

REPORT ON LOCAL TEAM ACTIVITIES

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KIDS INSPIRING KIDS FOR STEAM (KIKS)

Erasmus+ Project



Erasmus+

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University of Jyväskylä, Finland

University of Cantabria, Spain

STEM Team East, UK

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KIDS INSPIRING KIDS IN STEAM!

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 Co-funded by the
Erasmus+ Programme
of the European Union

1. Introduction: What was the KIKS Project About?

The goal of the *Kids Inspiring Kids for STEAM (KIKS)* project was to raise students' awareness towards the multi- and transdisciplinary connections between the **STEAM subjects (Science, Technology, Engineering, Arts & Mathematics)**, and make the learning about these fields more likeable. In order to achieve these goals, **KIKS** project has popularized the **STEAM-concept by projects** based on the **students inspiring other students-approach** and by utilizing **new technologies, open educational resources, and everyday items and materials**.

Through the **students inspiring other students-approach**, we have aimed to get participating students developing **STEAM activities** for other students in their own local context and in a wider European physical and virtual community. Local team activities were based by posing an open-ended complex challenge to the students asking them: **"How would you get YOUR SCHOOLMATE to get interested to learn about a phenomenon or a topic in STEAM?"**

In the phase of local team activities of the project, local student teams were working on planning and realizing their own STEAM-popularization projects to involve their own class- and schoolmates into their local project and into KIKS' on-line community (Facebook and website).

The working language of the groups in local communication was usually the local language, but in international communication, it was always English. KIKS Researchers and teachers were working as facilitators or "coaches" to help the local groups' work.

During April-May 2016, KIKS project's local coordinators contacted the schools and local groups were formed in all participating countries. Many of the local groups' members and their teachers have entered the **KIKS Facebook Group** (<https://www.facebook.com/groups/817572248375180/>).

The **KIKS Facebook Group** has currently more than 130 members and it was the main platform of on-line work throughout the project. Team-members, teachers and local KIKS-coordinators were encouraged time by time to post regularly in the KIKS Facebook-group about their progress in their own STEAM inspiration project. The teachers and international KIKS-project members made most of the individual posts and comments on each other's post related to STEAM.

Until the end of 2016 May, local groups have posted at least once in the KIKS Facebook Group to introduce their group and their school. Most of the Facebook-posts were short videos, in which (1) the group-members told who they are, (2) where they are studying, (3) what do they find interesting about STEAM, and (4) what kind of KIKS project they have in their mind or what are their expectations about the KIKS project.

Between September 2016 – 2017 February, teams have worked on their project about making their school and local environment inspired about STEAM. All teams have prepared and published on the KIKS-website their e-portfolio, which documented their work

(see Developed Activities on <http://www.kiks.unican.es/en/>). Many of the e-portfolios contains several kind of on-line material – like a short video, a photo-album, and textual summaries –, which serves as an introduction of the local project.

Starting from November 2016 each local team shared their full e-portfolio, which documented their STEAM inspiration project and local teams collected likes and comments in the KIKS Facebook group. Each local team was expected to invite their peers, teachers and members of their local community to see and give a “like” to their and to other groups’ e-portfolio. All e-portfolios were collected and re-presented on KIKS-project’s homepage as well.

27 local activities have been developed by the local KIKS teams. Spanish teams have uploaded to the KIKS-website 15 activities, Finnish teams have shared 5 activities, 3 activities were developed by the Hungarian teams and 10 activities have been uploaded by the UK teams.

2. STEAM is all around us! Local KIKS projects from Spain

The Spanish students have presented a rich collection of innovative ideas, based on learning-by-doing and collaborative problem-solving. All Spanish projects’ main activities are connected to the students’ research on such topics, that they have found in their own place of living and explored their environment creatively with the help of scientific knowledge and artistic inspiration. Each Spanish project implemented successfully the KIKS project’s STEAM-approach in the complex way of understanding complex phenomena, whose analysis cannot be limited to a certain school subject, but rather involves the perspective and approaches of many subjects in the same time.



