FROM TEACHERS FOR TEACHERS

Collaboration
in STEM Education

RNDr. Kateřina Vágnerová, RNDr.Miroslav Panoš, Ph.D.
Masarykova ZŠ Klatovy & Gymnázium J. Vrchlického, Klatovy, Czech Republic

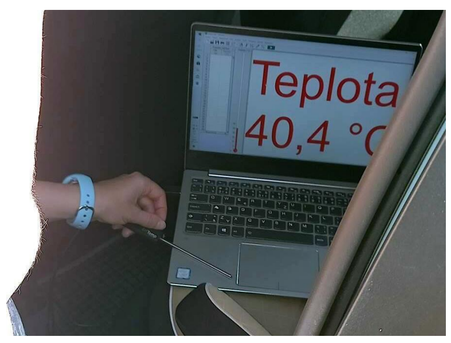
How long does it take to "cook yourself" in a closed car

Objective: measure the rate of temperature rise inside a car

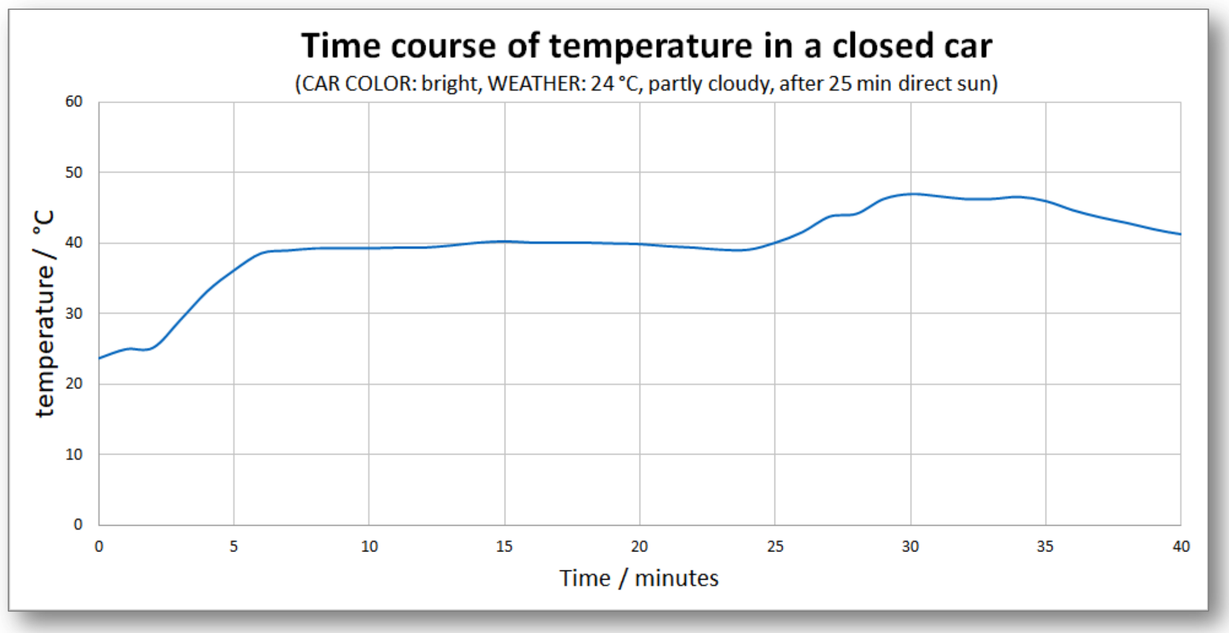
- elementary-school measurement based on a real situation
- surprising results (!) to children
- high-quality relevant data can be obtained with the age group at the primary school level
- very attractive regarding the tools used and the topic of the problem
- linking the physical problem with the use of IT
- link between the physical problem and critical thinking
- use of knowledge of biology

There are a number of seasonal media reports related to the danger of overheating of children / animals in a closed car.

Easily gradable: it is easy to adjust the difficulty and breadth of the assignment as well as the options and techniques according to the age and abilities of the children.



This project was implemented last summer as a part of "the research week" holiday program for gifted children in our town. The youngest children firstly tried measuring with an alcohol and digital thermometer, then chose a digital thermometer to carry out the experiment measurement.



