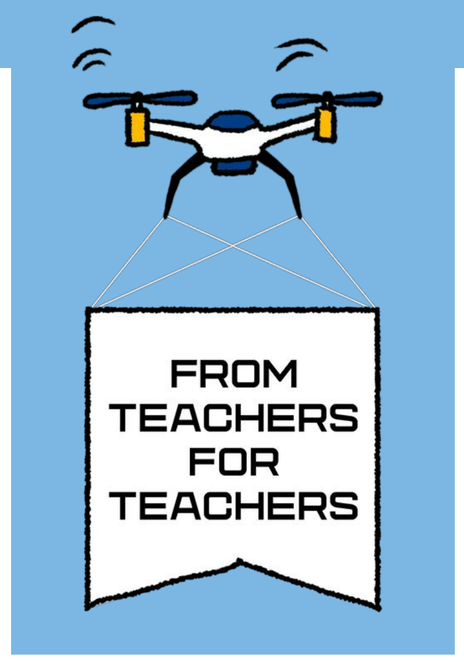
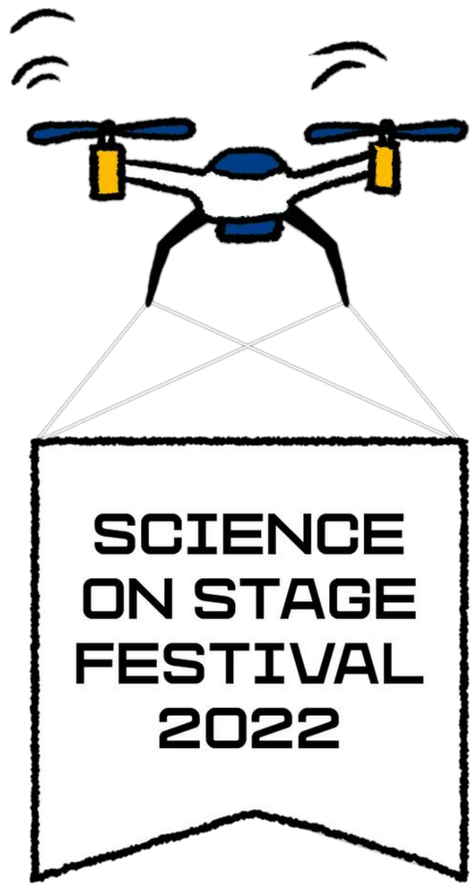


DIVERSITY IN STEM EDUCATION

Anders Erixon | Grillska Gymnasiet | Stockholm | Sweden

A Multimodal Approach to Science Education

Multimodal Teaching focuses not only on the texts and words but also on the ‘signs’ that are a crucial part of communication. In my ideal form of multimodality it is a ‘Catalytic’ way of teaching with a calm and thoughtful conversational climate. The teacher is inspiring the student without feeling stress.



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FROM TEACHERS FOR TEACHERS

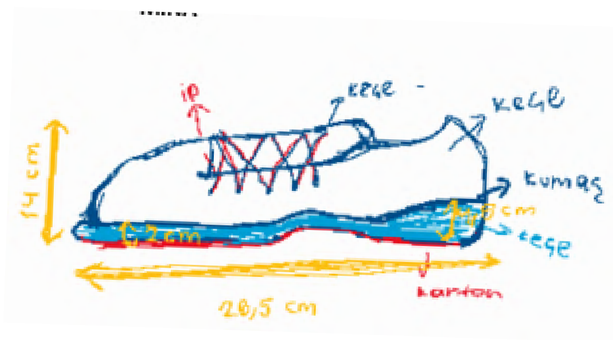
DIVERSITY IN STEM EDUCATION

projects including the variability of teaching methods, for talented students, for inclusive learning, cooperation between younger and older students etc.

Deniz Cemre Cimbar I Açı Middle School I İstanbul I Turkey

DESIGN YOUR OWN SHOES

The aim of this study, which is a STEM project, is to discover that solid pressure is related to force and surface area with the connection to everyday life. For this purpose, students were asked to design their own shoes by following the STEM steps. The study was applied in the distance education process due to the Covid-19 pandemic and the students had to work individually.



By designing and reinforcing how the dependence of solid pressure on the surface area affects daily life, it enables the use of engineering and design skills and the application of scientific process steps in the design process. The ease of procuring the materials used in the project and the variety of materials allow the emergence of different products for the same purpose.

FROM TEACHERS FOR TEACHERS

DIVERSITY IN STEM EDUCATION

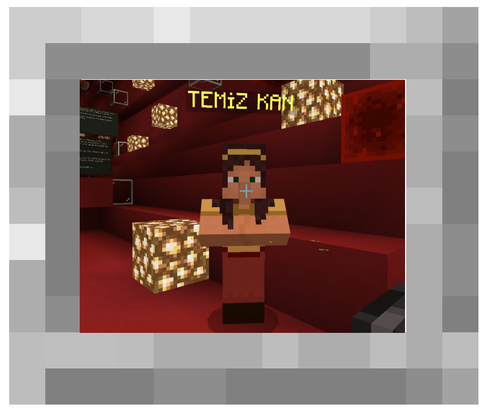
Yudum Özkan - Murat Zavrak | Izmir SEV Middle School | Izmir | Turkey

Journey to the Circulatory System with Minecraft

Minecraft:Education Edition Lesson Plan

In Minecraft:EE (Minecraft:Education Edition, we created 3D Vein. Students use Minecraft: EE to connect to the world and collaborate with their friends to learn about blood cells, their functions, and the aspects of the circulatory system in an online setting. We gave them the involved, social class setting that they had sorely missed during the outbreak. In this project, we'll show you how to start altering your teachings with Minecraft:EE by sharing a variety of multidisciplinary lesson plans.