Among the Spanish project topics we can find very interesting examples of how learning can be based on the built environment and cultural heritage of the place, where the students are living. A team has analyzed the geometry of different arches in Pontevedra city. Another team from Galicia has studied wind rosettes and nautical maps and found physics-based, geometrical and geographical explanation on how to determine the geographical North. They have also found the way on how to make a wind rosette in their own school. Another team from Pontevedra has used mathematics to verify disability ramps in the city. They found that most disability ramps are not complying with the law regarding the prescribed angle and the standardized width of disability ramps. They have shown that mathematics can be a tool of social inclusion and making critique of improper

social practices. There was a team, which redesigned their school's security camera surveillance with the help of geometry. Other teams from Santander and Cantabria have connected mathematics and art to investigate golden ratio's historical and scientific background and to find the golden ratio in students' own environment. There were teams, which were interested in the psychology of the human memory and another team has created a digital memory game by using Arduino and developed the groups' tinkering skills. Tinkering and making things with technology was an important goal to other teams as well. A team has designed and built a replica of R2D2, the famous robot character from the Star Wars movies, and another team has made a wireless telegraph. There were students, who decided to find a way to upgrade a torch with led-lights and there was a team, which made a deep study in the physics of light to understand and model several different kinds of camera obscuras. There were other teams, which were interested in the chemical characteristics of what we eat and drink. They made a research about the chemistry of the chocolate and measured the concentration of gas in carbonated beverages, such as Coca-Cola.

The work of the Spanish teams have offered an interesting example of how a KIKS-project had led to further inspirations in the school and initiated other projects. For the best description of this case, it is worth to quote the Spanish KIKS-members report from the project homepage (<https://www.kiks.unican.es/en/arcos-de-medio-punto/>): "It is usually difficult to know the degree of influence or >>inspiration<< that the work of a group of students has on their peers. The case of the work on the arches of Sara, Nuria and Sandra is not different. But this time their work has >>inspired<< a new project or activity in a teacher of her school, with aims and objectives different from those of Arches in our city. As Professor Belén Herrero says, what she has seen in the exhibition has led her to think about its application to a specific cultural and artistic sphere and activity: >>*I teach Spanish and Literature at IES Sánchez Cantón de Pontevedra. I am also the director of the theater group at this teaching center. Like every course, we are preparing a play. The staging of the work we are preparing is difficult because in the first act, the action takes place in a room of a house, but already in the second act, that house is destroyed and instead two apartments are built. From here, there is a simultaneous double action on stage. The problem was in the separation of those two spaces without blocking visibility to the audience. After seeing the magnificent work accomplished by our students with the arches, we came up with the idea of making that separation with a large arch leaning on columns and adding a wall. I think it is perfect to create in the viewer the illusion of being in two scenic spaces.*<< (Belén Herrero) It is curious, how an activity can lead to other activities. In the case of the activity of the semicircular arch, the exposition of the students' work initiated the proposal to make a large arch for the theater group of the Institute. This same arch for the theater group was used as a "gateway" to an exhibition dedicated to the writer Carlos Casares, honored by the Royal Academy of Galicia (RAG) on the Day Das Letras Galegas of this year 2017."

3. Science as an artistic tool! Local KIKS projects from Finland

Finnish KIKS teams have mostly concentrated to find ways in implementing scientific research and methods in artistic projects with various STEAM learning opportunities. Creating visual effects, such as colorful shadows in a theater performance; extending artistic methods by algorithmic thinking; discovering geometrical properties of traditional Finnish

Christmas decoration art, called Himmeli; designing funny geometrical hats; or making an interesting video and artistic photograph, which is based on a scientific experiment in thermodynamics, were all unique ways to go beyond learning subjects and making new connections between subjects of learning and between the learners in the KIKS spirit.

Physics of Shadow Theater: The Pig “Number Six” theater play is written, directed and realized by the KIKS-students of Laukaa School, Finland. A whole class of 7th graders were participating in the KIKS-team and they all were involved in the creation of the play. To explore visual illusions and the physics of shadow theater, KIKS-team made a scientific research concerning the development of visual effects, which they have implemented in the play. University of Jyväskylä physics education PhD-student, Antti Lehtinen has helped the group’s scientific research. Kristóf Fenyvesi, University of Jyväskylä’s KIKS-coordinator has inspired the KIKS-team from cultural and artistic aspects. Theater director Kirsi Sulonen from Laukaa was also helping with making the play ready. The team’s teacher, Mirka Havinga has facilitated the whole project.

