KIDS INSPIRING KIDS IN STEAM (KIKS)

Erasmus+ Project

FINAL REPORT FROM HUNGARY

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Abstract

As the aim of the KIKS project was to enhance STEAM education by inspiring students and they develop projects to inspire their peers. According to this, the Hungarian team carried out activities within the KIKS framework to offer challenging activities to students and aspire them to develop their own STEAM projects and showcase them to their peers. The six participating schools offered student teams who developed fascinating projects and presentations described in this report.

In the Hungarian project six schools participated, five in Budapest and Pest County and one in Pecs, these were the Bálint Márton Gimnázium, Törökbálint; Budapesti Fazekas Mihály Gimnázium, Budapest; Sashegyi Arany János Gimnázium, Budapest; Szilágyi Erzsébet Gimnázium, Budapest; Britannica International School, Budapest; Apáczai Nevelési és Általános Művelődési Központ, Pécs. The teams from schools developed several projects. Three Hothousing activities were carried out in Budapest with a participation of about 100 students, then the teams started to develop their own projects for the local challenges. It was followed by the international online collaboration. Finally, at the European Research night teams of students participated (more than 500) and in workshops we showcased STEAM activities.

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Introduction

The idea of the KIKS project originated from the experience and knowledge of the team and international partners on STEAM education. We envisioned that activities and projects developed by students could inspire other students to work on STEAM education ideas. Also, the development of the projects would offer invaluable knowledge for participating students. The partnership of University of Jyvaskyla, Finland; University of Cantabria, Spain; STEMNet East, UK; and the Budapest Metropolitan University, Hungary and members of these institutions offered a balanced knowledge to carry out the activities planned in the KIKS project. We selected participating schools to enhance diversity in the project and offer a wide range of experiences for diverse groups of students and teachers.

Bálint Márton Gimnázium, Törökbálint - The school is located in Törökbálint (town near Budapest). It was established in 1985. The new school building is combined with Törökbálint's new swimming pool, where Laszlo Cseh and other swimmers do their training. Bálint Márton, after whom the school got its name, was Törökbálint's famous teacher in the middle of the 20th century. Sport and ICT plays a big role in the life of the school.

Budapesti Fazekas Mihály Gimnázium, Budapest - School is one of the best secondary schools in Hungary. With top rankings, competition wins it is the most prestigious school in Budapest. Mathematics special education started in 1962. Fazekas was the first school to introduce special education for mathematically gifted students. This program has been so successful, that several Nobel prize and mathematics Olympics winners started their studies at Fazekas. The school has approximately 1000 students.

Sashegyi Arany János Gimnázium, Budapest - School has a beautiful location, close to the top of Sashegy. The building was built in the beginning of the 20th century and it used to be a religious and boarding school, called Notre Damme de Sion. It used to be a single sex girl's school until the 1940s, when the state took it over. After that it was boys only school, operated by the Soviet party. After the 50s it was renamed after the famous Hungarian poet, Arany Janos. It currently it accepts girls and boys, too. The school has 750 students.

Szilágyi Erzsébet Gimnázium, Budapest - This gimnazium is located in the historic first district of Budapest and teaches students from grade 5-12. The school has specialties in mathematics, science and music and there is a long list of well known teachers taught in this school. The history of close to 140 years contributed to the development of traditions and fame of the school.

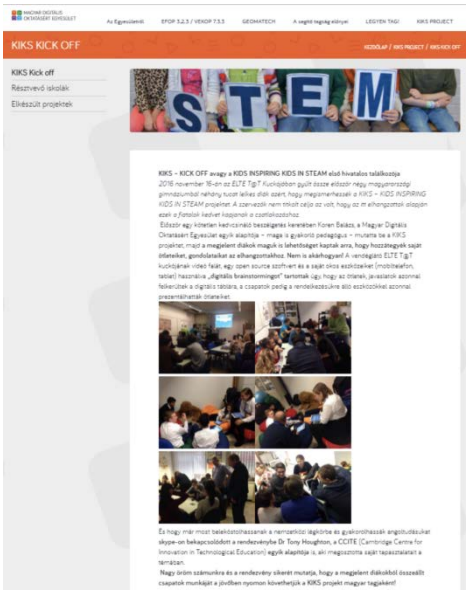
Britannica International School, Budapest – the school was founded in 1994 and is the longest established British School in Hungary. The educational programme is based on the National Curriculum for England suitably enhanced to reflect the school's truly international nature. The school located in District XII in the Buda Hills has a diverse student population with 46 nationalities between the ages of 5-18.

