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Kids Inspire Kids for STEAM

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Kids Inspire Kids for STEAM

Abstract

The goal of the Kids Inspiring Kids in 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 topics and phenomena from these fields more enjoyable. 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, tools, 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. English, Finnish, Hungarian and Spanish children were participating in the project.

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Keywords

STEAM, learning, motivation, engagement

Cover Page Footnote

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Kids Inspire Kids for STEAM

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Introduction

The goal of the *Kids Inspire Kids for STEAM (KIKS)* project was to raise Hungarian, Finnish, Spanish and UK students' awareness of the multi- and trans-disciplinary connections between STEAM subjects (Science, Technology, Engineering, Arts & Mathematics) and hence make the learning about these fields more enjoyable (Istúriz et al., 2017). The project was supported by the European Commission's Erasmus+ program.

Internationally the number of school students opting to study STEM subjects has declined over the past four decades while the growth of Science, Technology, Engineering and Mathematics-based industry, and a modern technology-rich lifestyle has developed and grown. The needs of the present and future way of life relies strongly on a much greater supply of multi-skilled Scientists, Technologists, Engineers and Mathematicians (Durado, 2013). Therefore, we need to help many more young people achieve in STEM subjects and to consider STEM based careers (Hristova, 2015).

The KIKS project supports the idea that STEAM is an important direction to achieve success in developing motivation and engagement in young people, because art is usually meant to include creative thinking and finding one's own way. Creative activities may support students to recognize that doing 'real' science is creative thinking; and creative thinking in science means that you are motivated to do your 'own' science. (Cf. Hähkiöniemi-Fenyvesi et al., 2016)



Figure 1. Artistic documentation of a spectacular experiment by the Mankola School, Jyväskylä: water freezing in midair at -20°C.

In this remarkable example, *STEAM-STORM* Finnish students decided to undertake and document a physics experiment, in which students threw boiling water into the air. As the Finnish winter temperature was -20°C , the water froze in midair and created a beautiful pattern, which was documented in an artistic photograph, see Figure 1. In addition to being an occasion of taking the photograph, the experiment also served as an event, where the group of secondary school students have demonstrated and explained the physical process to elementary school students in an inspiring way. Through the wordplay, concerning the topic and the subject of their project – i.e. STEAM –, the KIKS project’s main goals were also creatively popularized with the results of this project.

Via the **students-inspire-other-students-approach**, we aimed to get participating students developing STEAM activities for other students in both their own local context and in a wider European physical and virtual community. The project was set to school pupils as an open-ended, creative problem solving challenge:

How would you get your schoolmates to LOVE STEAM?

Students were supported by a three-stage process of Hothousing (to creatively develop ideas), Local Challenges (to develop those ideas into projects and deliver them to other students), and International Collaboration (sharing and working together). 15 schools in Spain, 10 schools in the UK, 5 schools in Finland and 4 schools in Hungary participated in the program with a high 80%+ completion rate producing 50+ projects.

Hothousing

The first stage, Hothousing, was an intensive workshop technique used in KIKS to foster creative problem solving, communication and collaboration skills and build self-belief - on many projects. It was also...Fun! For KIKS, it starts with a stimulus activity such as the

above *STEAM-STORM* to get the creative juices flowing, coming up with an idea and then developing and disseminating the idea in Local Challenges, and ending with International Collaboration. The KIKS Hothousing version was a variant of a well-established business technique, originally developed by British Telecom and adopted by many others (Evans, 2006). The key is intensity: student - led (teachers stand back), creative problem solving, active engagement – actually **DOING** activities, undertaking a project and coming up with **THEIR** solutions, working with others, 100% engagement within team, and also having fun.

Local Challenges

The students develop their idea back in school supported by teachers and other experts. This example shows a *WIND TUNNEL* development which was subsequently shown to the international audience and led to ideas for more accurate computer control features of the tunnel, see Figure 2.