The most capable children have built their own wireless temperature sensor. They used a single-chip ESP32 microcontroller, which (with a connected temperature sensor) made it possible to measure the temperature and immediately send it via Wi-Fi to a nearby PC.

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Carina Schneider| Graf-Stauffenberg-Gymnasiums | Floersheim | Germany
Dr. Sebastian Roeder| Martin-Niemoeller-Schule | Wiesbaden | Germany

Finding the Culprit

Case Profile and Status of Investigation

A crime scene, a wounded secret agent, eleven well-known suspects – 24 students from two different schools take on the roles of police detectives and embark on a fascinating journey into forensic science. Will they be able to examine all the traces and find the true culprit?

Using varying scientific methods from the fields of biology, chemistry, physics and mathematics, the young detectives learn how to conduct scientific experiments and draw conclusions whilst cooperating in a team. Their investigation includes:

- the microscopic analysis of fibre samples,
- the comparison of fingerprints and footprints,
- the performance of a chemical blood test,
- the examination of substance properties (e.g. solubility, flame colouration, …),
- the analysis of the refraction properties of lenses,
- the reconstruction of a bullet trajectory.

The detectives are hand-picked by their science teachers from all students in Year 5 based on their behaviour, their general abilities, as well as their in-class performances in science subjects.

The Collaboration …

- …is established between two schools from the Rhein-Main area with a focus on science education and talent management.
- …includes work in both schools' laboratories as well as on the "crime scene".
- …is characterized by a high degree of sustainability due to the project's resource-friendly annual realization with established materials.

Conclusion: "Finding the Culprit" is a thrilling annual cooperative science project which enables students to expand their scientific knowledge and competences beyond the classroom whilst strengthening their social skills at the same time.

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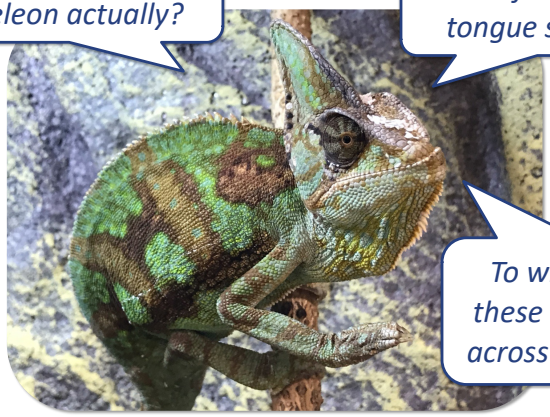
COLLABORATION IN STEM EDUCATION

Franziska Langer and Michael Sach| Burggymnasium | Friedberg | Germany

The Yemen chameleon as a Teaching Subject

How long is the tongue of a chameleon actually?

How fast does the tongue shoot out?



To what extent do these measures vary across ♂ individuals?

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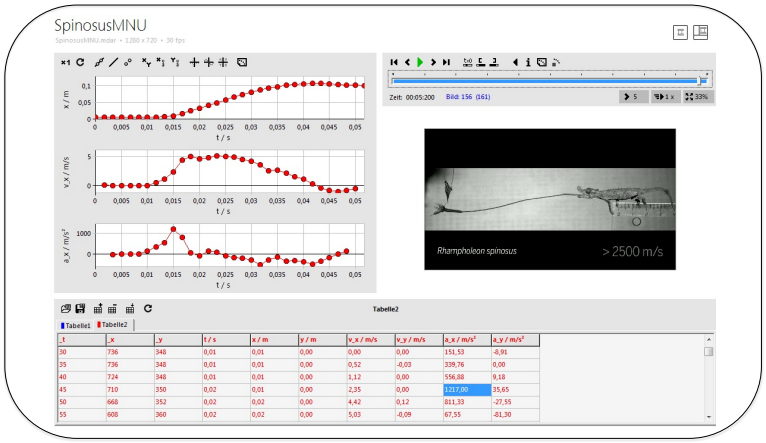
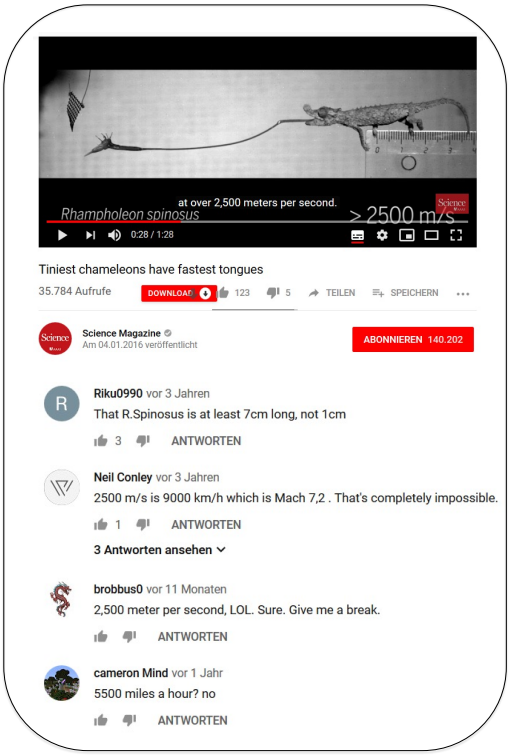
Real