Apáczai Nevelési és Általános Művelődési Központ, Pécs - is specifically organized multi-purpose institution. It's professionally independent institutions and member institutions are covering all forms of institutionalized education; from nursery to high school, also operates as a talent point in the region. The 13 institutional units provides educational services to 4500 – 5000 students on 6 hectares with 600 people working there. They have a special focus on logical-mathematical; environmental/science; bodily – kinesthetic; three-dimensional visual talent management.

Based on the experiences and the local needs we organized Hothousing events to introduce the concepts of the projects and inspire students and teachers to start developing their own projects. Then, school teams started to develop their projects, which were later showcased to other students and teachers. Finally, we organized dissemination events to show projects results to a wider audience

1. Hothousing

As described in the general discussion, Hothousing is an intensive workshop technique, which can be used in KIKS to foster creative problem solving, communication and collaboration skills and build self-belief - on many projects.
In Hungary, there were three hothousing activities. First in October 2016, teachers of the participating schools met at Budapest Metropolitan University to discuss the key objectives of the project and understand their and the involved schools involvement in the project.



The team explained the timeline, activities, teamwork and deliveries of the project. In addition, teachers were shown examples from previous projects of the KIKS team and they had the opportunity to discuss details on how to involve students, assist student projects, and find topics for the work. The introduction involved projects developed by English students in Cambridge while working at the university and at company sites as well as museums around the area. The presentations and discussions inspired both teachers and students and they immediately started coming up with ideas for their own projects and possible presentations for their peers. The interactive activities following the introductions resulted in immediate actions of students, which were presented the other groups.

1.1 Lessons learnt

The Hothousing activities immediately generated valuable motivation for both students and teachers. They immediately came up with ideas that could be developed and shared with other students. Inspirations from lectures and from the project team combined with immediate interactive discussions well prepared participants to pursue their ideas in their schools. We also observed that the prospect of participating in an international project considerably raised motivation of students to being involved. The presentation of Tony Houghton received great responses and working in English also offered additional motivations for students to become engaged. In the international collaboration, when students exchanged ideas we observed the importance of internationality. We believe that further project should include more international elements and if possible meeting with students and researchers abroad.

2. Local Challenges

In the Local Challenges, students developed projects that could inspire and motivate other students. Students could select projects of their choice or utilize the ideas from the Hothousing events. As follows the selected activities were strongly correspond to the interest of the groups and schools as well as most student groups attempted to address practical or real-world problems. There were some students who took initiatives and recruited students to a team, and usually together they researched a topic, developed a schedule for implementation, and developed the project for public presentations. It was interesting to observe that students continuously evaluated their progress and made changes according to the feedback they acquired from experiments or from other group members. There was always an opportunity to work in the team, but also to connect with teams within or outside their schools. Most projects developed by teams were addressed some artistic elements in STEAM or technology focused and used mostly micro:bits.

Teachers in the school were coordinating and advising the groups. Interviews of teachers showed that they learned from the projects immensely as they needed to transform themselves from teachers, transmitters of knowledge, to assistants or mentors of students. Research show that this transformation could be immensely difficult for teachers, but participating in such situations teachers had the opportunity to trial this new situation, which they could utilize later in their own teaching practices in their classrooms. In addition, the role of the teacher was to keep the motivation for students and help them to go through difficulties in the project development. Furthermore, teachers greatly assisted students to be able to focus their projects, develop and carry out their presentations. It was interesting to observe that in Hungary teachers were quite skilled to let students lead activities and share them in public to obtain feedback. Nevertheless, teacher feedback was rather positive allowing them to experiment in such new situations.