TEACHING AND ASSESSMENT TOOLS

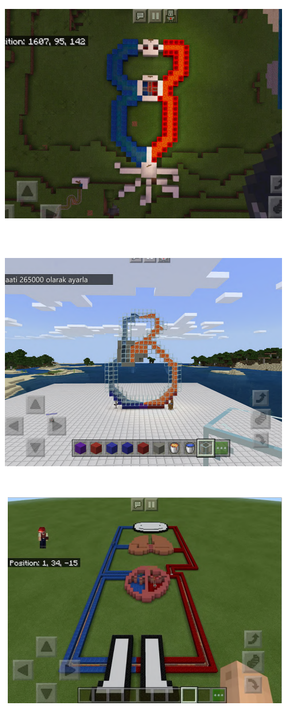


LEARN & SHARE & HAVE FUN

The circulatory system is made up of blood vessels that carry blood away from and towards the heart. Arteries carry blood away from the heart and veins carry blood back to the heart.
Two pathways come from the heart:

- The pulmonary circulation is a short loop from the heart to the lungs and back again.
- The systemic circulation carries blood from the heart to all the other parts of the body and back again.

STUDENTS' WORKS



ONLINE AND FACE 2 FACE

Students in our study, built their own learning paths out of Minecraft:EE blocks. Our research is a collaborative study that uses STEM-based educational materials.

Due to the pandemic, Minecraft:EE has provided flexibility to facilitate collaboration and learning in shifting settings. We carried out this work both online and in person, and as a result, students were able to collaborate and reveal their creations in the virtual world.

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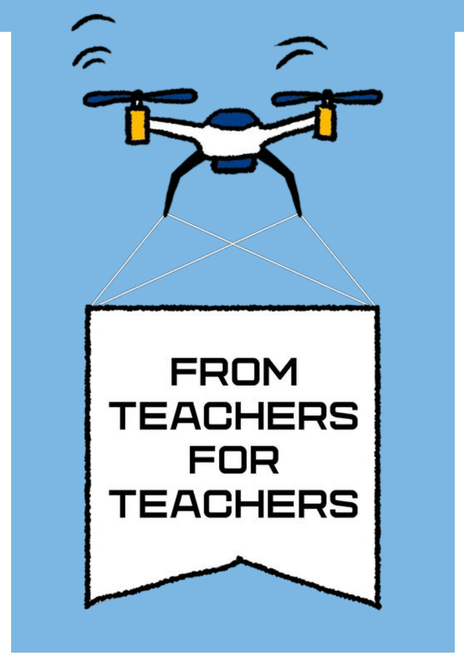


DIVERSITY IN STEM EDUCATION

John Cochrane | Greenfaulds High School | Cumbernauld | United Kingdom

Escaping the Primary Classroom

Using an escape room concept to inspire primary practitioners

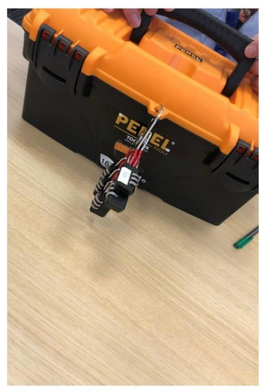
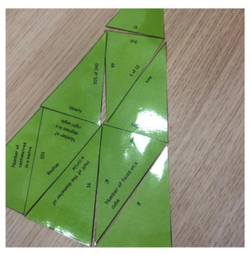
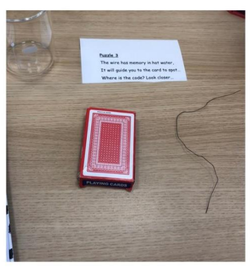
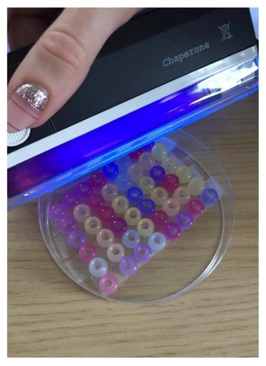
Inspiring young people is one thing, but inspiring fellow practitioners is another thing entirely. Building on the work of others, colleagues and I designed CLPL to show how an escape room could be used as a context for the delivery of Primary school STEM. Six STEM activities were designed that were appropriate for primary school aged pupils, using numerous innovative approached (including nitinol, microscale chemistry and a primary school safe equivalent to UV), taking into consideration the health and safety requirements for that age group. CLPL was then planned, written and delivered to over 120 primary practitioners in North Lanarkshire, leading to a massive increase in the delivery of high-quality teaching and learning in STEM council wide.

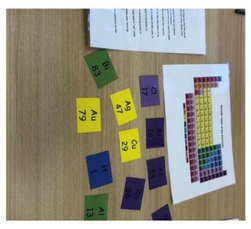
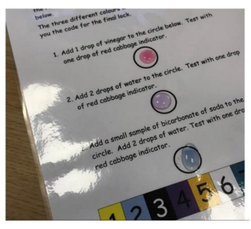





Working with professionals at SSERC, as part of the Primary Cluster Programme (PCP), building on the work of Adrian Allan, the following six experiments were packaged into a 90 minute workshop.

1. Numeracy problems in different colours, colour filters were used to identify the correct code.
2. Tarsia triangle with maths problems with a code written in UV ink.
3. Nitinol wire problem.
4. UV beads with a hidden code.
5. Periodic table puzzle.
6. Microscale acid and base experiment.

References

Resources

Of the back of this CLPL and others, North Lanarkshire Council launched its STEM agenda, with attendees from 96% of all centres, many of whom were trained in the Primary Escape Room, many of whom have contacted me stating the Escape Room as the inspiration to get fully behind the Local Authority STEM agenda.