- Ethogram
- Inductive inference to instinctual behavior in prey capture



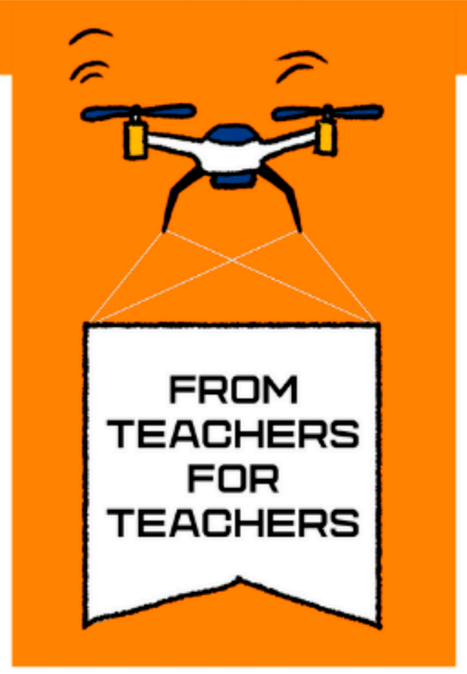
Digital

- Functional use of digital media
- Own video production and analysis



Authentic

- Confrontation with scientific publications
- Creation of authentic problems
- Sensitization for problem-oriented learning tasks



COLLABORATION IN STEM EDUCATION

projects including the local community – e.g. between teachers, schools and companies, different communities

Iryna Pakhomova | STEM-AR club |Kharkiv | Ukraine
Dmytro Matsokin | V.N.Karazin Kharkiv university |Kharkiv | Ukraine

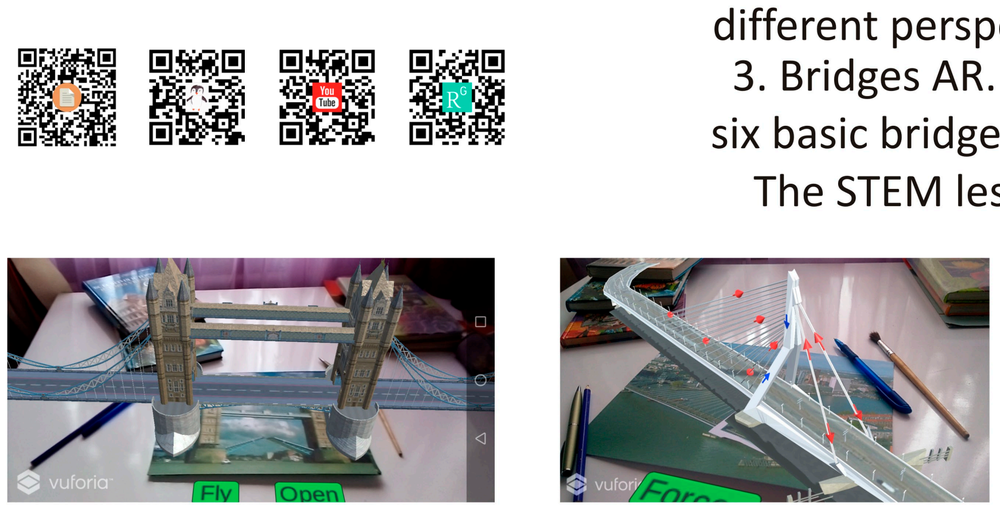
Augmented reality in education

The goal of the project: to create mobile (Android) applications with augmented reality and create STEM-lessons with these applications.