2.1 Schools and Projects

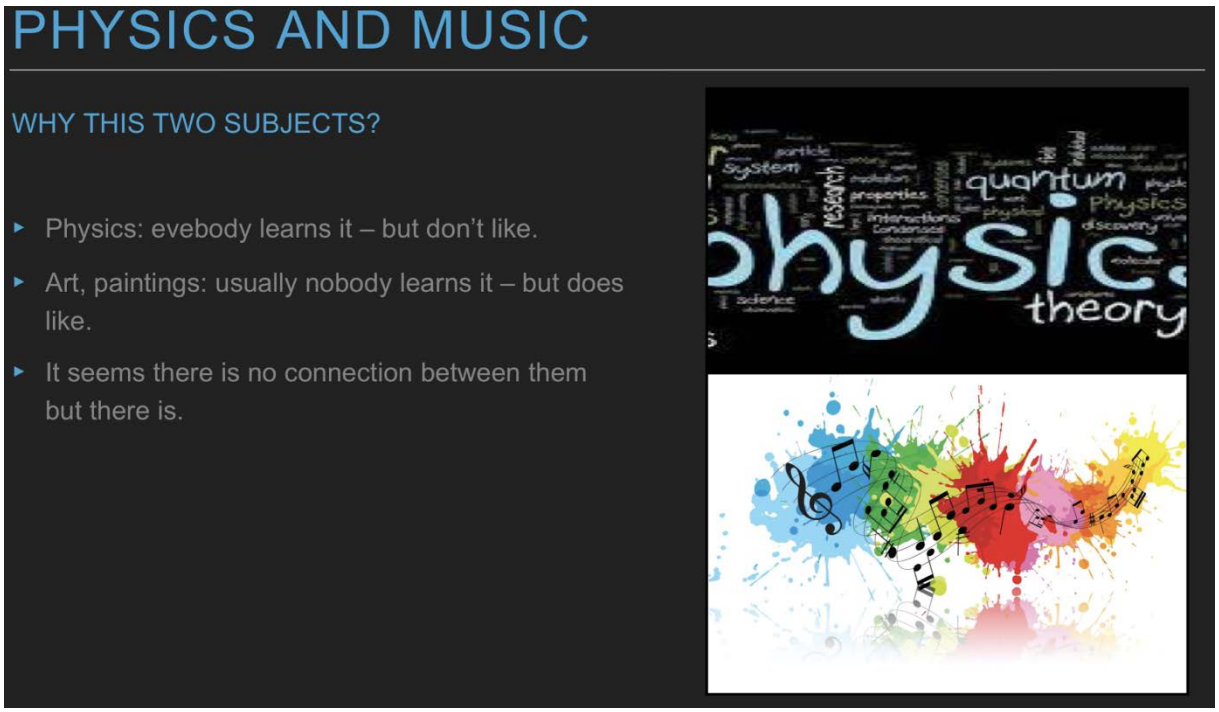
2.1.1 Magic Eyes: Spatial Illusion in Arts- Photography and film

The Magic Eye project was developed by the team of Balint Marton School in Torokbalint. The project aimed to address spatial illusion problems and experiment with new technologies. The group experimented with stereograms, anaglyph photography, fleece filters, virtual and augmented reality applications and explored the physics and biology of sight.