Systems in Art: Students of Palokka School, Jyväskylä, Finland have experimented to create artworks based on algorithmic thinking, systematic actions and various constraints. As an inspiration, art teacher Jarmo Laaksonen introduced scientific and artistic approaches to structures, logic, systems and processes. Students got familiar e.g. with the Finnish artist Matti Kujasalo’s and the Hungarian-French artist, Victor Vasarely’s work and then created their own artistic systems and systematic art pieces on the way as playing logical games. Pirjo Häkkinen and Kristóf Fenyvesi researchers have supported the project.

Geometry for Christmas in Finland: the himmeli, a traditional Finnish Christmas decoration made from specially selected and prepared straw in an octahedron, an eight-sided polyhedron. Just before the winter holiday, Huhtasuo School, Jyväskylä, Finland have organized an ethnomathematical himmeli making workshop. When the KIKS-students were ready with the himmeli modules, they have decorated their scientific Christmas tree with the himmelis. Ulla Koskiahde and Mari Itkonen teacher, Pirjo Häkkinen and Kristóf Fenyvesi researchers have supported the project.

Scientific Halloween: how geometrical shapes can be turned into geometrical Halloween hats? Take a look into Viitaniemi School KIKS group’s project from Jyväskylä, Finland. The students wanted to practice the Pythagorean theorem on a different way, so they have organized a geometrical Halloween hat party for other students in their school. It was fun! Merja Sinnemäki, Leena Kuorikoski teachers and Kristóf Fenyvesi researcher have supported the project.



Frozen “STEAM-STORM” FROM FINLAND: Mankola school’s students with the support of their teacher Tapani Aaltonen made a physics experiment, in which they threw boiling water in to the air. If it is cold enough, the water evaporates in midair and creates this beautiful pattern. It was -20°C . Researchers Pirjo Häkkinen and Kristóf Fenyvesi have supported this project. Mankola School’s KIKS Team had 15 student members.

4. Kids learning from kids to see! Local KIKS projects from Hungary



Do (not) believe your eyes! The Magic Eyes Website

(<http://magiceyes2016.simplesite.com/>) developed

by Hungarian students tells you all the tricks of optical illusions and introduce the student team’s own tricky artworks. The website is a real “hall of mirrors”, where you can find everything from the biology of seeing to the

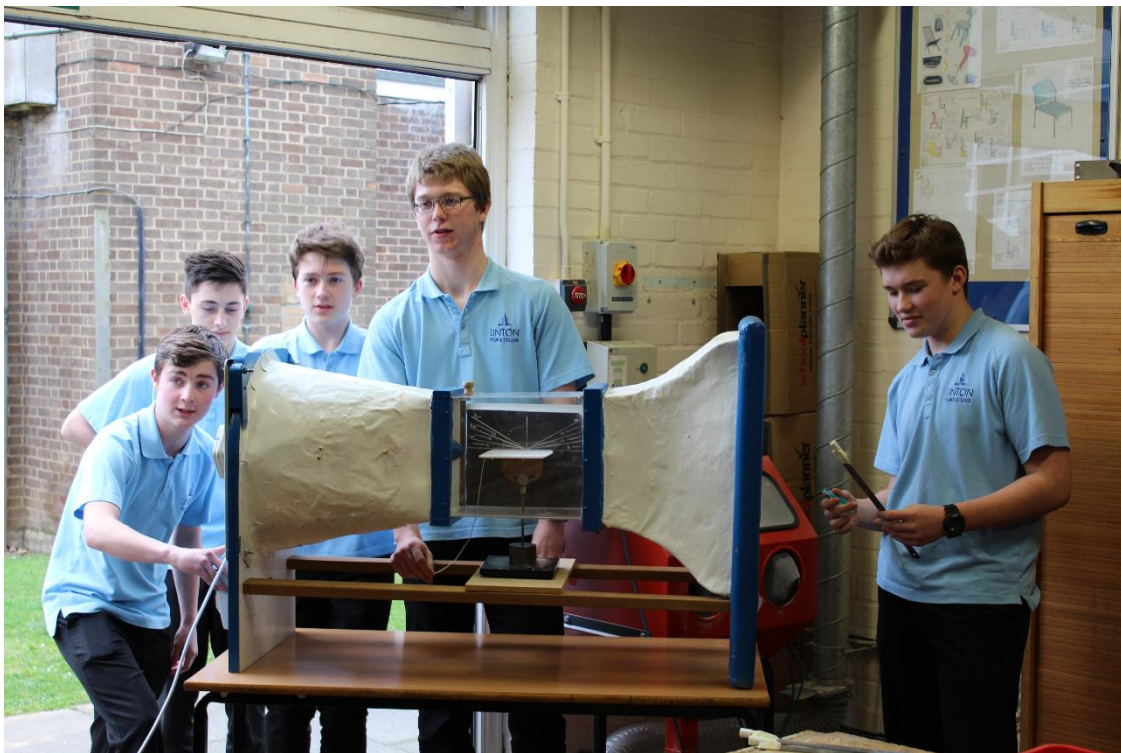
description of various illusions and on-line tools to create your own ones. Are you interested in optical illusion? And do you know how science and technology can take deception to a new level? Just be careful to not lose your way in this virtual labyrinth of valuable materials!