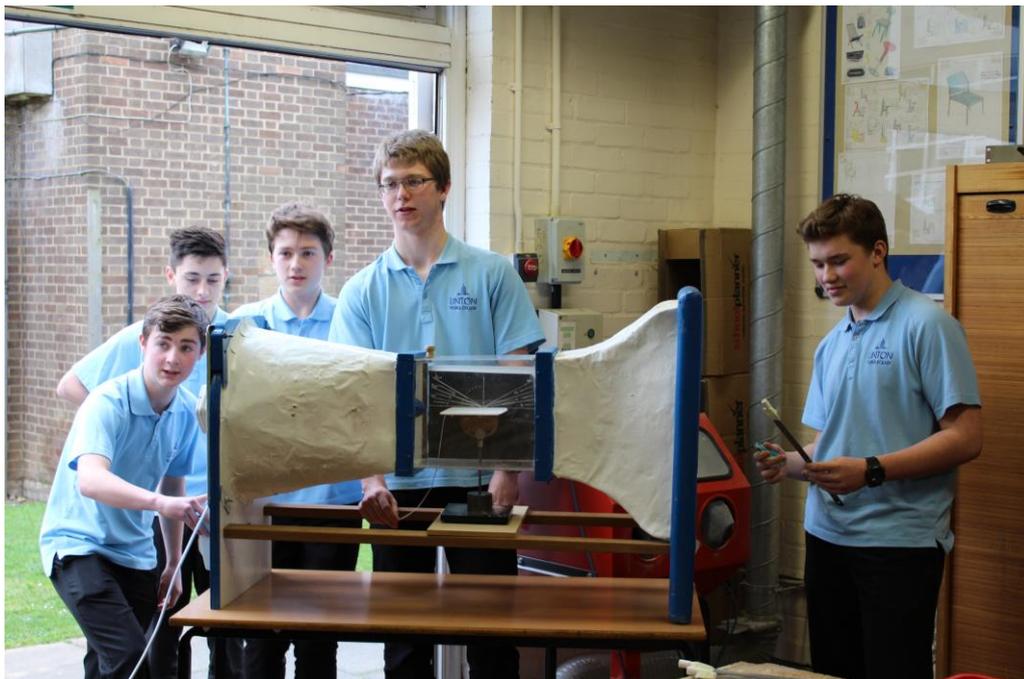


Figure 2. Wind Tunnel Development for aircraft wing test by English KIKS students from the Linton Village School, Cambridge. Photo: Mirka Havinga.

In their *SOUND WAVE* project, the team of Szilágyi Erzsébet High School from Hungary have merged physics and art – they experimented with sound waves and how to paint with them, see Figure. 3. Similarly, this was subsequently featured in a *CHAIN REACTION* project, which can be seen at: <https://kiks-microbit.wikispaces.com/Chain+Reaction>



Figure 3. Soundwave Painting project by Hungarian students

International Collaboration

After developing local projects, students from each country then worked together enhancing existing projects or new projects benefitting from the KIKS website (<https://www.kiks.unican.es/en/>) plus a Facebook closed user group (<https://www.facebook.com/groups/KidsInSTEM/>) and a KIKS WIKI site (see Figure 4. and <https://kiksmicrobit.wikispaces.com/?responseToken=938afcc3b6af4dc5e94a540dfee39a1f>

In the *SOLAR CAR* project, initiated by Spanish students, several on-line video conferences took place between KIKS groups in Finland and KIKS groups in Spain. The Spanish KIKS team sent solar cars to the Finnish KIKS students to carry out experiments on

determining the Finnish team's geographical location based on various measurements of sunrays' angles. Funnily, the Finnish KIKS students were unable to perform the experiment, because the Nordic sunlight in the beginning of March still was not strong enough to make the solar cars running. Nevertheless, the Finnish group tested the solar cars with artificial light, and learnt about the physics of solar energy with the help of the Spanish group. Both Spanish and Finnish students exchanged their experiences in a follow-up videoconference.