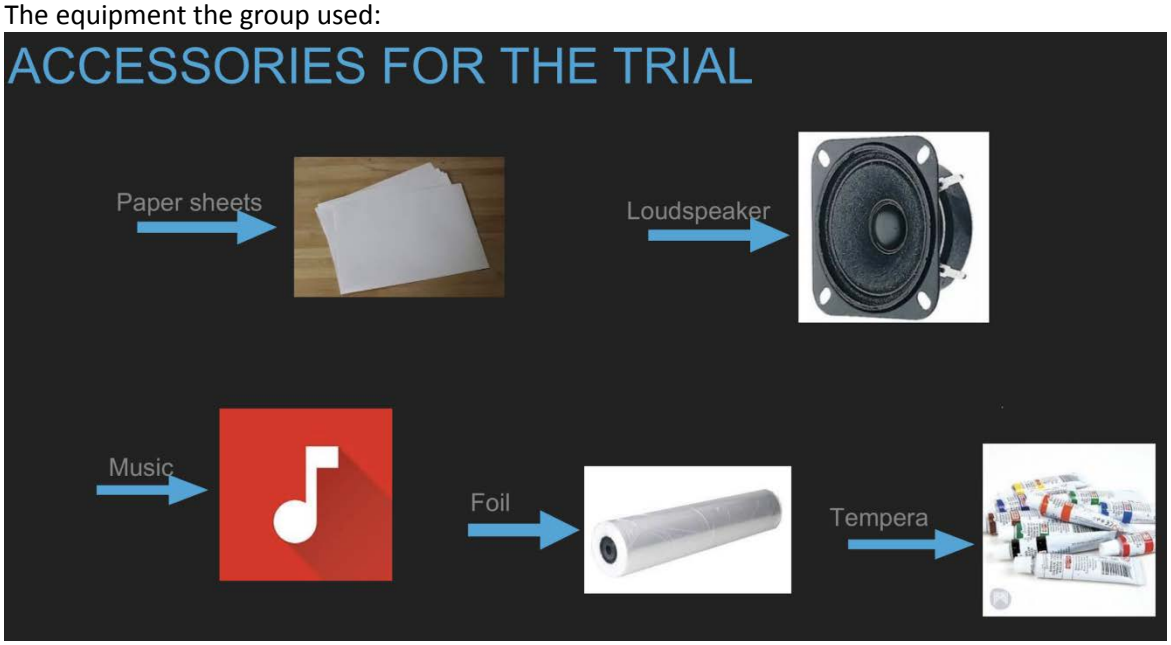
Students first carried out a thorough investigation about sight and explained how the human eye see physically and biologically. Then worked on visual illusion types and various ways how the human eye can be tricked. Students explored and developed autostereograms to illustrate visual illusions.

2.1.2 Soundwave painting experience

The group in Szilagyi Erzsebet school developed a project on soundwave painting. They created equipment to paint from sounds supplied to machines. The development of the project involved ordinary materials that were assembled to be able to paint through various sounds.



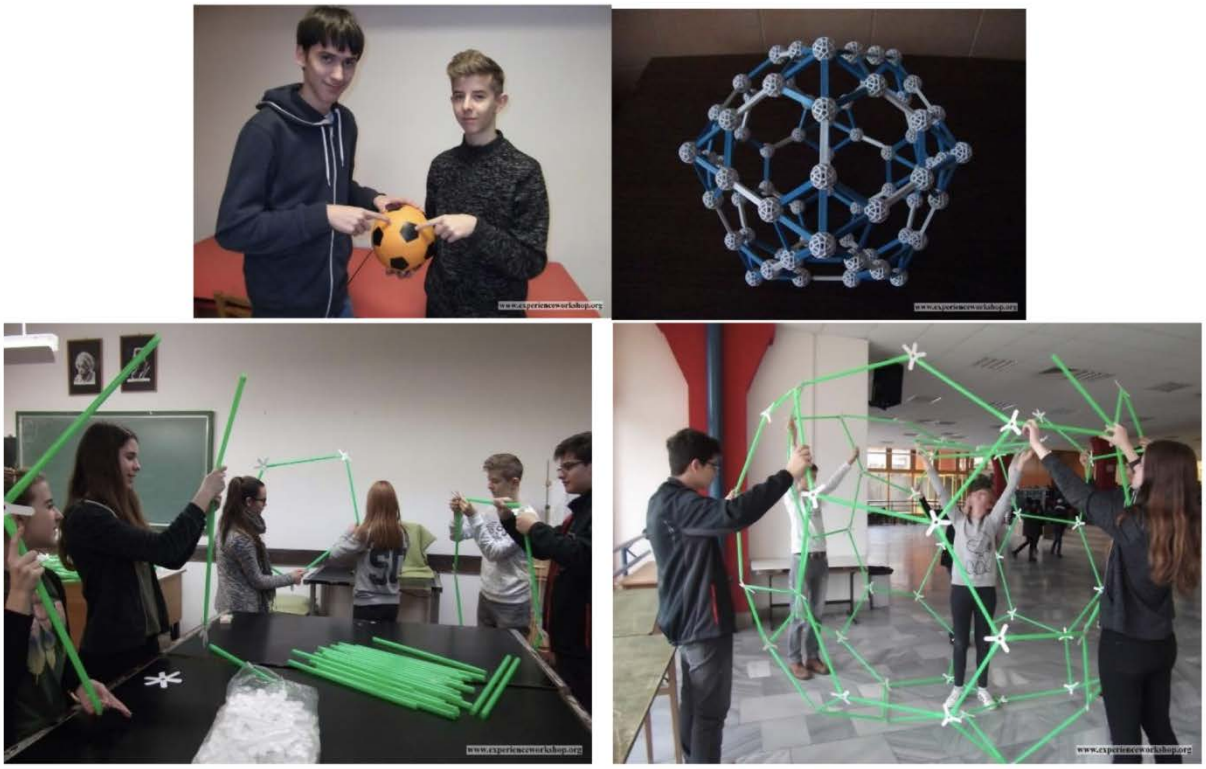
The equipment the group used:



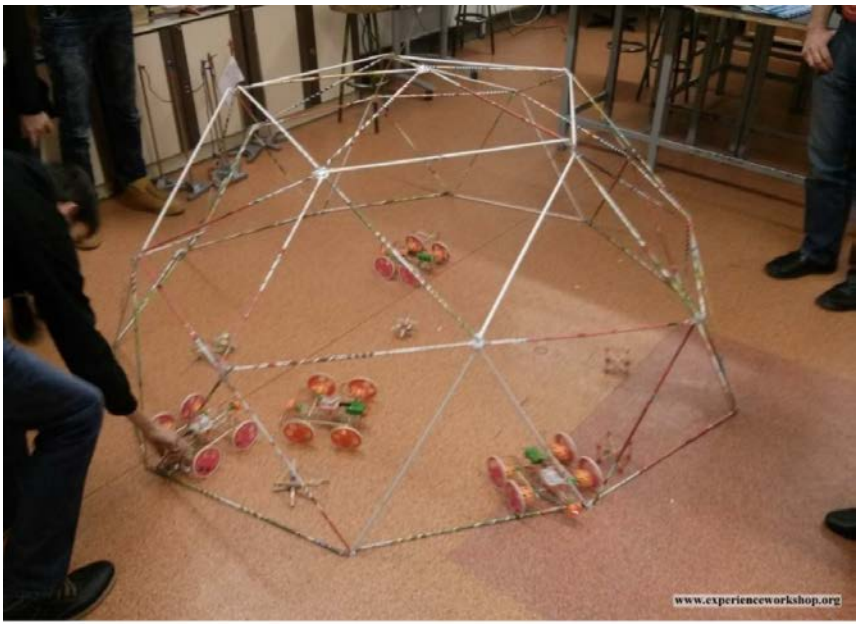
Then they assembled a machine that could carry out the painting, followed by calibrations and testing.

2.1.3 From the ball of football to the robots, or the planning of the equipment of an expedition in the footprints of Richard Buckminster Fuller

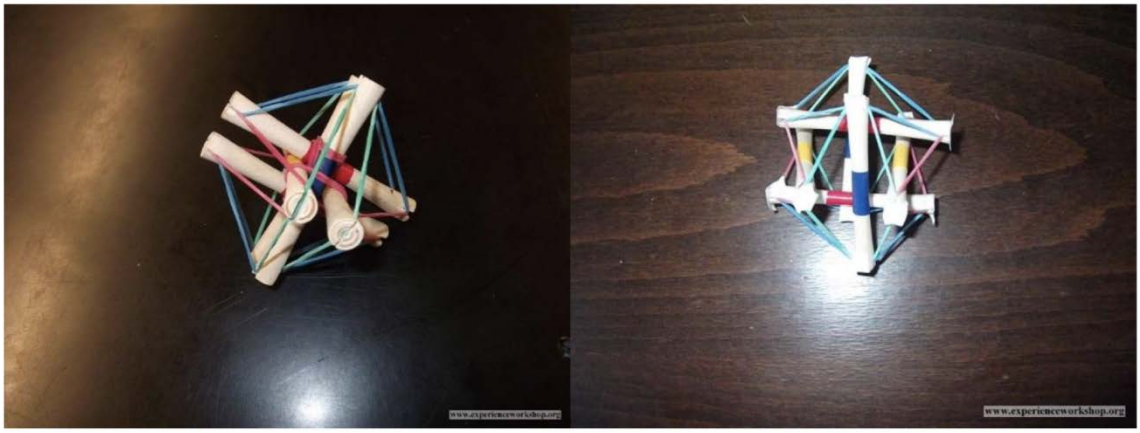
The group in Pecs developed a project involving robots and structures by Richard Buckminster Fuller. The group built a large dome and football from 4D Frame and its models.