However, for those ones, who are instead of seeing rather interested to *hear* with

their eyes, the project called Soundwave Painting offers some colorful amusement. Physics of sound meets liquid color and the bouncy beats will do the rest on a white sheet of paper. It is not impossible, but a bit hard to recognize the structure in the splodges, so an excursion to the space of logical order might be helpful. In the “Building artistic and scientific structures” project students have invited other students to follow the footsteps of the visionary architect and synergetic thinker, Richard Buckminster-Fuller, through his famous geodesic dome and tensegrity systems and go even beyond. With the support of Experience Workshop Math-Art Movement’s specialists, in addition to the domes, the students created so-called tensegrity robots, which were inspired by NASA’s experimental models of new robotic spacecrafts.

5. Learning from the FUNgineers! Local KIKS projects from the UK

UK student groups have worked intensively together with their teachers on problems like energy conservation, developing a self-driven car, merging sound and image and making a theremin – one of the first synthesizers in music history – from ultrasonic sensors, Arduino, Raspberry Pi, jumper leads and Ohm speakers. Many of the participating UK kids has been involved in programs like Tomorrow’s Engineers Week or TeenTech Awards, which brought wider recognition of the KIKS project in the international scene.



UK students and coordinators also have done a lot to bring Spanish, Finnish and Hungarian children into touch with the popular coding education tool, BBC Foundation’s micro:bit. Thanks to the connections established to the BBC Foundation by the UK team, Students in all countries received loads of micro:bits for free and micro:bit coding program became KIKS project’s spin-off activity in all participating countries (see: <https://kiks-microbit.wikispaces.com/>).

The UK students were asked to deliver projects that could be undertaken by other students. The choice of activity was obviously influenced by the previous Hothousing experience and was a natural follow-through. Here the students chose their own STEAM topics of interest and designed their own workshops and practical sessions. Students took full control of the projects and recruited the team members, researched the topics, designed and developed any practical work, delivered the workshops to their peer groups or younger students in schools. They then evaluated, made changes and launched their workshops

The projects broadly fitted into two groups: microbit related and other STEAM project/workshops.

As an example micro:bits project, Conservation of Energy was undertaken by Rainham Mark Education Trust and IET (Institute of Engineering and Technology) Phil Moffit. Three sixth formers (Rory, Oscar and Michael) designed, prepared and delivered. As a theme, they decided on the conservation of energy; a fascinating and relevant challenge. The team also posed a further challenge for the KIKS team: Could we use Tracker, GeoGebra, Bitty or anything else to get Micro:bits to track the balls?! This meant that the team had to learn about free online software and some electronics with modern electronics - they used the BBC Micro:bit computers for control.

This and other projects can be seen in the KIKS micro:bit WIKI:

<https://kiks-microbit.wikispaces.com/Conservation+of+Energy>

In contrast, Student-Led Workshop Projects at Sawston Village College and Linton Village College were particularly interesting for their mix of content and student learning described in their own words. Projects were:

- Constellations and Pointer Stars
- Circumpolar stars
- The Philae Lander - Learning By Design – How to design and develop your own STEM workshop
- Chaos Theory – Presentation and Hands on
- Wind Tunnel

Further details of the projects can be found in:

<https://kiks-microbit.wikispaces.com/file/view/sawston%20summary%20erasmus.doc/613650031/sawston%20summary%20erasmus.doc>