1. Skyscrapers AR. An app with augmented reality for the demonstration of world-famous architectural structures.
2. Da Vinci Machines AR. In this app you can explore Leonardo's work in 3D. With controls provided in the app, you will be able to see 3D models from different perspectives with mesmerizing 3D animations.
3. Bridges AR. Augmented reality application for the demonstration of six basic bridge structures.

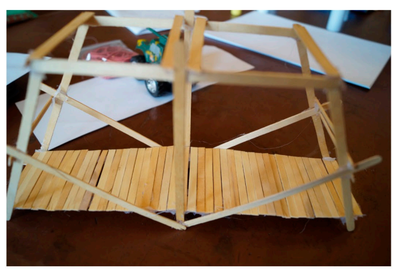
The STEM lessons program was created using these authour's applications.

Colaboration:
STEM-AR club "PenguIN" +
V.N.Karazin Kharkiv national university



Learn type of bridges with AR. 3D models

Bridges AR



Own models of bridges were created

How to start using augmented reality technology in lessons?

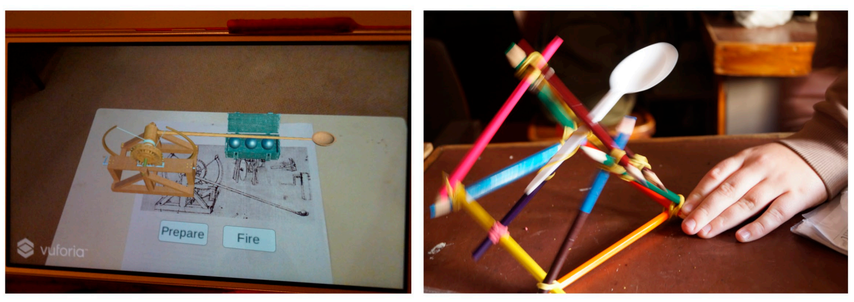
1. Find the application in Google Play
2. Install the application on a smartphone or tablet
3. Print out the key cards to which the application will respond
4. Turn on the application on the phone
5. Let's point the smartphone camera at the key picture
6. On the screen of the smartphone we will see augmented reality information

Skyscrapers AR

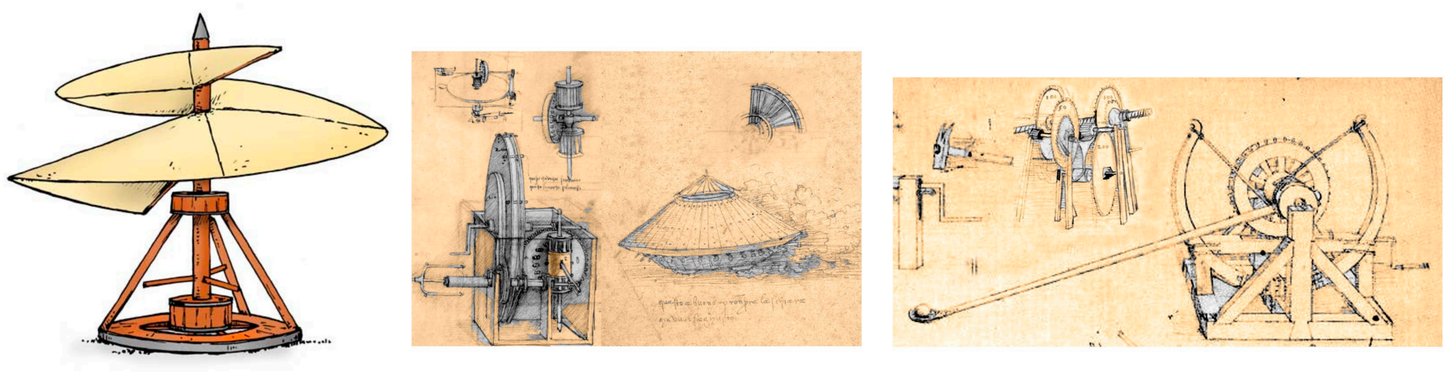
Travel around the world and learn about famous buildings

Create own tower from 20 sheets of paper

Da Vinci Machines AR



Create own model of the catapult



Key cards for "Da Vinci Machines AR"

AR technology gives teachers the opportunity to enhance classroom experiences, teach hands-on skills, to inspire student minds and get students excited about exploring new interests