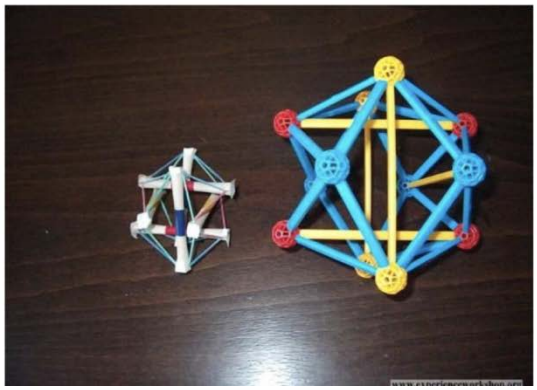


The Geodesic dome building was a challenging activity to follow the geometry of the shapes.



A tengserity models were consisted of numerous mathematical and physic concepts that students needed to consider.





Then students worked on robots from recycled materials that could program for various activities

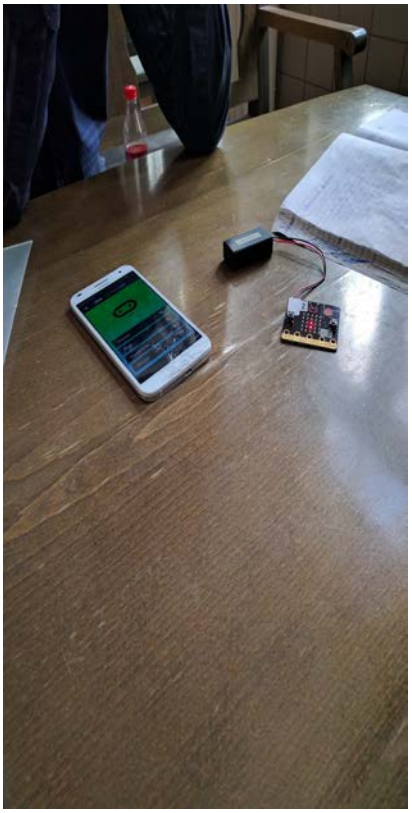
2.1.4 Developing Lego robots basketball player

Students planned to create robots, which can play basketball. The project wasn't finished. After a while, the group faced significant challenges and problems that they couldn't resolve. Though these problems, they stopped the project.

The dream to make a lego robot throw baskets was too big. The mechanical part, creating a catapult like lego robot, which is able to shoot the ball has been done by the group. The code and the past-process of making the robot precise and able to shoot in the basket was too difficult for the team.

2.1.5 Fazekas Mihály school - micro:bit

The group started to work with Micro:bits. The project was to workout collision detection. Micro:bits do have gyroscope built-in. The project was to use the micro:bits' built-in gyroscope to determine hard breaks. After that to use the small "microcomputer's" bluetooth radio to inform other cars in the area that there has been a hard-break. So they are aware of it before they see it.



The group created a prototype, where they created the programme for the micro:bits which could determine breaks. The radio connection with the other Micro:bits has been a problem, which they couldn't polish.

The project was fun for the students. They enjoyed the coding part and the mechanical part of the process, too. They were a bit too over excited to solve a problem which causes problems in the world. But since we know that self-driving cars created by huge companies face the same problems, 16 year old students haven't been able to solve these problems by themselves.

One student from the group decided to study in the field of programming and another is going to study law to work in the field of Ais and self-driving cars. Although the project itself hasn't been a great success, but it helped the students involved in it to decide what to do later in their studies and career.

2.2 Lessons Learnt

We observed in the local challenges that students become highly motivated if they have a chance to develop ideas that are close to their interests and perceived useful for everyday life and society. Teachers guided students in their project developments, but most of the work students carried out independently. However, constant motivation and guidance cannot be left out from the development of the projects and teachers have an important role in the challenge process. In the preparation phase of the project, teachers had an introduction of how to work with students in these situations. But, in the future we believe that such preparation needs to be extended and clarified further to strengthen teachers confidence and offer assistance for more wide-ranging projects. In addition, we need to monitor students activities more closely and ensure that they proceed with their work and discourage giving up visions.