In the *Micro: bit KITRONIK* project, after a first videoconference where students from the Rainham School, UK and San José School, Spain presented the Micro: bit KITRONIK and wireless-telegraph projects respectively, the two schools started their collaboration on a further Micro: bit KITRONIK project (see: <https://www.kiks.unican.es/en/wireless-telegraph/>). The aim of this collaboration was to improve the performances of the Kitronik model. The Kitronik model is a car/buggy controlled by Micro: bit (www.microbit.org) that includes an on-board accelerometer to change direction on impact. Building on this original work from Rainham School, San Jose School has contributed to the KITRONIK Buggy project with a soldering activity to be followed by coding. The video can be seen at the periodically updated KIKS Micro: bit wiki site: (<https://kiks-microbit.wikispaces.com/KITRONIC+BUGGY>)

Building on the above paired activities, we undertook a *KIKS Micro: bit INTERNATIONAL COLLABORATION* many-to-many project involving the four countries— England, Finland, Hungary and Spain. This project was supported by the Micro: bit Educational Foundation that kindly supported and supplied us with 400 micro: bits. The power of our project's website the Wikispaces alongside the KIKS WEB site and the Facebook Closed User group can be seen in the projects contained in this web space. The projects illustrate the degree of collaboration. Unique visits to each project can be seen, giving an indication of their relative attraction/interest. Also, the overall and unique visits by visitors

from different countries shows the developing impact of the WIKI Spaces Figure 4:

<https://kiks-micro:bit.wikispaces.com/International+Collaboration>

The screenshot displays the Wikispaces interface for 'About KIKS Microbit International Collaboration'. The page includes a navigation bar at the top with options like 'Members', 'Projects', 'Events', 'Engagement', and 'Settings'. The main content area features a title 'About KIKS Microbit International Collaboration' and a sub-header 'Conservation of Energy'. Below this, there are several project links: 'KITRONIC+BUGGY', 'Merging Sound and Image', 'Automated Cat Toys!', and 'wooh-WARRH! Star Trek sound!'. A central image shows a student using a microbit to control a robotic car, with a temperature sensor overlay showing 33.5°C. To the right, a sidebar lists various project pages, including 'Home', 'All Pages', 'home', 'About KIKS Hothousing and Student Digital Ambassadors', 'About KIKS Microbit International Collaboration', 'About Microbits and Cross-Curricular STEAM Activities', 'Ball Bearing Game', 'Calling all KIKS! Can you help with this project...', 'Chain Reaction', 'Chess Clock! Experience Workshop's BBC microbit program in Finland and in Hungary', 'Conservation of Energy', 'KITRONIC BUGGY', 'Robotics arm', 'Sound & Image', 'Toys...for Cats', 'Tracker, GeoGebra & Bitty Data Logger', 'Traffic lights problem! Can you de-bug them?!', and 'Wireless telegraph'.

Figure 4. KIKS WIKI SPACES for International collaboration

Conclusions

The high number of completions across countries (80%+) gave us confidence that the “Kids-Inspire-Kids” approach was successful. In comparable projects, completion rates are often less than 50%. In addition, the physical and on-line mix proved powerful. In physical events we would reach typically 20-25 students. With on-line collaboration we reached approximately 600 people per month – at the time of writing 3000 and counting, with repeat collaboration and also visibility in countries not involved in the project.

Building on STEAM, the “Kids-Inspire-Kids” factor has been powerful, as has been the international on-line interaction. However, the on-line collaboration had to be tightly controlled by the project team to meet teacher and legal security requirements. Nevertheless, the success clearly shows the opportunity when we can develop safe and secure (in reality and perception) on-line solutions including remote access for both mainstream schools/students and also disadvantaged students for example with SEN (Special Educational Needs) or living in remote communities.

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