3. International Collaboration

In the international collaboration we envisioned that students work together on projects and they communicate via the Internet. Initially, this sounded to be a good idea and worked in other countries, but in Hungary the constraints of teachers and schools made this activity quite limited. Below, these activities are described.

3.1 Virtual challenges

Video Conference: Fazekas Mihály Elementary and High School of Budapest & La Albercia School

Both groups discussed what they have achieved.

Students of both schools gathered together in the classrooms in Spain and in Hungary. The first 10 minutes of the conversation was about getting to know each other. To understand each other's culture, learning and working environments.

After that each team described what they did in the project. But no further collaboration could be established from this call. Online collaboration is difficult mainly because students in Hungary and in Spain couldn't arrange meetings all together afterschool. In the mornings, while lessons were taught, it wasn't possible either to set up regular Skype calls to discuss further collaboration.

3.2 Lessons learnt

The problems we faced with international collaboration:

Teams are together at school. In the Hungarian secondary schools most of the students aren't attending school from the same area, so getting together in the afternoons is not easy to be organized. As we realized, organising after school activities in Finland and the UK is difficult too. This is the reason why we tried to arrange Skype calls in the morning during school time. Doing so we had to sacrifice lesson time, which can be only done in a limited amount. That's why we only could set up a few Skype conversations between schools.

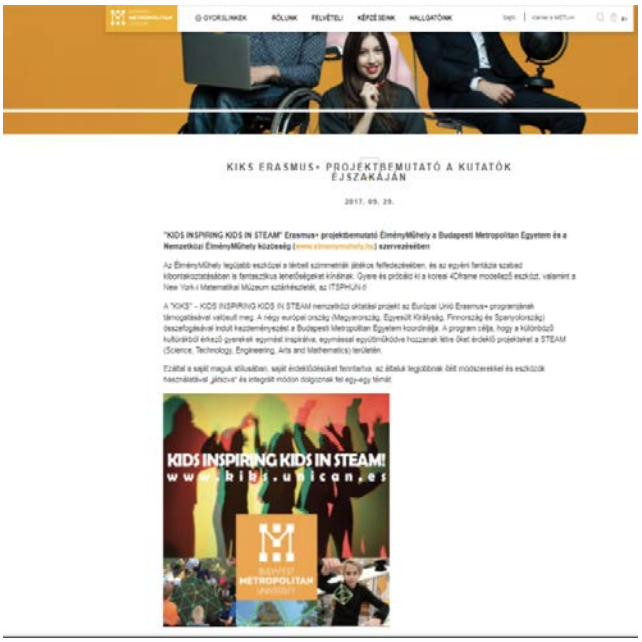
4. Impact, Dissemination and Sustainability

4.1 Key Impact Organizations' & WEB Sites

Most activities of the project was presented on the project website and Facebook page. Also, students created their own websites for their projects. It is an important skill to create and design websites, presentations and dissemination materials. The prepared sites and facebook posts were high quality, but with the preparation of teachers and improving their technical skills this development could be further enhanced. In addition, there is a possibility to create or subscribe to web hosting pages that could include student projects. Furthermore, getting students think about how to best present their projects would be advisable.

4.2 KIKS Multiplier School Event – Closing workshop

The Hungarian team organized a multiplier event at the European Researcher Night in Budapest. The event included showcasing students' projects and running workshop with different equipment, 4D Frame, Lux, and robotics, that were utilized by the teams involved in the project.



The event was a great success and hundreds of students and their parents participated in the event. The Pecs team assisted other students to explore STEAM activities at the event and showed great competences showcase their knowledge for their peers.

Interviews were done by the local TV and media and we created a video that could inspire students to be involved in the activities.

Links: http://www.kutatokejszakaja.hu/2017/esemenynaptar/esemeny.php?id=4765&menu_id=4
http://www.metropolitan.hu/20170929-kiks-projektbemutato
http://www.elmenymuhely.hu/?p=5216&lang=en
https://www.facebook.com/experienceworkshop.math.art/videos/1629625453768128/?hc_ref=ARR8-qiF1qg06hm1IGZTFHLFa4GFuMY3YmXFA2-H_rz5UZBreoNJmaJxMg4bPy7xrVk&fref=gs&dti=817572248375180&hc_location=group

It can be stated that there is a great interest in students to work on STEAM approaches and learn in this way and be inspired to choose future studies and careers in this area

4.3 Sustainability

The Website of the project contains all materials and guidelines developed in the project. Future participants can download materials and examine the activities carried out in the project. In addition, there are several videos and suggestions for further participants to be able to replicate activities of KIKS. The project team continue working on the ideas of KIKS and introduce project results at international and local events. There are publications and conference talks in progress to raise attention to the possible continuation of the project. We believe that there are great potentials in inspirational activities developed by students with the skilled supervision of teachers.

5. Evaluation

5.1 Events, teacher and student experiences

As described in the earlier paragraphs students and teachers participated in a range of activities. The team of the projects constantly observed participants and interviewed teachers and students throughout the activities. Students were engaged in the activities despite the emerging difficulties and they were keen to share their experiences with their peers. Teachers were also active participants of the project and valued the aims of the project, however, they also faced institutional constraints such finding time for activities, diverting close attention from the require curriculum and being orchestrators of activities rather than transmitting knowledge to students as teachers. Nevertheless, feedback from both students and teachers were mainly positive, but further projects needs to take account the limitations of teaching and learning environments in schools.

5.2 Lessons learnt

Overall, the project was carried out successfully, but with some modifications of the original aims to fit school realities in Hungary. The listed points below needs to be thought of and considered for further projects.

- kids in schools are motivated to do activities not related to the curriculum and to stretch their boundaries and explore their interests, however, after school there are numerous other activities they do and fitting KIKS-style activities could be challenging to fit their restricted schedules.
- Group activities need considerable organisation and because of time and schedule restrictions it is quite difficult to find available times for carrying out activities regularly. On-line collaboration is helpful, but physical presence is highly valued.
- KIKS started at the end of August and most of the students already had their school year (trainings, private lessons, music, sport, etc.) already booked late August - mid-September, thus timing of projects is crucial.
- International collaboration became even more complicated since not only a local, but an international team had to find suitable time to work together. It is important to plan well ahead of activities and find the most suitable channel for the work.
- all groups need individual mentors. Teachers who are already exhausted and overbooked in schools and beyond have to create extra time and resources to carry out the project activities. Nevertheless, most teachers were highly motivated, but since they didn't get any external motivation (salary, travel, etc.), their motivation sunk with the time spent in the project
- There were no official binding contracts with teachers or students. Everyone in the project worked voluntarily, because we asked them to do so and highlighted the potential beneficial results. However, offering additional resources could raise the effectiveness of such projects.
- Since there were no official connection with the participants, there was no tool in the hand of the organizing team to motivate or ask the teachers/students to do anything and stretch their imaginations.
- The projects themselves were motivating in the beginning, so does the international collaboration, but after a while these were not enough to keep the motivation for the whole project. Further projects need to work on sustained motivation for participants.

6. Conclusion and Next Steps

We believe that the project was carried out successfully despite the listed difficulties we encountered during the implementation. The reflections and feedback from participants were overwhelmingly positive and they assured us that they were happy to participate and would be involved if further activities were planned. According to our information participating teachers utilize some of the experiences they gained in the project in their current practices and reported that some students also reminded them to utilize more collaborative activities in their teaching. Furthermore, the project team gained important knowledge about the types of activities, the organization, the approaches we should carry forward in future projects and the topics students are interested learning by themselves and put forward to their peers. Students are keen to work on their own ideas and happy to share their work with their teams. However, the current structure of the curriculum in Hungary, the restrictions of time and resources in schools, the overwhelming duties of teachers, and students' ample extra-curricular activities constrain such project. But, reporting on our work and contributing it to the scientific discussion as well as our connection to the development of new curricula could offer new perspectives to integrate such activities into school settings as well as built into classroom activities. In the upcoming year, we plan to present our results at scientific conferences and write academic publications. In addition, we will utilize results of the project in Experience Workshop, further projects, and academic studies and through this promote to researchers, schools, teachers, and students.